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NEW *ACARICALUS* SPECIES (ACARI: ERIOPHYOIDEA) FROM TURKEY OAK, *QUERCUS CERRIS* L. (FAGACEAE) AND THE NEW RECORDS FOR THE FAUNA OF SERBIA

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Abstract

A new species of eriophyoid mite, *Acaricalus cerriquerci* n. sp. (Acari: Prostigmata: Eriophyoidea) collected from Turkey oak, *Quercus cerris* L. (Fagaceae), is described and illustrated. Differential diagnosis is provided in comparison with *Acaricalus halli* Boczek. Three eriophyoid mites (*Setoptus strobacus* Keifer, *Nalepella shevtchenkoi* Boczek and *Platyphytoptus pineae* Castagnoli) from pine and spruce trees are recorded as new to the Serbian fauna.

KEY WORDS: *Acaricalus cerriquerci*, new species, Serbia, Eriophyoidea, *Quercus cerris,* taxonomy, new records.

Introduction

The eriophyoids (Acari: Prostigmata: Eriophyoidea) are among the most diverse and economically very important groups of phytophagous mites. They are the most highly adapted of the plant-feeding mites and have evolved extremely intimate associations with their plant hosts. Currently, 3,690 species names are known, of which 3,442 are valid (AMRINE *et al.,* 2003). Most of them are highly host specific, i.e. they feed on a single host or on a few hosts within a single genus. Few species are known to have extremely broad host ranges (OLDFIELD, 1996).

The research on eriophyoid fauna to date has been neither systematic nor regular. Conservative estimates place the eventual eriophyoid world fauna at between 35,000 and 50,000 species - and some researchers make estimates as high as 250,000 species. Despite the great improvement and increasing interest in investigations of almost all aspects of diversity and functional biology of Eriophyoidea in many regions of the

world, knowledge of the eriophyoid fauna is limited, and taxonomy is in a so-called α phase. An accumulation of a great number of newly described species and also the absence of revisions still characterize the taxonomy of Eriophyoidea. LINDQUIST (1996b) has placed considerable emphasis on the need for revisional systematic studies including cladistic analyses that may clarify the phyllogenetic relationships among eriophyoid mites and produce a classification consistent with them. At the same time (LINDQUST & AMRINE, 1996) emphasised that "the continuing need for so-called alpha taxonomy must be supported, and its image not eroded as a simpler or lesser science. Collection, recognition, adequate description and classification of a great many undescribed taxa of Eriophyoidae must continue if we are ever to approach completion of a species inventory adequately, and thereby obtain an idea of the present species diversity of this group".

Actual knowledge of the Eriophyoid fauna of Serbia is almost at the same level as in the countries with a longer tradition in the field of acarology. In the fauna of Eriophyoidea of Serbia, 287 species have been determined within three families and 46 genera (PETANOVIĆ, 2008). Inasmuch as the territory of Serbia represents one of the leading parts of Europe with respect to floristic diversity (STEVANOVIĆ *et al.,* 1995), significant diversity of the eriophyoid fauna can be expected.

During the recent investigations of the fauna of Eriophyoidea of Serbia three species were identified: *Setoptus stobacus* Keifer, *Nalepella shevtchenko* Boczek, and *Platyphytoptus pineae* Castagnoli, new for the fauna of Serbia and *Acaricalus cerriquerci* identified as a new species, and herein described and illustrated.

Material and Methods

Plant samples containing *Quercus cerris* L. (Fagaceae) leaves were collected in Vršac, Serbia on 05.10.2005, 06.12.2005 and 02.06.2006. Mites were collected from leaves and branches by direct examination under stereo-microscope and/or using extracting methods described by DE LILLO (2001). The morphology of the species was investigated using a phase-contrast microscope (LEICA DMSL). Prior to light microscopy, the mites were cleared in lactic acid for several days and then mounted in Keifer's "F" medium. The nomenclature of morphology follows that of LINDQUIST (1996a). Systematic classification follows that of AMRINE *et al*. (2003). Morphometry was performed using the software package IM 1000 (Leica, Wetzelar, Germany), according to AMRINE & MANSON (1996). Measurements are in micrometers and rounded to the nearest integer, and refer to length unless specified otherwise. All measurements of morphological characters are of the holotype with the measurement range of paratypes in parentheses. Because some measurements of holotype could not be taken due to the position of the mounted mite, only the range of paratypes is reported. Body length is measured from the anterior edge of the prodorsal shield to the end of the anal lobe.

Holotype and paratypes are deposited in the Acari collection, Department of Entomology and Agricultural Zoology, Faculty of Agriculture, University of Belgrade, Serbia.

Results and Discussion

Taxonomy and Faunistics

Acaricalus cerriquerci sp. nov. (Figs. 1, 2 & 3)

Description

Protogyne female (holotype and 4 paratypes): Body fusiform, 165 (165-207), 67 (67-83) wide, light orange in color. Gnathosoma 22 (22-25; coxal setae (*ep*) 4, dorsal genual setae (*d*) 7 (6-7) apical setae (*v*) 2; cheliceral stylets 15 (15-18). Prodorsal shield 50 (50-51), 60 (60-70) wide; anterior lobe moderately broad. Shield sculpture: central field as well as laterals made of network pattern; median line, one admedian and one submedian line (on each side) present in the central field, length of these lines 1/3 of the prodorsal dorsal shield. Dorsal tubercles ahead of rear margin, their axes longitudinal and parallel; scapular setae (*sc*) 7 (7-9), 20 apart, projecting up and inward anteriorly. Legs with all usual segments and setae. Leg I 31(31-33), femur 10, femoral seta (*bv*) 11 (10-11), genu 5, genual seta (*l"*) 25 (22-25), tibia 5 long, tibial seta (*l'*) 5, tarsus 6 long, inner fastigial setae (*ft'*) 20, outer fastigial setae (*ft"*) 20 (20-25), ventro-mesal seta (*u'*) 6, solenidion (ω) 6, knobbed, empodium divided, 5, 4-rayed. Leg II 29 (29-32), femur 9 (9-10), femoral seta (*bv*) 7 (7-9), genu 5, genual seta (*l"*) 6 (6-9), tibia 6, tarsus 5, inner fastigial seta (*ft'*) 4 (4-6), outer fastigial seta (*ft"*) 4 (4-6), ventro-mesal seta (*u'*) 4, solenidion 6 (5-6), knobbed, empodium divided 4 (4-5), 4-rayed. Coxigenital area: coxae with numerous granulae; sternal line 3 (3-6), unforked; coxal setae *1b* 7, 16 (16-17) apart, coxal setae *1a* 20 (15-20), 8 (8-10) apart, coxal setae *2a* 30 (25-30), 25 (25-26) apart. Coxisternal area with 9 microtuberculated annuli. Genitalia: 13 (13-15), 22 (20-22) wide with 8 (8-10) longitudinal ridges in one row. Coxal setae *3a* 41 (30-41) and 12 (12-15) apart. Opisthosoma with 59 (54-59) dorsal semiannuli and 73 (70-76) microtuberculate ventral semiannuli; rounded microtubercles located on the rear margin of ventral semiannuli. Dorsal semiannuli smooth, forming narrow central ridge ending on 30th dorsal semiannulus, and two subdorsal ridges tapering simultaneously with dorsal through. Setae *c2* 25 (25-30), 50 (50-65) apart, on annulus 14 (11-14), setae *d* 47 (40-47), 30 (30-35) apart, on annulus 27 (27-29), setae *e* 14 (14-15), 13 (13-17) apart, on annulus 43 (43-50), setae *f* 21 (20-21), 16 (16-25) apart, on annulus 61 (72). Setae *h2* 70 (70-76), 7 (5-7) apart, setae *h1,* absent (Fig. 1)

Deutogyne female (37 paratypes): Body fusiform, 165-190 long, 80-82 wide, light orange in color. Gnathosoma: 22-25; coxal seta (*ep*) 5, dorsal genual seta (*d*) 7-9, apical seta (*v*) 2, cheliceral stylets 18-25. Prodorsal shield with net-like pattern: 50-55, 69- 73 wide. Dorsal tubercles ahead of rear margin, their axes longitudinal and parallel; scapular setae (*sc*) 8-10, 20-22 apart, projecting up and inward anteriorly. Legs with all usual segments and setae. Legs I 34- 35, femur 10-11, femoral seta (*bv*) 10-12, genu 5, genual seta (*l"*) 25 -26, tibia 7 long, tibial seta (*l'*) 6, tarsus 5-7, inner fastigial seta (*ft'*) 20-22, outer fastigial seta (*ft"*) 20-22, ventro-mesal seta (*u'*) 5, solenidion 5-6, knobbed, empodium divided, 4-5, 4-rayed. Leg II 31-32 long, femur 10, femoral seta (*bv*) 9 long, genu 5, genual seta (*l"*) 10, tibia 6, tarsus 6, inner fastigial seta (*ft'*) 6-7, outer fastigial seta (*ft"*) 15-20, ventro-mesal seta (*u'*) 4, solenidion 5, knobbed, empodium 4, 4-rayed. Coxigenital area: smooth, sternal line 5 -6, unforked, coxal setae *1b* 7-8, 18-20 apart, coxal setae *1a* 20, 7-10 apart, coxal setae *2a* 30, 23-25 apart. Coxisternal area with 8-10 microtuberculated annuli. Genitalia: 15, 22-24 wide with 8 longitudinal ridges. Coxal setae *3a* 30-32 and 12-13 apart. Opisthosoma with 47-53 dorsal semiannuli and 61-63 microtuberculate ventral semiannuli; rounded microtubercles located on the rear margin of ventral semiannuli. Dorsal semiannuli smooth, forming narrow central ridge ending on 32nd dorsal semiannulus, and two subdorsal ridges tapering simultaneously with dorsal through. Setae *c2* 35-39, 52- 62

apart, on annulus 12 -13, setae *d* 36-44, 32- 34 apart, on annulus 29, setae *e* 15-20, 15-16 apart, on annulus 41-42, setae *f* 20-31, 25-27 apart, on annulus 57-59. Setae *h2* 60-65, 8-10 apart, setae *hl* absent (Fig. 2).

Male (n = 4): 147-160, 55-75 wide. Gnathosoma: 18-20, downcurved; dorsal genual setae (*d*) 5, cheliceral stylets 15-18. Prodorsal shield: 44-55, 50-62 wide. Dorsal tubercles ahead of rear margin, their axes longitudinal and parallel; scapular setae (*sc*) 5-8, 13-20 apart, projecting up and inward anteriorly. Legs with all usual segments and setae. Legs I 27-30, femur 8-10 , femoral seta (*bv*) 6-8, genu 4-5, genual seta (*l")* 20-21, tibia 5-6, tibial seta (*l')* 3-4, tarsus 4-6, inner fastigial seta (*ft')* 16-20, outer fastigial seta *(ft")* 15-20, solenidion 5, knobbed, empodium 4, 4-rayed. Legs II 23-25, femur 5-8, femoral seta (*bv*) 6, genu 4-5, genual seta *(l")* 15-20 tibia 5, tarsus 3-5, inner fastigial seta (*ft')* 6-7, outer fastigial setae *(ft")* 20-21, solenidion 5, knobbed, empodium 4, 4 -rayed. Coxae: Sternal line 3-5, coxal setae *1b* 4-5, 10-13 apart, coxal setae *1a* 10, 7 apart, coxal setae *2a* 20, 20-24 apart. Coxisternal area with 8-10 microtuberculated annuli. Genitalia: 12-16 wide; coxal setae *3a* 10 and 13-17apart. Opiosthosoma: Setae *c2* 20-30, 45-55apart, on annulus 12-15, setae *d* 22-25, 26 apart, on annulus 26, setae *e* 13-15, 11- 12apart, on annulus 41-43, setae *f* 17—20, 20-22 apart, on annulus 59- 62. Total dorsal annuli 47-52, total ventral annuli 61-68. Setae *h2* 35-40, 6-7 apart, setae *hl* absent (Fig.1).

Larva (n=1): 110 , 51 wide. Gnathosoma 16; dorsal genual setae (*d*) 4; cheliceral stylets 12. Prodorsal shield: 36, 40 wide. Dorsal tubercles ahead of rear margin, their axes longitudinal and parallel; scapular setae (*sc)* 4, 13 apart, projecting up and inward anteriorly. Legs with all usual segments and setae. Legs 21, femur 6, genu 4 long, genual seta (*l")* 15, tibia 4, tarsus 4, inner fastigial setae (*ft')* 10, outer fastigial setae (*ft")* 15, solenidion 4, knobbed, empodium 3, 4-rayed. Legs II 18, femur 5, genu 3, tibia 4, tarsus 4, solenidion 4, knobbed, empodium 3, 4-rayed. Coxae: coxal setae *1b* 4, 10 apart, coxal setae *1a* 10, 5 apart, coxal setae *2a* 15-20 apart. Coxisternal area with 10 microtuberculated annuli. Coxal setae *3a* 3 and 6 apart. Opiosthosoma: Setae *c2* 7, 35 apart, on annulus 11, setae *d* 21, 20 apart, on annulus 24, setae *e* 7, 11 apart, on annulus 36, setae *f* 11, 17 apart, on annulus 55. Total dorsal annuli 55, total ventral annuli 58. Setae *h2* 30, 5 apart, setae *hl* absent (Fig.3).

Differential Diagnosis and Remarks

Until now four *Acaricalus* spp. have been described from different *Quercus* spp. (Fagaceae) host plants. *Acaricalus cristatus* (Nalepa) and *Acaricalus halli* Boczek are described from Europe (NALEPA, 1897; BOCZEK, 1961), while *Acaricalus segundus* Keifer and *Acaricalus rhodaspris* Keifer are described from the Nearctic region (KEIFER, 1940; 1964). So far *A. cristatus* have been recorded also from the Near East while *A. segundus* have been recorded also from Hungary. Differing morphometric characters between these species and the newly described *A. cerriquerci* sp. n. are presented on Tab. I. Comparing morphometric characteristics it could be concluded that *A. cerriquerci* sp. n. is most similar to *A. halli* but, besides differences in the length of *sc*, *3a* and *d* seta, as well as the number of dorsal and ventral annuli it can be distinguished by the appearance of the prodorsal shield pattern, coxigenital area, and the appearance of male genitalia. The prodorsal shield of *A. halli* has a net-like pattern made of two complete admedian lines and two submedians both of which bifurcate at the rear; the median line is absent; the coxigenital area is smooth. In the new species, the shield pattern consists of a network pattern on the central field as well as laterals; the median line, one admedian (on each side) and one submedian line (on each side) are present in the central field; the length of these lines is 1/3 of the prodorsal dorsal shield; the coxigenital area has numerous granulae; the shape of the male genitalia is also different (see the drawing in BOCZEK, 1961).

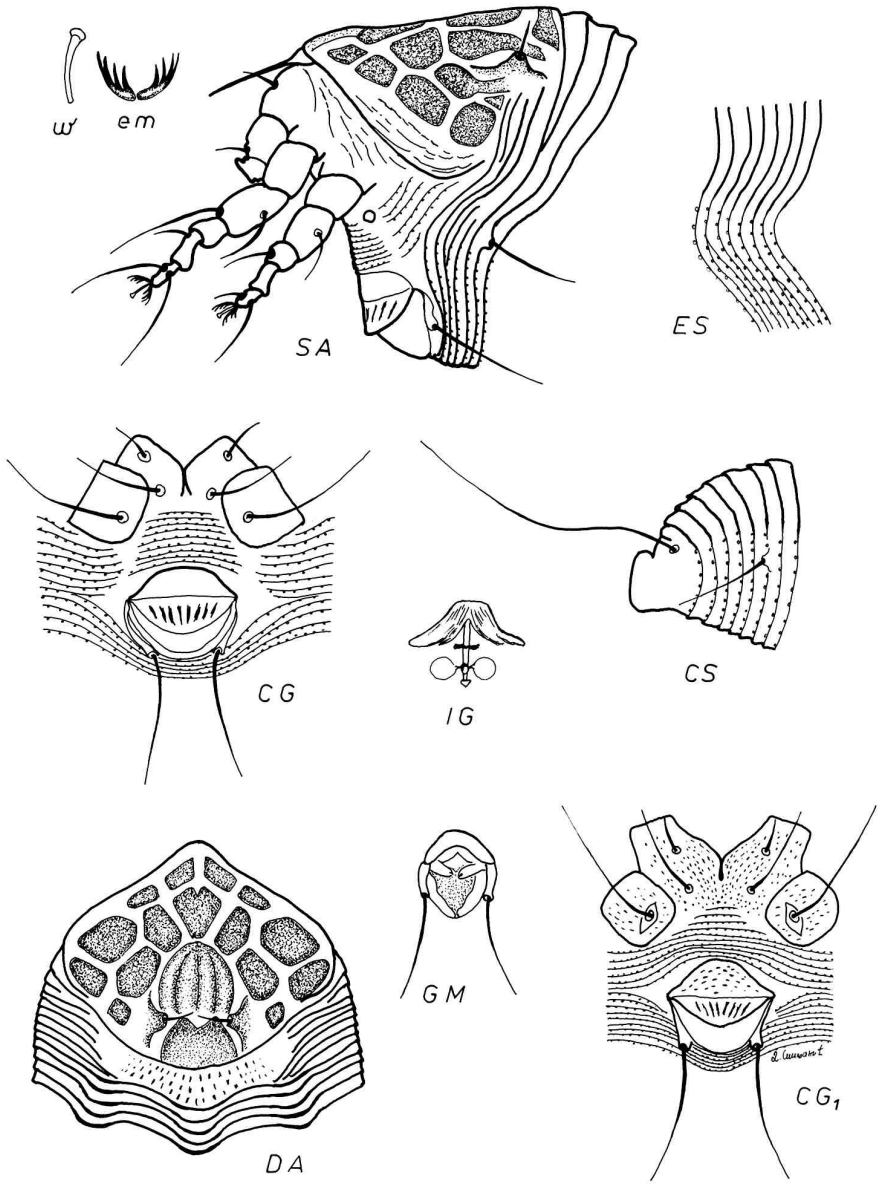

Figure 1. *Acaricalus cerriquerci* n. sp.: CG - coxigenital region of deutogyne female; CG1 - coxigenital region of protogyne female; CS - lateral view of the caudal opisthosoma of protogyne female; DA - dorsal view of the prodorsal shield of protogyne female; em - empodium (enlarged); ES - lateral view of annuli of protogyne female; GM - genital region of male; IG - internal female genitalia of protogyne female; SA - lateral view of anterior region of mite; w - solenidion.

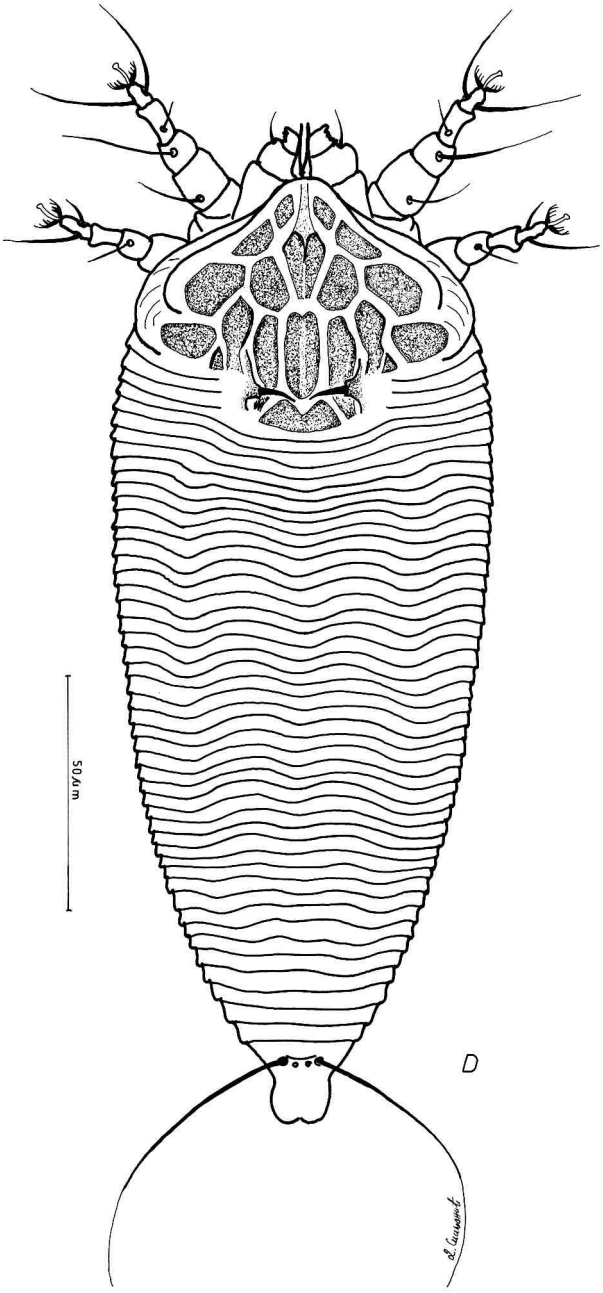

Figure 2. *Acaricalus cerriquerci* n. sp. D - dorsal aspect of deutogyne female.

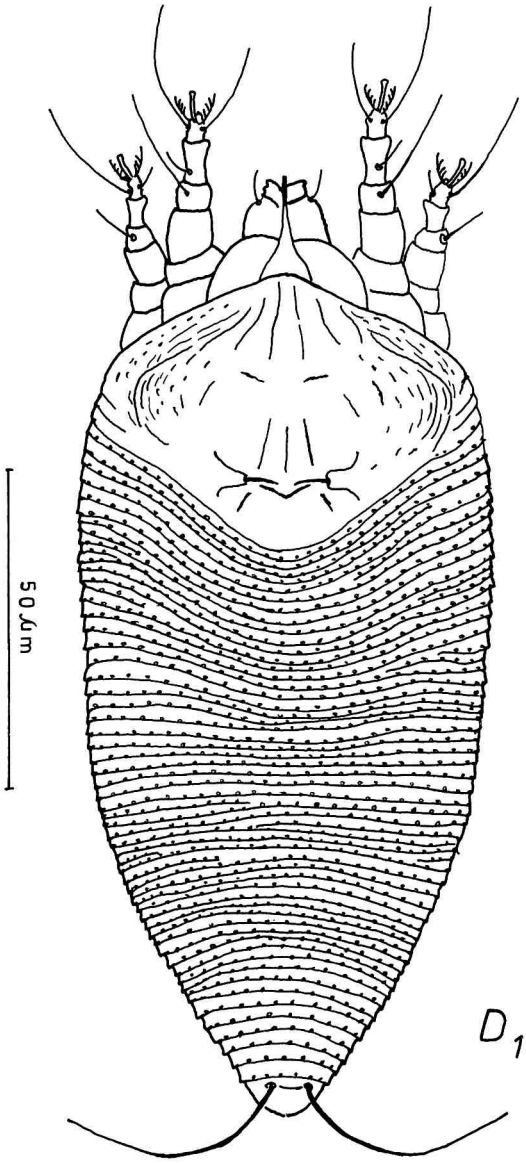

Figure 3. *Acaricalus cerriquerci* n. sp. D1 - dorsal aspect of larva.

Type material: Holotype female (slide 1005/16) paratypes (3 paratype females, 10 males and one larva) and allotype male (1005/1) of *A. cerriquerci* sp. n. collected from the lower surface of Turkey oak leaves on 2 June 2006, as well as 37 deutogyne females collected on 25 October 2005 and on 6 December 2005 in the central park of the town Vršac, North East Serbia by our student, Miss Dragana Novak.

Host Plant: *Qurcus cerris* L. (Fagaceae). Relation to Host Plant - the mites are free living on the lower surface of Turkey oak leaves.

Etymology: The specific name is derived from the combination of specific and generic names of the host plant on which the mite was found.

Table I. Comparison of differing morphometric characters of *Acaricalus* species described from oak trees. Measurements in μm.

Characters, host plants and distribution	***Acaricalus cerriquerci* n. sp**	***Acaricalus rhodaspris***	***Acaricalus segundus***	***Acaricalus cristatus***	***Acaricalus halli***
Length of body	165-207	170-205	120-145	170	169-194
Width of body	67-83	-	50	57	72
Length of gnathosoma	22-25	22	30	-	-
Length of chelicerae	15-18	-	-	-	17
Length of prodorsal shield	50-51	50	50	50	54
Width of prodorsal shield	60-70	60	50	-	58
Length of *sc* setae	7-9	3.5	9.5	10	6.3
sc setae apart	20	20	22	-	16.5
Length of I legs	31-33	32	30	27	32
Length of tibia I	5	8,5	6.5	6	7
Length of seta *l'*	5	6	-	-	5
Length of tarsus I	6	6.5	6	5.5	6.5
Length of solenidion I	6	6.5	5.5	-	5.5
Length of empodium I	5	-	-	-	4
Length of II legs	29-32	32	27	-	27.5
Length of tibia II	6	6.5	6	-	-
Length of tarsus II	5	6.5	5.5	-	-
Length of solenidion II	5-6	6.5	5.5	-	-
Length of genitalia	13-15	11	13	-	18
Width of genitalia	20-22	15	24	24	23
Length of *3a* seta	30-41	10-12	8.5	-	19
Number of longitudinal ridges	8-10	14	10	-	10
Length of *c2* setae	25-30	15	6,5	-	32
c2 seta on annulus	11-14	8	6	-	11
Length of *d* seta	40-47	28	35	-	55
d seta on annulus	30-35	23	22	-	23
Length of *e* seta	14-15	12	14	-	15
e seta on annulus	43-50	40	40	-	42

Characters, host plants and distribution	*Acaricalus cerriquerci* n. sp	*Acaricalus rhodaspris*	*Acaricalus segundus*	*Acaricalus cristatus*	*Acaricalus halli*
					(Table I - continued)
Length of *f* seta	20-21	16	16	-	21
f seta on annulus	43-50	59	65	-	59
Number of dorsal annuli	54-59	47	65	55	45
Number of ventral annuli	70-76	-	70	-	64
Host plant	*Quercus cerris* L.	*Quercus rubra* L.	*Quercus kelloggii* Newb. *Quercus alba* L.	*Quercus pubescens* L.	*Quercus robur* L.
Distribution	Serbia	Virginia, USA	Nearctic region, Hungary	Austria, Germany, Ukraine, Near East	Poland

Records of three new eriophyoid species for the fauna of Serbia

Setoptus strobacus Keifer

Material: 13 females, 2 males and 2 juveniles found inhabiting needle sheaths, causing stunt and deformation of young needles of *Pinus strobus* L. (Pinaceae) in the yard of a summer house at the mountain Avala cc. 500 m.a.s.l. near Belgrade on October 15 2005; leg. R. Petanović**.** (Fig. 4 & 5). The species has so far been recorded in Michigan and West Virginia, USA (Baker *et al*, 1996). Since ithasn't been registered in the Fauna of Europe yet (de Lillo, 2004) it is very probable that it was unintentionally introduced together with its ornamental host plant.

Nalepella shevtchenkoi Boczek

Material: 2 females found inhabiting needle sheaths of *Picea abies* (L.) Karst. (Pinaceae) in Kaluđerske bare, village Rača at Tara Mountain, South West Serbia, on September 28 2005; leg. S. Pešić. The species has so far been recorded in Poland, Bulgaria, the Danish mainland and in Germany (de Lillo, 2004) as a vagrant on *Abies alba* Mill. and *A. nordmanniana* (Stev.) Spach.

Platyphytoptus pineae Castagnoli

Material: 2 females found inhabiting needle sheaths, causing stunt and deformation of young needles of *Pinus strobus* L. (Pinaceae) in the yard of a summer house at the mountain Avala cc. 500 m.a.s.l. near Belgrade on October 15 2005; leg. R. Petanović. The species has so far been recorded in Italy as a vagrant on needles of the Italian Stone Pine or Umbrella Pine, *Pinus pinea* L. (Pinaceae) (Castagnoli, 1973), Ukraine and the Near East (de Lillo, 2004). It was also reported from *Pinus oocarpa* Schiede needles of the Brasilia Botanical Garden in Central Brasil and suspected to have been imported by Italian immigrants (Flechtmann & Navia, 1998).

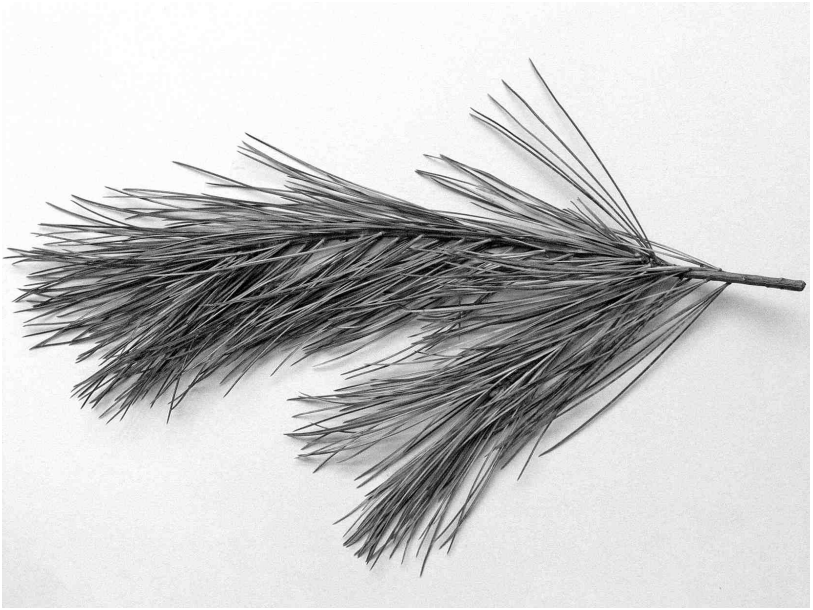

Figure 4. *Pinus strobus* L. deformations of needles.

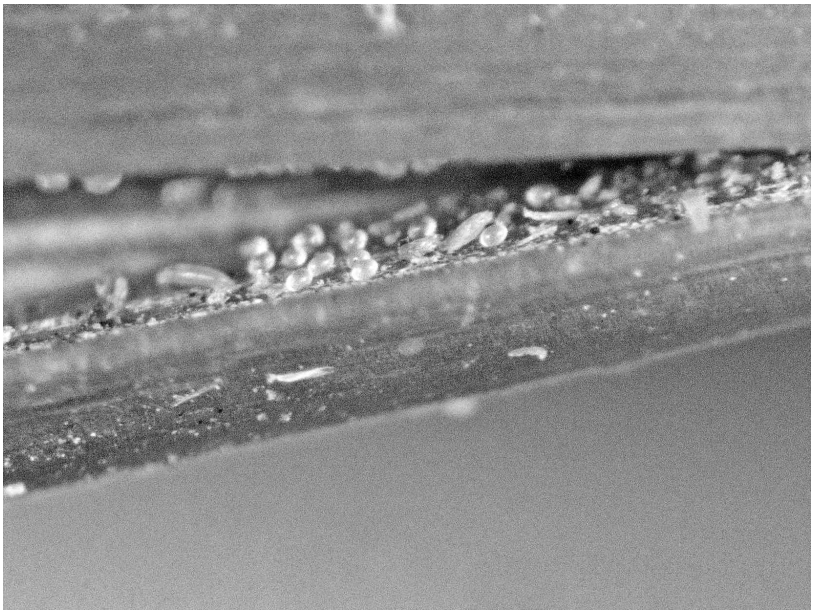

Figure 5. *Setoptus strobacus* between needles on eastern white pine.

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НОВА ВРСТА РОДА *ACARICALUS* (ACARI: ERIOPHYOIDEA) СА ЦЕРА, *QUERCUS CERRIS* L.(FAGACEAE) И ПРИЛОЗИ О НОВИМ ВРСТАМА У ФАУНИ СРБИЈЕ

Радмила Петановић и Биљана Видовић

Извод

У раду је описана једна нова врста ериофида (Acari: Eriophyoidea), *Acaricalus cerriquerci* n. sp. са цера, *Quercus cerris* L. (Fagaceae). Поред протогине женке детаљно је описана и нацртана и деутогина женка, ларва и детаљи грађе мужјака. Основне квантитативне карактеристике упоређене су са до сада описаним врстама рода *Acaricalus* које насељавају различите врсте рода *Quercus* у свету. Приложена је и диференцијална дијагноза у односу на *Acaricalus halli* Boczek која је описана са храста лужњака, *Quercus robur* L.

У раду се наводе и релевантни подаци о три нове врсте ериофида у фауни Србије: *Setoptus strobacus* Keifer, *Nalepella shevtchenkoi* Boczek и *Platyphytoptus pineae* Castagnoli. Врста *S. strobacus* је до сада регистрована само у САД и вероватно је ненамерно интродукована са домаћином *Pinus strobus* L. На истој врсти бора нађена је и европска врста *P. pineae*. Обе врсте доводе до рђања и опадања четина. Трећа нова врста у фауни Србије *N. shevtchenkoi,* забележена је по први пут на смрчи, *Picea abies* (L.) Karst. на планини Тари.

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