

CHARACTERIZATION OF *BERLESIANA* TURK, 1943
AND DESCRIPTION OF *BERLESIANA BEUNZANA* SP. N.
FROM SPAIN
(ACARI, MESOSTIGMATA, EPICRIIDAE)

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ACARI
MESOSTIGMATA
EPICRIIDAE
BERLESIANA

SUMMARY: *Berlesiana beunzana* sp. nov. is described from adult females and males collected in oak forest litter and humus in Navarra. A revised description of the genus *Berlesiana* Turk, 1943 and a key to species, based on adult females, are provided.

RÉSUMÉ : *Berlesiana beunzana* n. sp. est décrit à partir de mâles et femelles en provenance de litière de chêne de Navarre (Espagne). Une révision de la définition du genre *Berlesiana* Turk, 1943 est présentée et la clef des espèces, basée sur les femelles, est établie.

INTRODUCTION

EVANS (1955), ATHIAS-HENRIOT (1961), BREGETOVA (1977) AND MORAZA & JOHNSTON (2004) summarized the previous knowledge of the enigmatic lower derivative mesostigmatic family Epicriidae.

Berlesiana Turk, 1943, was based on *Epicrius cirratus* Berlese, 1916. The genus was first seriously studied by EVANS (1955) who added a second species, *B. denticulata*, from England. ATHIAS-HENRIOT (1961) described a third species, *B. schizoprocta*, from Algeria and BREGETOVA (1977) synonymized *Berlesiana* and included all anteriorly described species of the genus in *Epicrius* Canestrini & Fanzago, 1877. However, characteristics of the sternal and genital shields, dorsal adenotaxy and the chaetome of tarsus I, lead us to consider *Berlesiana* to be a valid Palearctic genus.

In the present paper, a fourth species of *Berlesiana* is described together with a new characterization of the genus. MORAZA & LINDQUIST (1998) discussed the phylogenetic relationship between Epicriidae and Zerconioidea before *Neoepicrius* Moraza & Johnston, 2004 and *Adenoepicrius* n. gen. (MORAZA, 2005) were described. The new information provided by these two studies and the present work will enable us to better analyze the genetic relationships within the family and to carry out a phylogenetic comparison between epicriids and other families of Mesostigmata.

MATERIAL & METHODS

The specimens were collected by the author during soil ecology studies in Navarra, northern Spain. Specimens were examined using light microscopy and

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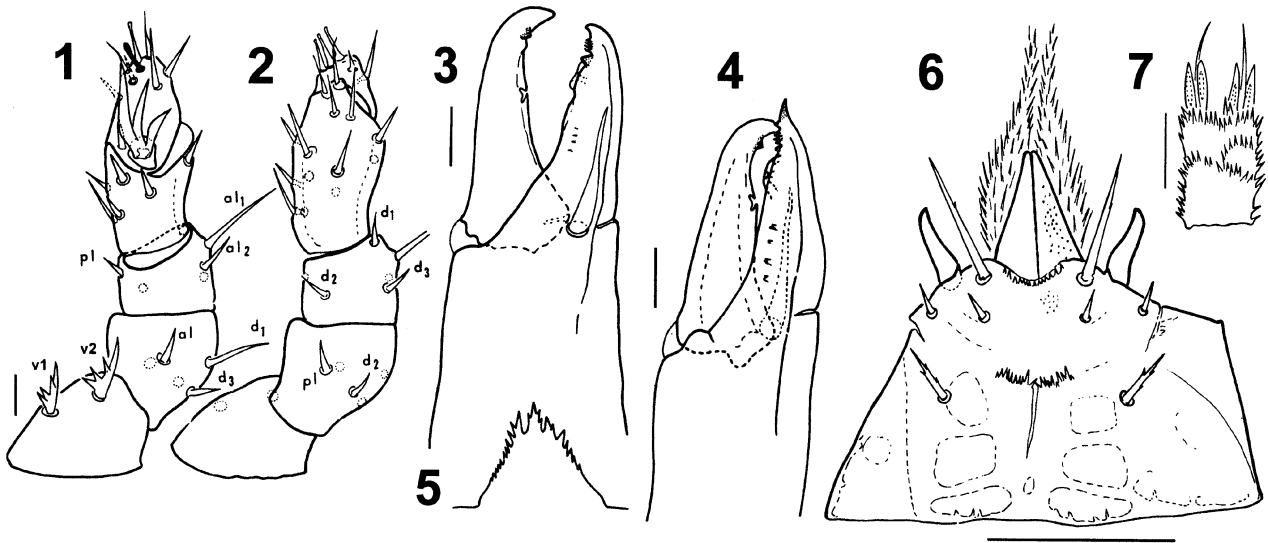
were cleared in Nesbitt's solution and mounted in Hoyer's medium. Drawings are based on slide mounted material.

In the generic diagnosis, unique apomorphic characters are indicated with an asterisk. Idiosomal setal notation follows LINDQUIST & EVANS (1965), with modifications for the caudal region as given by LINDQUIST (1994) and LINDQUIST & MORAZA (1999). The system of sigla for designating dermal glands and lyrifissures is based on JOHNSTON & MORAZA (1991) and KRANTZ & REDMOND (1987). The system describing the chaetotaxy of tarsus I is based on EVANS (1963) and MORAZA (2004). All measurements are given in micrometers (μm), presented as ranges (minimum to maximum) or mean size \pm standard deviation, size range and sample size.

Berlesiana Turk, 1943

Diagnosis: Chelicera (FIGS. 3, 4) with antiaxial hyaline apophysis; fixed digit with subapical denticulate ridge followed by tooth in antiaxial position; pilus dentilus vestigial, reduced to a conspicuous insertion; movable digit with two teeth. Subcapitulum (FIG. 6) with hypostomal setae *hp1* slightly barbed and twice longer than barbed capitular setae; *hyp2* and *hyp3* shorter and smooth. Hypostomal processes large, triangular in shape with long and spiculate laciniae. Deutosternum with two rows of denticles. Palps (FIGS. 1, 2) with tarsal setae reduced to 14. Dorsal shield (FIG. 8) in female and male extended laterally and ventrally to fuse with peritrematic and exopodal elements and captures six pairs of ventral setae (*Jv* and *Zv*). Dorsal and ventral cuticular ornamentation with bi- and trifurcate tubercles forming a polygonal network; usually one seta in each polygon. Dorsal chaetotaxy (FIG. 8, 10) with 31 pairs of stout and strongly barbed setae (*j1* — *j6*, *z4* — *z6*, *s1* — *s6*, *r3* — *r5*, *J2* — *J5*, *Z2* — *Z4*, *S3* — *S5*, *R1* — *R4*). Podonotum with four pairs of simple glands (glands with single gland openings) (*gdj2*, *gdj4*, *gdj6*, *gds5*), four pairs of glandular complexes (FIG. 13) (with one gland opening and one nonglandular ports) (*gdj1*, *gdj3*, *gds2*, *gds4*) and two pairs of glandular conspicuous complexes (with one gland opening and two nonglandular ports) (*gds6* and *dgz6*) (FIGS. 11, 12);

glands *gds6* always basal to *dgz6* and less developed. Glands *gdz4* absent. Podonotum with four pairs of lyrifissures (*idj1*, *idz3*, *ids6* and *idz6*). Opisthonotum (FIG. 8) with four pairs of simple glands (*gdJ2*, *gdJ4*, *gdJ5*, *gdZ2*) and five pairs of lyrifissures (*idJ4*, *idJ5*, *idS3*, *idS4*, *idR3*). Lateropeltidial region with two pairs of glands (simple *gp1* on soft cuticle and complex *gp3*) and four pairs of lyrifissures (*ip1*–*ip4*). Tritosternum (FIG. 7) with laciniae trifid; medial branch thinner and longer than lateral. Sternum: *st1* on jugular shields; *st2*, *st3* and *st4* on separate shields (*B. cirrata*) or *st2*, *st3* on one shield and *st4* on soft cuticle (*B. denticulata*) or *st2* and *st3* on two longitudinal separate shields (FIG. 9) and *st4* on soft cuticle; sternal lyrifissures *iv1*–*iv3* absent. Female genital shield (FIG. 9) with more or less parallel sides; anterior portion of the epigynal region serrate; genital seta *g* (= *st5*) and *Zv1* on shield. Female and male (FIGS. 9, 18) with nine pairs of opisthogastric setae and three pairs of opisthogastric lyrifissures. Male (FIG. 18) sternogenital shield with four pairs of setae; genital opening with two valves, anterior with one pair of eugenital setae. Glands *gv2* simple. Female and male with free ventrianal shield, one or two pairs of preanal setae and glands *gv3* at level of paranal setae and *gv4* absent. Setation of trochanters of legs, respectively, 6-5-5-5; that of femur, 13-13-8-8; that of genu, 2 3/2 3/1 2 (13), 2 3/1 2/1 2 (11), 2 2/1 2/1 2 (10), 2 2/1 3/1 1 (10); that of tibia, 2 3/2 3/2 2 (14), 2 2/1 2/1 2 (10), 2 1/1 2/1 2 (9), 2 1/1 3/1 2 (10). Tibia I with *av1* simple. Tarsus I (FIGS. 16, 17) with 48 setae (5 30/8 5); three to four macrosetae (*av3*, *pv3*, *pv4*, *al5*) on the telotarsal basal region; *al5* half as long the tarsal length, with apical portion barbed and procumbent on lateral face of tarsus I*; *av3* and *av4* with a clubbed spiny tip. Apical region of tarsus I with two small pointed projections which may be a vestigial ambulacrum, three smooth macrosetae and an anteroventral spine-like sessile seta (FIG. 17). Pretarsi II-IV with well-developed claws and pulvilli (FIG. 5); tarsi II-IV with one subapical dorsal gland and two dorsal glands associated with circumpodal fissure, dorsal lyrifissure incorporated into circumpodal fissure so that together they circumscribe a dorsal platelet bearing setae *ad3* and *pd3*; basitarsi II-IV with one dorsal lyrifissure. Coxa I with four anterolateral glands and five basal glands (FIG. 14).



FIGS. 1-7. *Berlesiana beunzana* sp. n. — (1) Female, palp, right, ventral, (2) Female, palp, right, dorsal, (3) Female, chelicera, antiaxial, (4) Male, chelicera, paraxial, (5) Female, tectum, dorsal, (6) Female, subcapitulum, ventral. (7) Female, tritosternum. Scale (1 – 5, 7) = 10 μ m, (6) = 50 μ m.

Berlesiana beunzana sp. n.

(FIGS. 1-18)

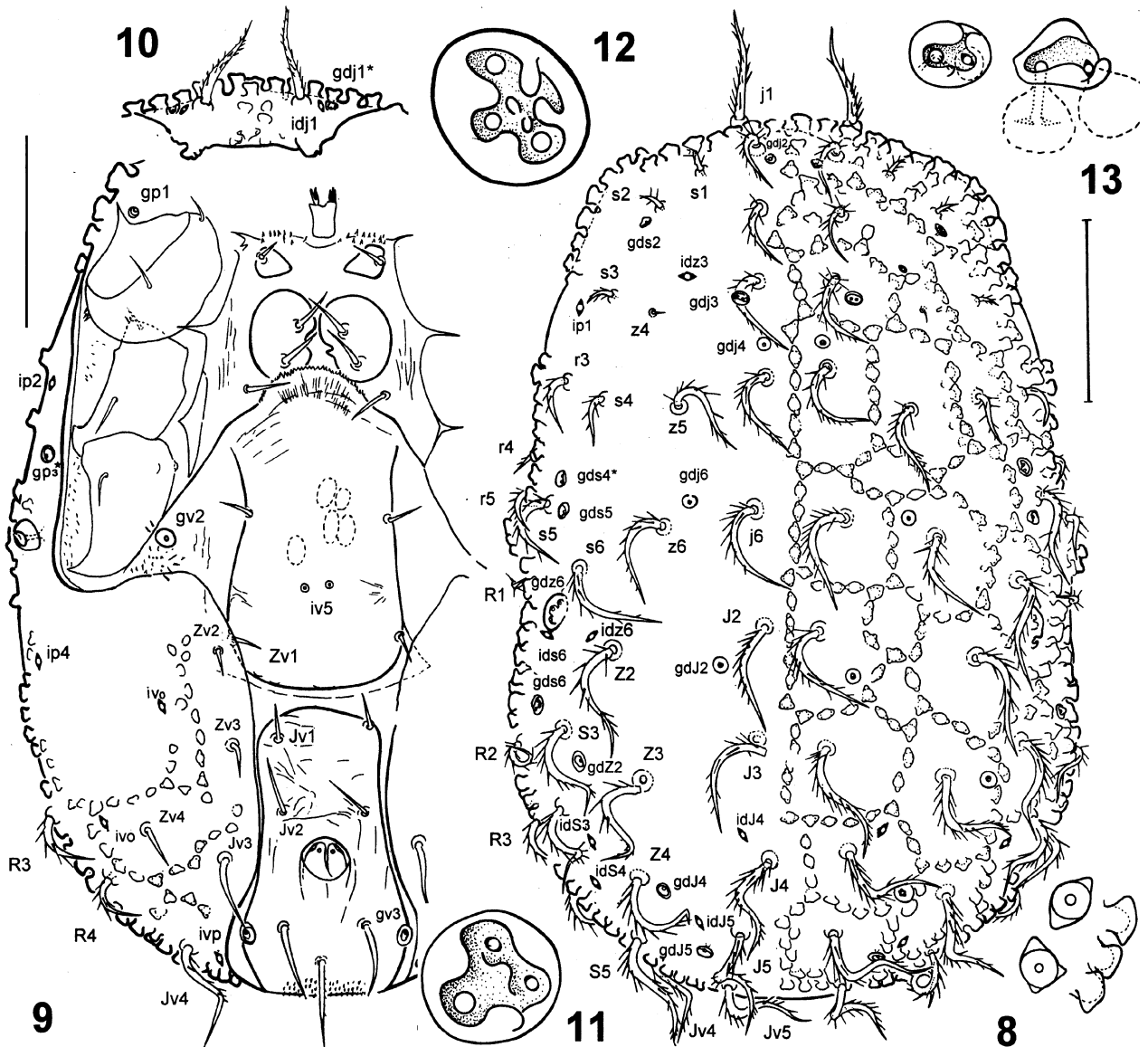
ADULT FEMALE. (based on two adult female specimens). Idiosomal length 498-506; idiosomal width 352-381.

Gnathosoma. Tectum (FIG. 5) triangulate, strongly serrate. Chelicera (FIG. 3) normal for the genus; dorsal cheliceral seta long, situated at level of dorsal lyrifissure. Corniculi short; deutosternal groove of subcapitulum (FIG. 6) absent between the two rows of denticles; capitular setae longer than hypostomal setae 2 and 3 (at least twice as long) and less than half the length of *hyp1*. Palpal chaetotaxy normal for the genus (FIGS. 1, 2); palp-trochanter with branched thick setae; palp-claw 3-tined.

Dorsum (FIGS. 8, 10). Dorsal shield with bi- and trifurcate tubercles and 31 pairs of dorsal setae (*j1-j6*, *z4-z6*, *s1-s6*, *r3-r5*, *J2-J5*, *Z2-Z4*, *S3-S5*, *R1-R4*) densely plumose on one side, stout, curly and heterogeneous in length: *z4* is the shortest seta, thin and smooth; seven pairs of anterolateral setae are short and thinner ($s1 = s2 = s3 = r4 < s4 = r3 = r5 = R1 < s5$);

other dorsal setae as in FIG. 8. Dorsal poroidotaxy and adenotaxy such as in FIG. 8. Complex glands *gdj1*, *gdj3*, *gds2*, *gds4* and *gp3* (FIG. 13) (with one gland opening and one non-glandular port); glandular complex *dgz6* (FIG. 12) in the same reticule as *s6* and *gds6* (FIG. 11) smaller, in an isolated reticule; *gdj4*, *gdj6*, *gds5*, *gp1* and other podonotal glands are simple. Peritreme absent and stigmata opening in a prominent tubercle proximal to *r5*.

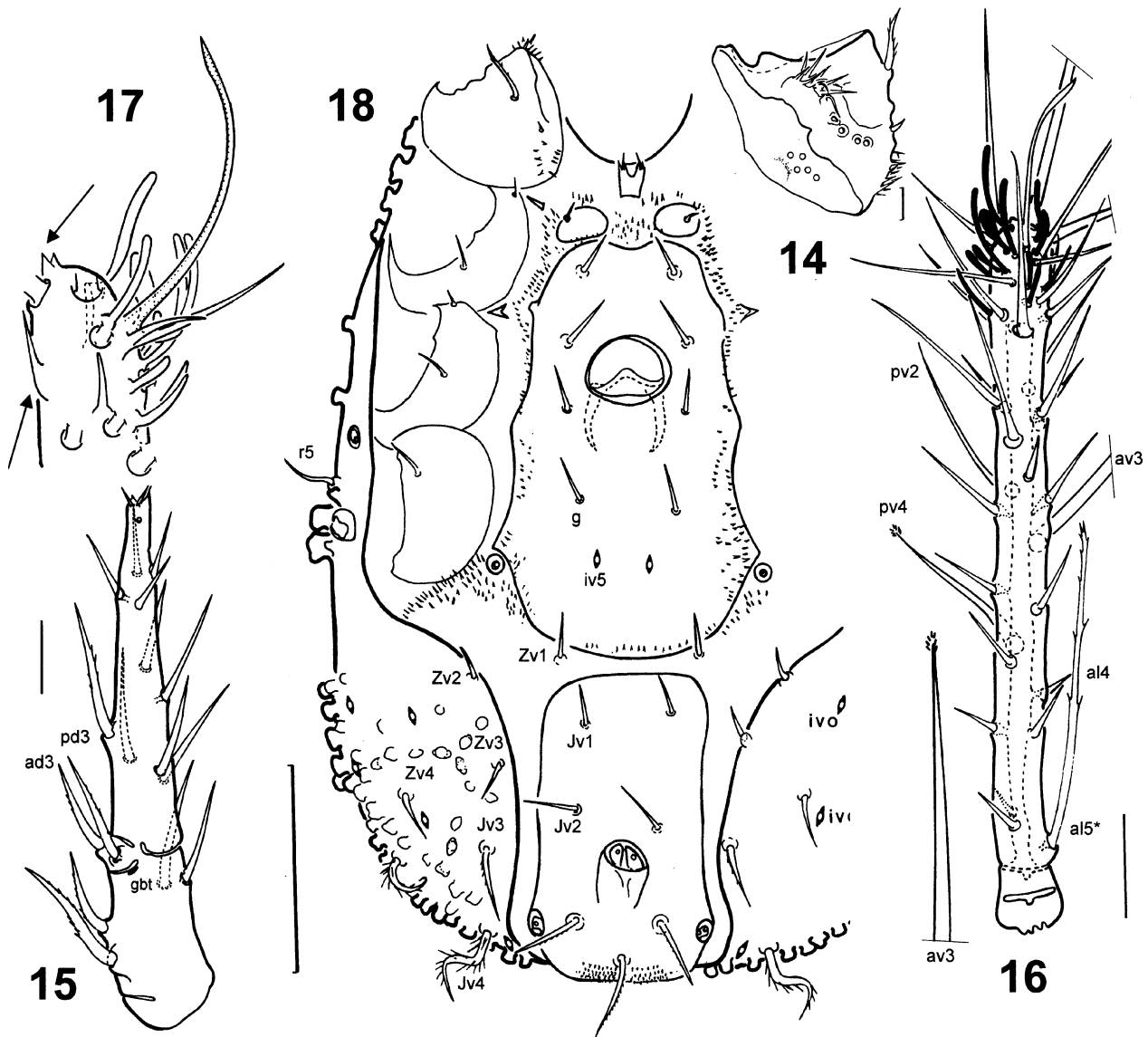
Venter (FIG. 9). Tritosternum with a wide spiculated base and smooth laciniae (FIG. 7). Sternal setae *st1* on poorly sclerotized shields. Setae *st2* and *st3* together on two medially separated rounded shields between coxae II and III; *st4* on soft cuticle; *iv3* absent. Genitoventral shield narrow, with parallel lateral sides. Ventrianal shield free, with one or two pairs of preanal opisthogastric setae shorter than circumanal setae; glands *gv2* simple. Nine pairs of opisthogastric setae (*Jv1-Jv5*, *Zv1-Zv4*); *Jv4* and *Jv5* pilose, similar to other dorsal setae; three pairs of lyrifissures *ivo* on the sclerotized and ornamented cuticle. Endopodal shields weakly sclerotized, reduced and free.



FIGS. 8-13. *B. beuzana* sp. n., female, (8) Idiosoma, dorsal, (9) Female, idiosoma, ventral, (10) Female, idiosoma, anterior, dorsal, (11) Gland complex *gds6*, (12) Gland complex *dgz6*, (13) Complex glands *gdj1*, *gdj3*, *gds2*, *gdj6*, *gp3*. Scale (8, 9) = 100 μ m.

Legs. Tarsus I (FIG. 16) with two distal projections (vestigial ambulacrum?) and 48 setae (5 30/8 5). Ventral setae notated as *av3* and *pv4* are macrosetae with a spiny, clubbed tip; *pv3* simple macroseta; macroseta *al5* barbed, more than twice the length of the segment. Tarsus I length 175 ± 0.5 , 174-175, 2; tarsus II 161 ± 5 , 156-166, 2;

tarsus III 137 ± 2 , 135-138, 2; tarsus IV 177 ± 1 , 175-178, 2; tibia I 151 ± 1 , 149-151, 2; tibia II 68 ± 9 , 59-77, 2; tibia III 66 ± 5 , 60-71, 2; tibia IV 79 ± 1 , 78-80, 2; genu I 89 ± 0.4 , 89-90, 2 and femur I 198 ± 9 , 189-207, 2. Ratio of body length/tibia I length = 3.3. Tarsi II-IV (FIG. 15) normal for the genus.



FIGS. 14-18. *B. beunzana* sp. n., (14) Female, coxa I, right side, anterolateral, (15) Female, tarsus IV, left side, posterolateral, (16) Female, tarsus I, left side, dorsal, (17) Female, distal region of tarsus I, anterolateral view (18) Male, idiosoma, ventral. Scale (14) = 10 μ m, (15, 16) = 25 μ m, (18) = 100 μ m.

ADULT MALE (Based on three specimens). Idiosoma length 448 ± 9 , 434-464, 3, width 337 ± 3 , 333-342, 3.

Gnathosoma. Fixed digit of chelicera (FIG. 4) with acute, bent tip. Subcapitulum and palps similar to female.

Dorsum. Dorsal chaetotaxy, adenotaxy and poroidotaxy similar to female.

Venter (FIG. 18). Jugular shields rounded with minute *st1*. Sternogenital shield extends behind coxa IV with four pairs of smooth setae and *iv5*. Genital opening between sternal setae *st3* and *st4*. Glands *gv2* simple. Ventrianal shield similar to female, totally free from dorsal shield and bearing two pairs of preanal opisthogastric setae (*Jv1* and *Jv2*) and glands *gv3*. Setae *Zv1* on soft interscutal cuticle. Endopododal shields I and II small and free.

Legs. Chaetotaxy, adenotaxy and poroidotaxy similar to female.

MATERIAL EXAMINED. Holotype female, Spain, Navarra, Beunza, from oak forest litter and humus (*Quercus pyrenaica*), 10.VIII.1982, M.L. Moraza coll.. Paratypes, two females and four males from same locality and date.

Deposition of types. Holotype and paratypes (one female and three males) deposited in the Museo de Zoología, Universidad de Navarra (MZUNA), Pamplona, Spain. Paratypes, one female and one male, deposited in the Acarology Collection of The Ohio State University (Columbus, Ohio, USA) (OSAL).

Additional Material. In addition to the specimens of *B. beunzana*, we have studied the following material: *Berlesiana cf. cirrata* Berlese, one male, Italy, Firenze, ex leaf litter in garden of Zoological Institute, D. L. Wrensch coll (Ohio State University, Acarology Laboratory, OSAL); *Berlesiana* sp., one female, two males, France (no other data), Marc Andre coll. (OSUAL).

ETYMOLOGY. The species name “*beunzana*” refers to the type locality of the new species.

KEY TO SPECIES OF *BERLESIANA*
(based on adult females)

- 1(2). Sternal setae *st2*, *st3* and *st4* on separate shields; ventrianal shield with one pair of preanal setae; body length 440, width 300 *B. cirrata*
- 2(1). Sternal setae on a different arrangement of shields
- 3(4). Sternal setae *st2* and *st3* together on one shield, *st4* on soft cuticle or on small platelets; ventrianal shield with one pair of preanal setae; body length 420, width 262..... *B. denticulata*
- 4(3). Sternal setae *st2* and *st3* on either side together on two longitudinally separate shields, *st4* on soft cuticle; ventrianal shield with two pairs of preanal setae; body length 502, width 366 *B. beunzana*

Males of *B. schizoprocta* have a pair of ventral scutellae bearing setae *Jv1* and a free ventrianal shield with one pair of preanal setae; dorsal setae *s1*, *z4*, *s2* and *s3* are short, similar in length and smooth, and seta *s6* and glandular complexes *gdz6* and *gds6* in the same reticule.

BREGETOVA (1977) described four species with ventral characteristics resembling *Berlesiana*, such as the non-expanded genitoventral shield and fragmented sternal shield. *E. subalpinus* has setae *st1* to *st3* on separate shields and tarsus I with two macrosetae with a “fork” at the tip; *E. ivanovi* has *st2* on separate shields. Both species have genital and anal shields with one pair of setae. *E. pinetorum* and *E. tauricus* have *st2* and *st3* on the sternal shield (type *B. denticulata*) but the dorsal setae are smooth or with a short plumosity and glandular complexes *gdz6* are well developed pustules (conspicuous protuberances with two gland openings), *Epicrius* type. The inclusion of these species in *Berlesiana* will not be possible until morphological characters, especially those of dorsal adenotaxy and tarsus I, have been thoroughly studied.

DISCUSSION

Among the described characters of *Berlesiana*, several features may be attributed as unique diagnostic apomorphies: dorsal glands *gdz4*, *gdz5* and *gdJ5x* absent, glandular complex *gds6* basal to *gdz6* and tarsus I with a basal lateral macrosetae “*al5*”, barbed and procumbent on lateral face of tarsus. *Berlesiana* may have the sternal shield fragmented as an apomorphic character shared with *Sejina* and the cheliceral morphology has, in a low degree, sexually dimorphic characters.

The sexual dimorphism exhibited by the lateroventral expansions of the dorsal shield and ventral shielding in *Neoepicrius* (e.g. *N. krantzi* Moraza & Johnston, 2004), is present, although to a lesser degree, in other genera of the family. In *Epicrius*, males may have the anal or ventrianal shield completely fused to the dorsal shield, being otherwise free or partially fused in females. The ventrianal shield of males in *B. denticulata* are larger than in females; in *B. schizoprocta*, males have a pair of ventral scutellum, which probably are absent in females.

Other apomorphic characters shared with other Epicriidae: tarsus I lacking ambulacrum and with telotarsal macrosetae, tarsi II to IV with dorsal sclerite with setae “*d3*” and conspicuous glandular complex *gds6* and *gdz6* on the dorsal shield.

Berlesiana exhibits a Palearctic distribution. *B. cirrata* Berlese, 1916, is found in moss in Italy and Balears Isles (Spain), *B. denticulata* Evans, 1955, from litter under beech in England, *B. schizoprocta* Athias-Henriot, 1961 (only males are known) from soil and litter of *Laurus nobilis* in Algeria and *B. beunzana* from litter and humus of oak forest in Navarra (Spain).

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