

THE GENERA *LIACARUS*, *STENOXENILLUS* AND *XENILLUS* (ORIBATIDA: GUSTAVIOIDEA) FROM TURKEY

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SUMMARY: Two new gustavioid species viz. *Stenoxenillus incisus* sp. nov. and *Xenillus setosus* sp. nov. are described from Turkey. Taxonomic problems concerning the genera *Liacarus*, *Stenoxenillus* and *Xenillus* are briefly discussed. It is proposed that the genus *Stenoxenillus* is placed in the family Liacaridae. Two species, viz. *Liacarus coracinus* (Koch, 1840) and *Xenillus tegeocranus* (Hermann, 1804), are newly recorded for this region and redescriptions are presented for these species.

INTRODUCTION

The gustavioid genera *Liacarus* Michael, 1898, *Stenoxenillus* Woolley & Higgins, 1966, and *Xenillus* Robineau-Desvoidy, 1839 are difficult to deal with taxonomically. They are not clearly defined and, in the case of *Liacarus* and *Xenillus*, include many morphologically diverse species, which are also highly variable intraspecifically. Authors such as GRANDJEAN (1936), AOKI (1967), WOOLLEY (1968), BERNINI (1973) and BALOGH (1986) reported a high degree of variability in body size, sculpture, lamellar development (especially the degree of development of the cuspidal teeth and intercuspidal mucro) and shape of the sensillus. Such species diversity and intraspecific variations may bring into question the problem of the validity of currently recognised generic characters. Unfortunately, as analyses of intraspecific variation is often lacking, many described species may be only variants of widespread species. The above-mentioned

genera are in need of revision, but, as it was not possible to examine any relevant type material, only provisional remarks are presented in this paper.

Based on present knowledge, only one gustavioid species, *Xenillus clypeator* Robineau-Desvoidy, 1839, has been previously recorded from Turkey (AYYILDIZ 1988). Two new species viz. *Stenoxenillus incisus* sp. nov. and *Xenillus setosus* sp. nov. are described below and *Liacarus coracinus* (Koch, 1840) and *X. tegeocranus* (Hermann, 1804) are newly recorded for Turkey and complementary data of these two species are presented.

MATERIAL AND METHODS

From January to April 1999, mites were surveyed in hazelnut (*Corylus avellana* L.) orchards throughout the growing areas in the Black Sea region, Turkey. All districts of Samsun, Ordu, Giresun and

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Trabzon were surveyed, thus focusing on the coastal plain of the Black Sea. Samples of leaf litter (about 1 kg) were collected from the orchards and from beneath surrounding hedge plants (e.g. *Smilax excelsa* L., *Pteridium aquilinum* (L.) Kuhn., *Alnus glutinosa* (L.) Gaertn., *Rubus* spp., *Urtica* spp., *Rhododendron* spp., *Malus* spp., *Populus* spp., *Salix* spp., *Acacia* sp.). The orchards contained 210 weed species, belonging to 54 families (e.g. *Bellis perennis* L., *Convolvulus arvensis* L., *Mercurialis annua* L., *Smilax excelsa* L., *Urtica* spp., *Anagallis* spp., *Euphorbia* spp., *Plantago* spp., *Viola* spp., *Ranunculus* spp., *Medicago* spp., *Trifolium* spp., *Vicia* spp., *Lamium* spp., *Veronica* spp., *Avena* spp., *Poa* spp., *Lolium* spp., *Bromus* spp.) (MENNAN et al., 1999). Mites were extracted from these samples with BERLESE funnels. All oribatid mites thus recovered were preserved in 70 % ethyl alcohol and mounted in Hoyer's medium (slide numbers S1-213). Classification follows BALOGH & BALOGH (1992) and terminology used in this paper is based on MAHUNKA & ZOMBORI (1985). All measurements are given in micrometers (μm).

TAXONOMIC DISCUSSION AND DESCRIPTION OF TAXA

Family Liacaridae Sellnick, 1928

Liacarus Michael, 1898

Type species *Oribata nitens* Gervais, 1844

Dorycranosus Woolley, 1969 (AOKI 1971)

Leuroxenillus Woolley & Higgins, 1966

(BALOGH & BALOGH 1992)

The cosmopolitan genus Liacarus is comparatively species-rich, encompassing over 100 highly diverse species. It belongs to the family Liacaridae which, according to WOOLLEY (1958, 1967, 1968), includes genera characterised by the following traits: elongately oval bodies, glabrous or slightly sculptured integument, contiguous or convergent lamellae, lamellar surfaces usually longitudinally wrinkled, not pitted or tuberculous, intercuspidal mucro (protuberance situated between medial bases of cusps) present or absent, two

pairs of simple humeral setae present with 10 additional pairs on notogastral setae, five to six pairs of genital setae, genital aperture smaller than anal aperture, widely separated, insertions of leg III and IV medially displayed, far removed from lateral margins of hysterosoma, trochanteral foveae II and III with small tubercles.

MICHAEL (1898) proposed the genus *Liacarus* and diagnosed it as follows: body smooth, last three pairs of legs inserted under the body and tridactylous tarsi. WOOLLEY (1968) characterised *Liacarus* species as glabrous, ovoid mites with spindle-shaped sensilli, rostrum complete or deeply incised, rostral setae inserted at medially curving distal end of tibia, lamellae convergent and blade-like, cusps and intercuspidal mucro present or absent, trochanteral foveae III and IV tuberculous and tridactylous tarsi. WOOLLEY (1969) subsequently divided *Liacarus* into four genera, based on the shape of the sensilli: 1) *Liacarus* with spindle-shaped sensilli; 2) *Dorycranosus* Woolley, 1969 with clavate-lanceolate sensilli; 3) *Procorynetes* Woolley, 1969 with capitate sensilli; and 4) *Rhaphidosus* Woolley, 1969 with needlelike or setiform sensilli. AOKI (1971), however, contested the reliability of distinguishing among genera on the basis of the sensillar shape and synonymised *Dorycranosus* with *Liacarus* (AOKI 1980). In the present paper the views of AOKI (1971, 1980) are followed, although some authors still retain the genus *Dorycranosus*.

Based on lamellar morphology, the following *Liacarus* species can be associated into six species-groups. 1) **Xylariae-group** (FIG. 1A), characterised by broadly fused lamellar apices with lamellar setae inserted apically on small, cylindrical cusps. Small intercuspidal mucro and cuspidal teeth present or absent. Includes *L. xylariae* (Schränk, 1803), *L. cuspidatus* Mihelcic, 1954, *L. inermis* Aoki, 1965, *L. detosus* Woolley, 1968, *L. indentatus* (Aoki, 1973), *L. chiebunensis* Fujita & Fujikawa, 1984, *L. dickersoni* (Moraza, 1990). 2) **Nitens-group** (FIG. 1B) characterised by narrowly fused lamellae with narrow, almost cylindrical lamellar cusps. Distinct cuspidal teeth absent. Lamellar setae inserted apically on cusps. Short to long and sharply pointed intercuspidal mucro present. Includes *L. nitens* (Gervais, 1844), *L. robustus* Ewing, 1918, *L. madeirensis* Willmann, 1939, *L. acutidens* Aoki, 1965, *L. trichionus* (Woolley

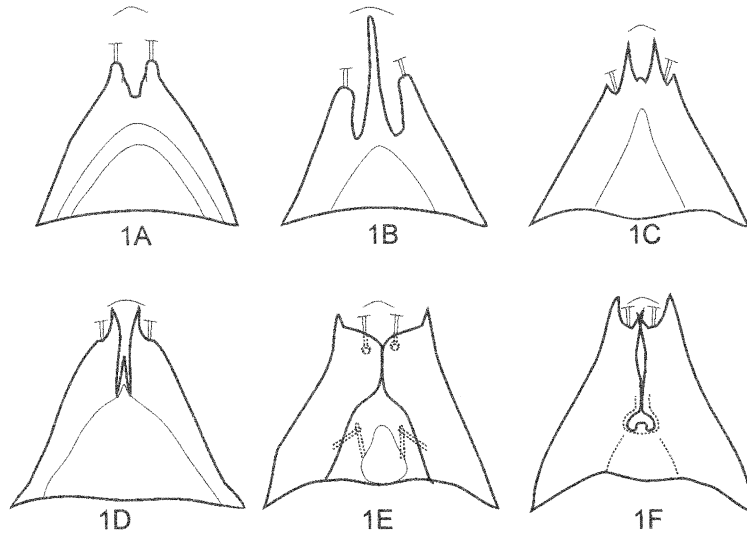


FIG. 1: Lamellar types.

A. — *Xylariae*-group. B. — *Nitens*-group. C. — *Coracinus*-group. D. — *Splendens*-group. E. — *Gammatus*-group. F. — *Montanus*-group.

& Higgins, 1966), *L. parallelus* Hammer, 1967, *L. breviclavatus* Aoki, 1970, *L. angustatus* (Weigmann, 1976), *L. tenuilamellatus* Hirauchi, 1998. 3) ***Coracinus*-group** (FIG. 1C) with wide, bladeliike lamellae. Distinct medial cuspidal teeth present, lateral teeth present or absent, when present much smaller than medial teeth. Lamellar setae inserted apically on cusps, between cuspidal teeth. Small mucro present or absent. Includes *L. coracinus* (Koch, 1840), *L. breviamellatus* Mihelcic, 1955, *L. major* Mihelcic, 1955, *L. lencoracinus* Krivolutsky, 1967, *L. ovatus* (Djaparidze, 1973); 4) ***splendens*-group** (FIG. 1D) characterised by closely situated but unfused large, bladeliike lamellar cusps, distinct medial teeth present, lateral teeth absent. Lamellar setae inserted apically on lamellar cusps, laterally to medial cuspidal teeth. Mucro narrow, sharply pointed. Includes *L. splendens* (Coggi, 1898), *L. acutus* Pschorn-Walcher, 1951, *L. ovatus* (Djaparidze, 1973). 5) ***Gammatus*-group** (FIG. 1E) characterised by peculiarly shaped lamellae with closely situated, unfused apices. Distinct lateral cuspidal teeth present, medial teeth absent, lamellar setae situated ventrally or dorsally on cusps, close to medial border of cusps. Mucro absent. Posteromedial part of prodorsum (or antero-median part of notogaster) with conspicuous circular structures inter-

nally or externally. Includes *L. gammatus* Aoki, 1967, *L. latilamellatus* Kaneko & Aoki, 1982, *L. montanus* Aoki, 1984, *L. gammatus coreanus* Choi, 1994 and *L. luscus* Hirauchi, 1998. (*L. latilamellatus* and *L. luscus* have thick, blunt lamellar setae). 6) ***Montanus*-group** (FIG. 1F) with long, bidentate lamellar cusps. Medial cuspidal teeth slightly shorter than lateral teeth. Translamellar region peculiarly shaped or with complicated circular structures. Includes *L. montanus* Aoki, 1984, *L. ocellatus* Aoki, 1987, *L. murotensis* Aoki, 1988.

The following generic diagnosis is based on specimens examined in the course of this study and a review of the literature.

GENERIC DIAGNOSIS. With character states of the Liacaridae. Adults have the following combination of characters: Body length ranging from approximately 529-1057 μm .

Prodorsum. Rostral apex usually deeply incised. Anterior rostral margin smooth to dentate. Rostral seta setiform. Prodorsal surface punctate to tuberculate. Lamellar surface laterally longitudinally striate, medially punctate, sometimes pitted. Lamellar morphology highly diverse, lamellae usually well-developed, bladeliike, or exceptionally weakly developed. Lamellar cusp varying from narrowly cylindrical

to widely bladelike. Lamellar seta of diverse length, usually setiform, inserted near to or on cuspidal apex. Intercuspidal mucro absent or present. Translamella present or absent, with considerable variation in developed. Interlamellar area small to large, sometimes with complicated circular medial configuration. Bothridium covered by notogaster. Shape of sensillus diverse (spindle-shaped with long apex, lanceolate, club-shaped, clavate to bacilliform). Tutorium lamelliform, narrow, long.

Notogaster. Notogaster tapering slightly posteriorly. Dorsosejugal suture straight or slightly to strongly concave or convex medially. Dorsal and ventral integument lightly sculptured, usually punctate, sometimes also minutely foveolate, lineate or reticulate. Ten to twelve pairs short, indistinct, setiform notogastral setae present, except seta p_1 longer, easily discernable and of varying type. Humeral setae of similar type and length, seta c_1 inserted close to bothridium, c_2 inserted anteriorly or posteriorly to lyrifissure ia . Lateroabdominal gland opening located mostly between lyrifissures im and ih .

Ventral side. Pedotectum I large, pedotectum II absent. Discidium small. Apodemata I-II well developed, apodemata III short, indistinct. Epimeral setation: 3-1-3-3 or 3-1-3-2. Epimeral setae 1b, 3b and 4b usually longer than remaining epimeral setae. Five to six pairs of genital setae present. Aggenital setae mostly resembling ventral setae or peculiarly shaped. Two pairs of anal setae present. Three pairs of adanal setae present, ad_{1-2} mostly longer than ad_3 . Position of adanal lyrifissure iad varies from horizontal with anterior margin to parallel with lateral margin of anal aperture.

Legs. Legs heterotridactylous. Setal formulae (including famulus) recorded for legs: Leg I: 5/6-3-4-19/20/21; Leg II: 4-2/3-4-16; Leg III: 2-3-1-3-15; Leg IV: 1-2-2-3-12; solenidial formulae as follows: Leg I: 1-2-2; Leg II: 1-1-2; Leg III: 1-1-0; Leg IV: 0-1-0. Solenidia of normal type or with slightly swollen bases. Leg I: Tarsal solenidion ω_1 piliform, longer than ceratiform ω_2 , famulus ε located posterior to solenidion ω_2 , tibial solenidion φ_2 considerably longer and thicker than φ_1 . Leg II: Solenidia ω_1 and ω_2 equal in length, ceratiform. Porose areas present on paraxial sides of all femora and trochanters III and IV. Trochanter III dorsally smooth or dentate. Tro-

chantera III-IV disto-ventrally pointed. Femora I-IV and trochanters III-IV each with a ventral blade.

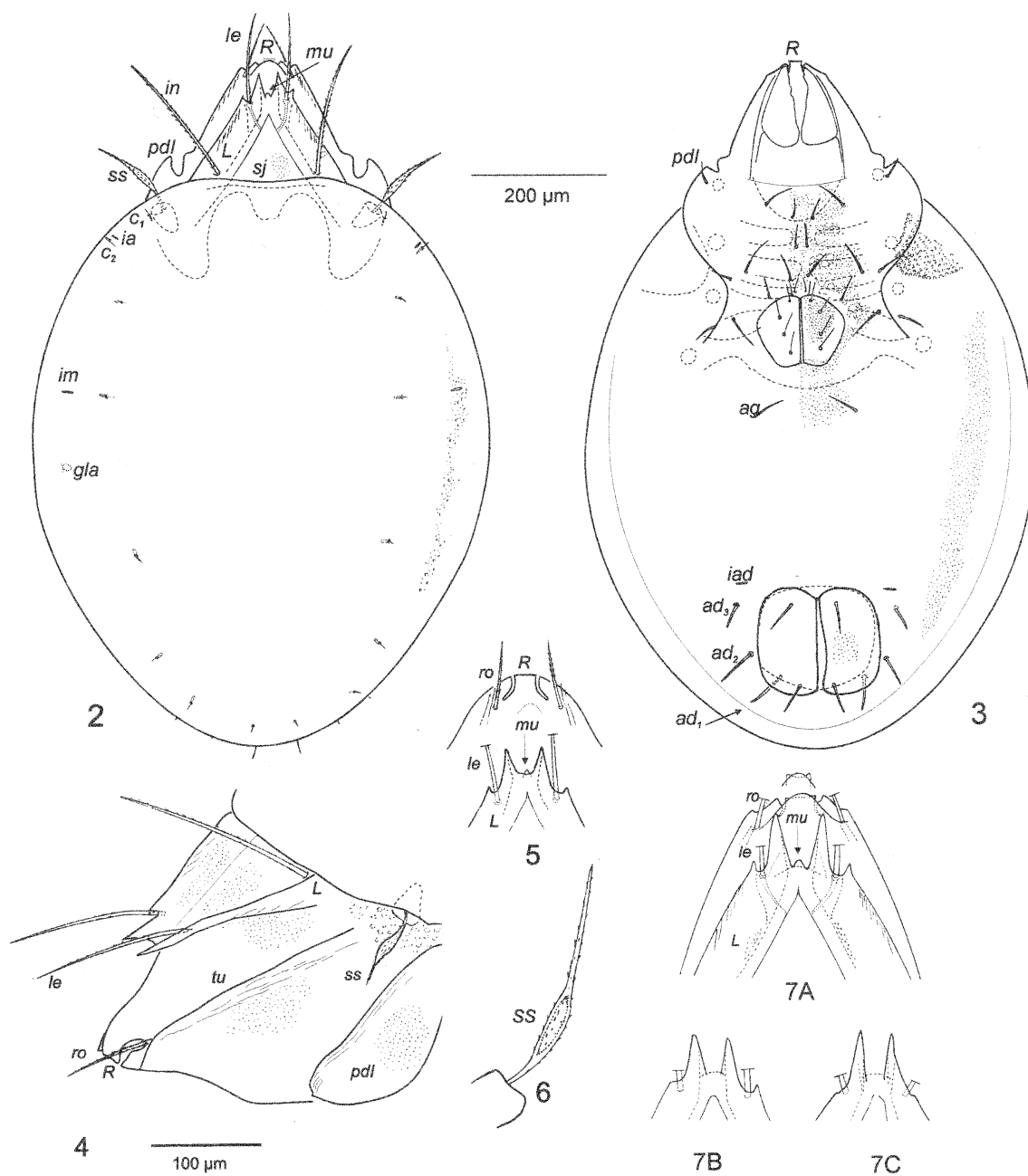
REMARKS. Lamellar size, presence of cuspidal teeth and the intercuspidal mucro, rostral shape and body size, varies considerably intraspecifically. A lesser degree of variation in shape and size of the sensillus and body sculpture also occurs. Variation in number of genital setae between five and six pairs as well as unequal numbers of setae on the left and right sides of genital aperture have also been observed.

Liaccarus coracinus (Koch, 1840)

(Figs. 2-11)

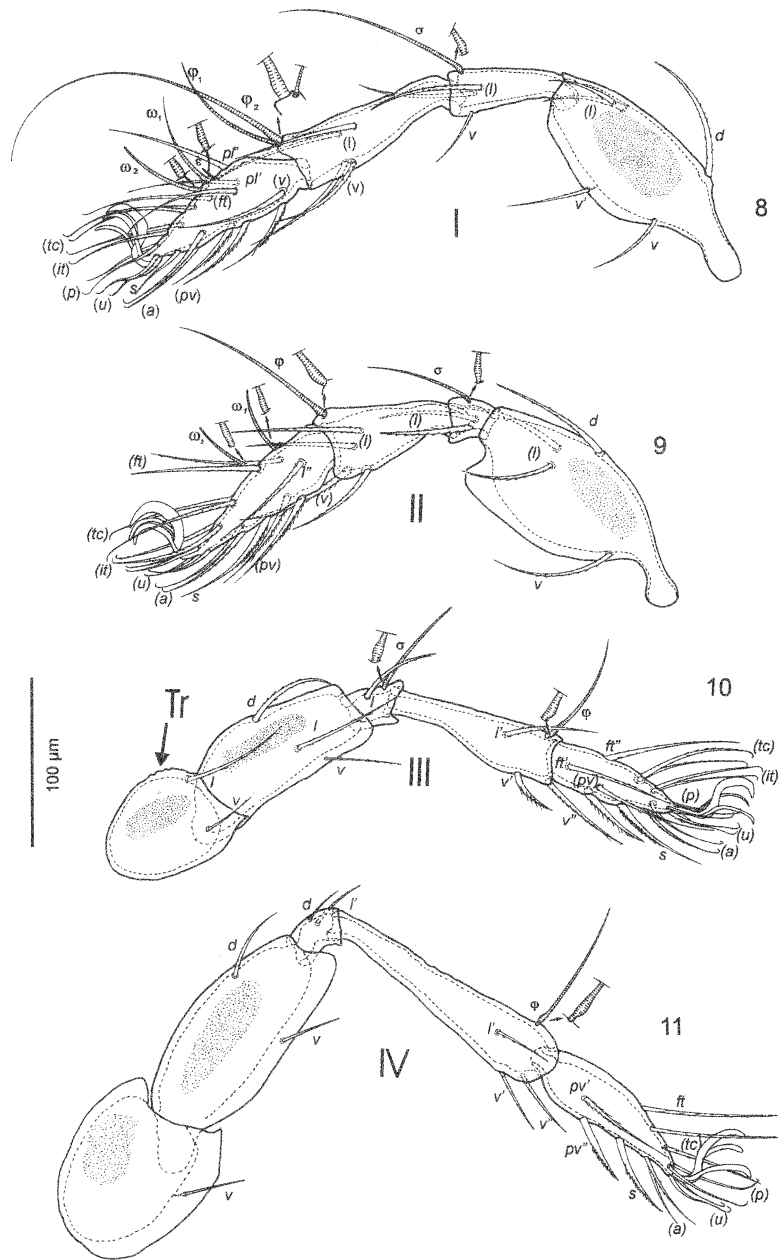
Liaccarus coracinus is well distributed in the Holarctic Region. This species presents a good example of the taxonomic difficulties encountered in the genus *Liaccarus*. Although recorded and described by many authors, it remains difficult to identify due to the intraspecific variability displayed by this species (WILLMANN 1931, SCHUSTER 1956, WINKLER 1957, WOOLLEY 1958, 1968, SELNICK 1960, GHILAROV & KRIVOLUTSKY 1975, KRIVOLUTSKY 1967, BECK & WOAS 1991, BORCARD 1992). Variation in the development of the lateral cuspidal tooth seems to be the widest, ranging from absent to distinct (BECK & WOAS 1991, BORCARD 1992). The medial cuspidal tooth, which is much larger than the lateral tooth, displays a much lesser degree of variation in length and width and is always distinctly present. The intercuspidal mucro also varies in degree of development and is sometimes absent. Concerning body sculpture, BECK & WOAS (1991) recorded very fine, longitudinal lines on the notogaster apart from the usual punctation, in some of the individuals they studied.

DIAGNOSTIC CHARACTERS. Rostral incisions deep, narrow, directed postero-laterally, central lobe curving ventrally, distal margin varying from straight to slightly concave. Lamella wide, bladelike. Medial cuspidal tooth always present, large. Lateral cuspidal tooth present or absent, when present, much smaller than medial tooth. Sensillus narrowly spindle-shaped, apically with long, thin spike.



FIGS 2-7: *Liacarus coracinus* (Koch, 1840) adult.

2. — Dorsal view. 3. — Ventral view. 4 — Detail of prodorsum, anterolateral view. 5 — Anterior view of rostrum. 6. — Sensillus. 7 a-c. — Variation in cusps.



FIGS 8-11: *Liacarus coracinus* (Koch, 1840) adult.

8. — Leg I, left, antiaxial view. 9. — Leg II, left, antiaxial view. — 10. Leg III, left, antiaxial view. 11. — Leg IV, left, antiaxial view.

MATERIAL EXAMINED. Eight specimens. Samples S66 (Terme); S70 (Ünye); S71 (Mersin-Trabzon); S205 (Persembe) collected from orchards and S64, S68 (Giresun); S65 (Taflan-Samsun); S206 (Ünye) collected from hedge plants in January and April 1999.

DESCRIPTION. Mean length 1024 (range 970-1150); mean width 690 (range 620-680); $n = 5$.

Prodorsum (Figs. 2, 4-7). Prodorsal surface punctate, postero-laterally faintly granulate. Rostrum with two deep, lateral-curving incisions (best discernable in anterior view of rostrum); central rostral lobe curving ventrally, distal margin varying from straight to slightly concave in anterior view of rostrum. Rostral seta *ro* inserted posteriorly to rostral incision, short, faintly ciliate. Lamella *L* bladellike, not protruding beyond rostral apex, apices narrowly fused. Lamellar surface laterally striated, medially punctate. Medial cuspidal tooth always present, long, sharply pointed, lateral tooth present or absent, when present considerably smaller than medial tooth. Lamellar seta *le* inserted on ventral surface of lamella, between lateral and medial cuspidal teeth, faintly ciliate. Intercuspidal mucro *mu* present or absent, when present, very small. Interlamellar area triangular. Interlamellar seta *in* very long (ratio of prodorsal setae: $in > le > ro$), thick, faintly barbed. Sensillus *ss* narrowly spindle-shaped, pointed apex long, ciliate. Tutorium *tu* extending to rostral margin.

Notogaster (FIG. 2). Notogaster punctate, some specimens with minute foveolae (best visible on lateral slopes of notogaster). Dorsosejugal suture *sj* medially weakly concave. Eleven pairs of notogastral setae present, minute, glabrous, except seta *p₁* which is longer and easily distinguishable.

Ventral side (FIG. 3). Epimeral surface punctate, some specimens with minute foveolae in addition to the usual punctation. Epimeral setation 3-1-3-3, setae long, barbed. Anogenital setation 5-1-2-3 (a few individuals with unequal numbers of setae on the left and right sides were encountered). Genital setae long, thin, smooth. Aggenital seta *ag* resembles epimeral setae. Adanal setae thicker than anal setae, minutely roughened.

Legs (Figs. 8-11). Setal formulae for legs: Leg I: 5-3-4-20; Leg II: 4-2/3-4-16; Leg III: 2-3-1-3-15; Leg IV: 1-2-2-3-12; solenidial formulae typical for the

genus. Solenidia with slightly swollen bases. Trochanter III dorsally with a few small, uneven teeth (see Remarks).

REMARKS. Characters not previously mentioned for this species are solenidia with slightly swollen bases and the dorsally dentate trochanter III, similar to but much smaller than in the case of *Liacarus latilamellatus* Kaneko & Aoki, 1982 *L. luscus* Hirauchi, 1998 and *L. tenuilamellatus* Hirauchi, 1998. The only reference to this kind of solenidial morphology in this family is in the case of *Rhaphidosus acuminatus*, where WOOLLEY (1969, FIG. 25) illustrated solenidion φ_1 of tibia I with a swollen base. The new species *Stenoxenillus incisus* sp. nov. displays similar solenidial morphology.

The usual range of intraspecific variations were displayed by the Turkish individuals: 1) lateral tooth varying from distinctly present (FIG. 4A) to absent (FIG. 4C), as well as showing asymmetrical variation, with one cusp bidentate and the other monodentate (FIG. 4B); 2) mucro mostly present but indistinct in a few specimens; and 3) some individuals with minute foveolae, best discernable on the lateral slopes of the notogaster and ventral plate. In the present study, the above-mentioned characters are regarded as intraspecific variations, but the taxonomic significance of these variations still needs to be fully investigated. *Liacarus lencoranicus* Krivolutsky, 1967 and *L. polychothomus* Wen, 1991 resemble *L. coracinus* in having lamellar cusps with long medial and short lateral teeth. Based on lamellar morphology, it is difficult to distinguish between *L. coracinus* and *L. lencoranicus* and in view of the high degree of variability in this regard, the names may be synonyms. *Liacarus polychothomus* is easily distinguished from *L. coracinus* by its clavato-lanceolate sensillus without a long apex.

Stenoxenillus Woolley & Higgins, 1966

Type species *Stenoxenillus atraktus*
Woolley & Higgins, 1966

The monotypic genus *Stenoxenillus* Woolley & Higgins, 1966, described from North Carolina, USA, is characterised by straight, narrow lamellae with well-separated apices and the absence of a transla-

mella. Later, WOOLLEY (1970) questioned the validity of the genus and considered the type species (*S. atraktus*) to be a representative of *Stonyxenillus* (Fam. Xenillidae). However, the newly described *S. incisus* sp. nov., is very closely related to the family Liacaridae, especially the lightly sculptured integument, small, indistinct notogastral setae and deeply incised rostrum, contrary to the heavily sculptured integument, robust, setose notogastral setae and slightly incised rostrum in representatives of the family Xenillidae. Based on these characters, *Stenoxenillus* is considered a member of the family Liacaridae and is closely related to the genus *Liacarus*. These two genera are distinguished by weakly developed lamellae with separate, unfused lamellar apices in *Stenoxenillus* and well developed lamellae with fused, adjacent or connected apices in *Liacarus*. The highly diverse lamellar morphology in *Liacarus* makes the systematic value of lamellar shape as generic characters in this family uncertain. Therefore, the separate lamellar apices of *Stenoxenillus* might prove to be insufficient and we tentatively retain the name *Stenoxenillus* until the relationship between these two genera has been studied further.

GENERIC DIAGNOSIS. *Diagnostic characters as for Liacarus, except for the following: Lamella weakly developed, narrow, straight, lamellar apices unfused; cusp small; translamella and intercuspidal mucro absent; eleven to twelve pairs of short, indistinct notogastral setae present, humeral setae c_1 and c_2 of similar shape and length. Five to six pairs of genital setae present.*

Stenoxenillus incisus sp. nov.
(Figs. 12-20)

DIAGNOSTIC CHARACTERS. Rostral incision deep, straight, central lobe distally straight. Lamella narrow, short. Cuspidal tooth apically rounded. Lamellar seta inserted posterior to lamellar cusp. Sensillus spindle-shaped, apically with long, thin spike. Notogastral surface punctate and minutely foveolate.

MATERIAL EXAMINED. Holotype, S181, female, collected from hedge plant leaf litter at Giresun, Turkey

in January 1999. The holotype is deposited at the University of Ankara, Agricultural Faculty, Plant Protection Department, Ankara, Turkey.

DESCRIPTION. Length: 750; width could not be determined due to flattening of notogaster during mounting process.

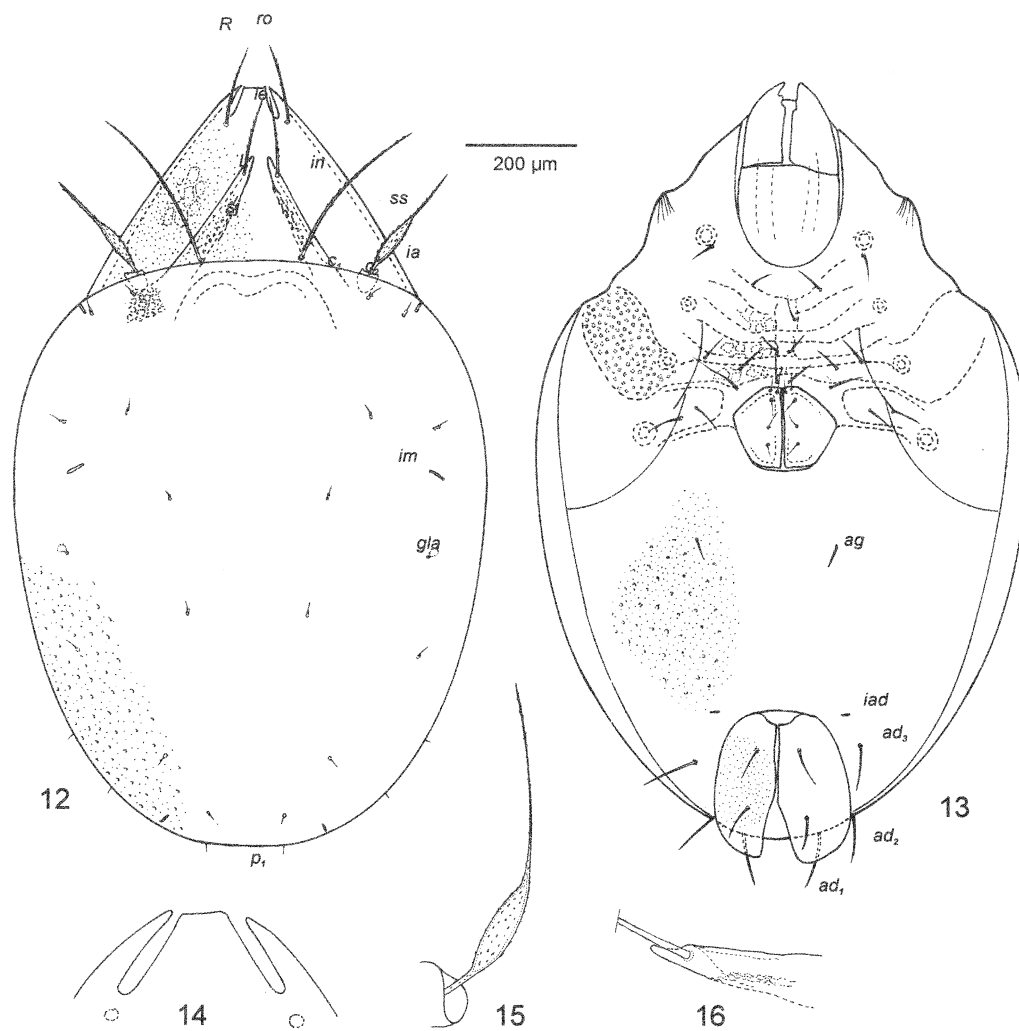
Prodorsum (Figs. 12, 14-16). Prodorsal surface punctate, faintly reticulate laterally. Rostrum with two deep, straight incisions, central lobe *R* distally straight. Rostral seta *ro* short, faintly barbed, inserted posteriorly to rostral incision. Medial lamellar margin roughened. Cuspidal tooth apically rounded. Lamellar seta *le* short, thin, faintly barbed, inserted dorsally on lamellar surface, posteriorly to lamellar cusp. Interlamellar seta *in* long, faintly barbed, ratio of prodorsal setae: $in > le > ro$. Sensillus *ss* spindle-shaped, apex with long, thin spike, ciliate.

Notogaster (FIG. 12). Notogastral surface punctate, minutely foveolate. Dorsosejugal suture *sj* straight. Twelve pairs of minute notogastral setae present, seta *p₁* slightly longer than remainder of notogastral setae.

Ventral surface (FIG. 13). Epimeral surface punctate, medially faintly reticulate. Epimeral setation 3-1-3-3, setae long, thin, smooth. Anogenital surface punctate, indistinctly foveolate. Anogenital setation 6-1-2-3. All anogenital setae, thin, smooth, adanal setae longest. Adanal lyrifissure *iad* situated at level of anterior border of anal aperture.

Legs (Figs 17-20). Setal formulae for legs: Leg I: 5-3-4-20; Leg II: 4-2-4-16; Leg III: 2-3-1-3-14; Leg IV: 1-2-2-3-12. Solenidial formulae typical for the genus. Solenidia with swollen bases.

REMARKS. *The new species is very similar to its congener S. atraktus Woolley & Higgins, 1966, but can be differentiated from it by the deeply incised rostrum, straight distal margin of the central lobe, narrower lamellae and cuspidal teeth. It is also very similar to Liacarus mucronatus Willmann, 1939 and Xenillus superbus (Perez-Iñigo & Baggio, 1980). Liacarus mucronatus can be distinguished from the new species by the presence of a mucro which is situated on an elevated portion of the prodorsum anteriorly to the lamellar apices, and by the presence of five pairs of genital setae. Xenillus superbus can be distinguished from the new species by closely situated lamellar*



FIGS 12-16: *Stenoxenillus incisus* sp. nov. adult.

12. — Dorsal view. 13. — Ventral view. 14. — Rostral incisions. 15 — Sensillus. 16. — Detail of lamellar apex.

apices, much longer and more robust dorsal and ventral setae. The type material of the above mentioned species needs to be investigated to determine their generic relationships. An interesting character observed for the new species is solenidia with swollen bases. Similar solenidial morphology was also observed in the Turkish individuals of *L. coracinus*.

ETYMOLOGY: The specific epithet «*incisus*» refers to the incised rostrum.

Xenillidae Woolley & Higgins, 1966

Xenillus Robineau-Desvoidy, 1839

Type species: *Xenillus clypeator*

Robineau-Desvoidy, 1839

Dinoxenillus Perez-Íñigo & Baggio 1980

(BALOGH 1985)

WOOLLEY AND HIGGINS (1966), proposed the family Xenillidae and differentiated it from Liacaridae by rugose, pitted, dorsal and ventral integument, complete or weakly incised rostrum, broad, blade-like, rugose lamellae, cusp and mucro present or absent, translamella usually present, sensilli clavate, spindleshaped, lanceolate or setiform, two pairs of humeral setae, usually five pairs of genital setae (sometimes six) and trochanteral fossae II and III with tubercles. Based on the above-mentioned diagnosis, Xenillidae is very closely related to Liacaridae, and they seem to differ only in characters such as the degree of body sculpture, type and length of body setae and the length of the rostral incisions. We tentatively retain the name Xenillidae as valid; however, uncertainty remains regarding the status of these two families to be resolved by further study.

The genus *Xenillus* includes approximately 74 species (BALOGH & BALOGH 1992). It is well distributed throughout the Holarctic and Neotropical regions but seems to be absent in the Ethiopian, Oriental and Australian regions. According to GRANDJEAN (1936) the original description of this genus by ROBINEAU-DESVOIDY (1839) provides very little information and he regarded JACOT's (1929) interpretation of *Xenillus* as more comprehensive. WOOLLEY & HIGGINS (1966) restricted *Xenillus* to species with a clavate sensillus

and proposed the genera *Stenoxenillus* and *Stonyxenillus* for those species characterised by spindleshaped sensilli. In the present study *Stenoxenillus* has been included in the family Liacaridae.

GENERIC DIAGNOSIS. Diagnostic characters as for *Liacarus*, except for the following: Dorsal and ventral integument usually distinctly sculptured. Rostrum complete or only slightly incised. Lamellar morphology display similar diversity as in *Liacarus*. Interlamellar area without complicated circular medial configuration. Interlamellar seta minute to very long. Tutorium short to long. Dorsejugal suture mostly straight to slightly concave medially. Dorsal and ventral setae highly diverse in type. Notogastral setae usually more distinct than in *Liacarus*. Humeral setae c_1 and c_2 highly diverse in type and length. Five, exceptionally six pairs of genital setae present. Solenidia without swollen bases.

Xenillus tegeocranus (Hermann, 1804)

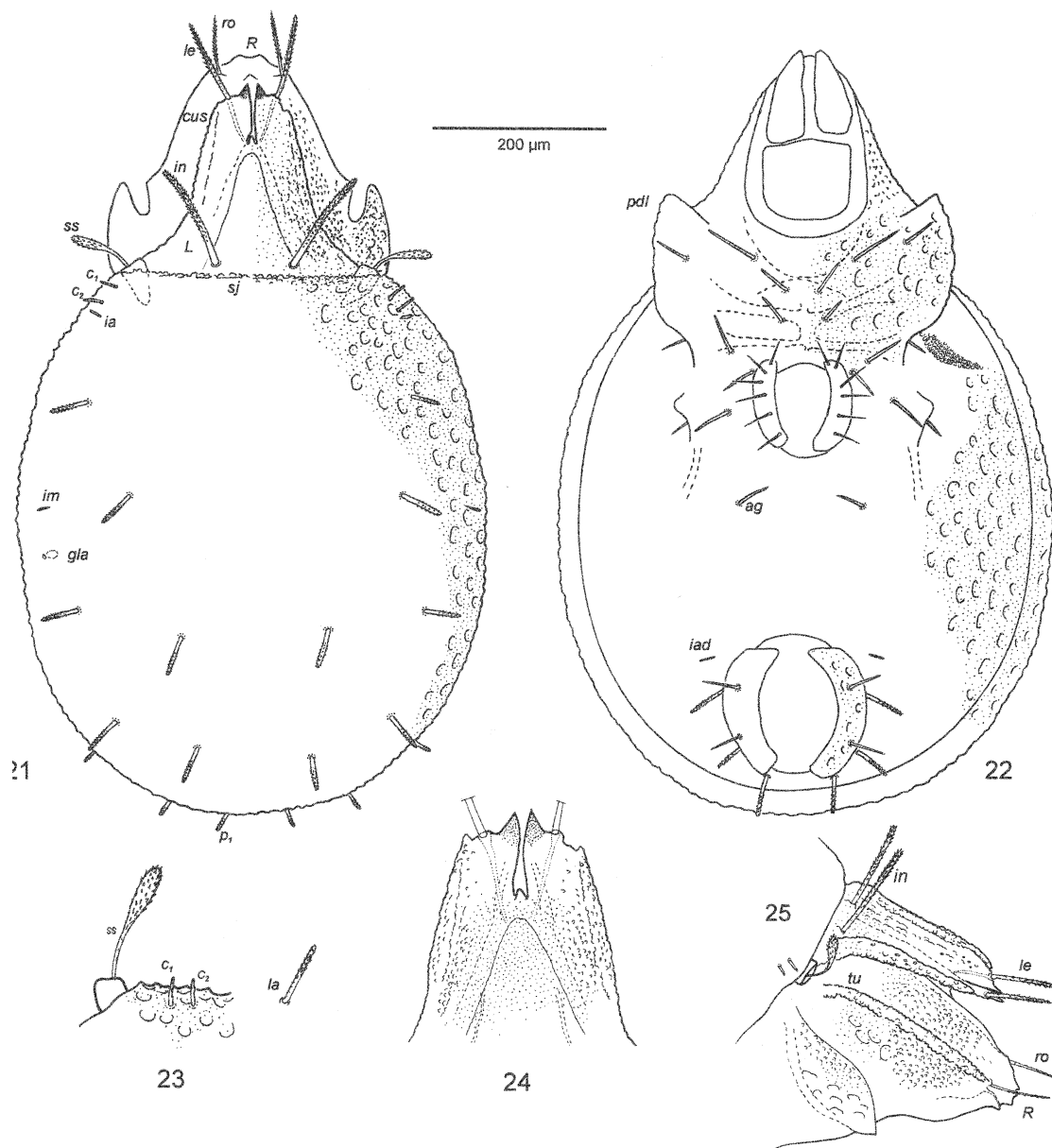
(FIGS 21-29)

Xenillus tegeocranus is well distributed in the Holarctic Region. Authors such as GRANDJEAN (1936), and PÉREZ-ÍÑIGO (1971, 1976) recorded intraspecific variations for this species in body size, medial cuspidal teeth size, lateral rostral teeth size, notogastral sculpture and notogastral setal length.

DIAGNOSTIC CHARACTERS: Lamellar cusp long, broad, with sharply pointed, darkly sclerotised medial tooth. Sensillus short, fusiform, barbed. Notogastral and ventral surfaces distinctly punctate, alveolate. Notogastral setae c_1 and c_2 equally long, bacilliform, remainder of setae considerably longer, spiniform, distal halves strongly barbed.

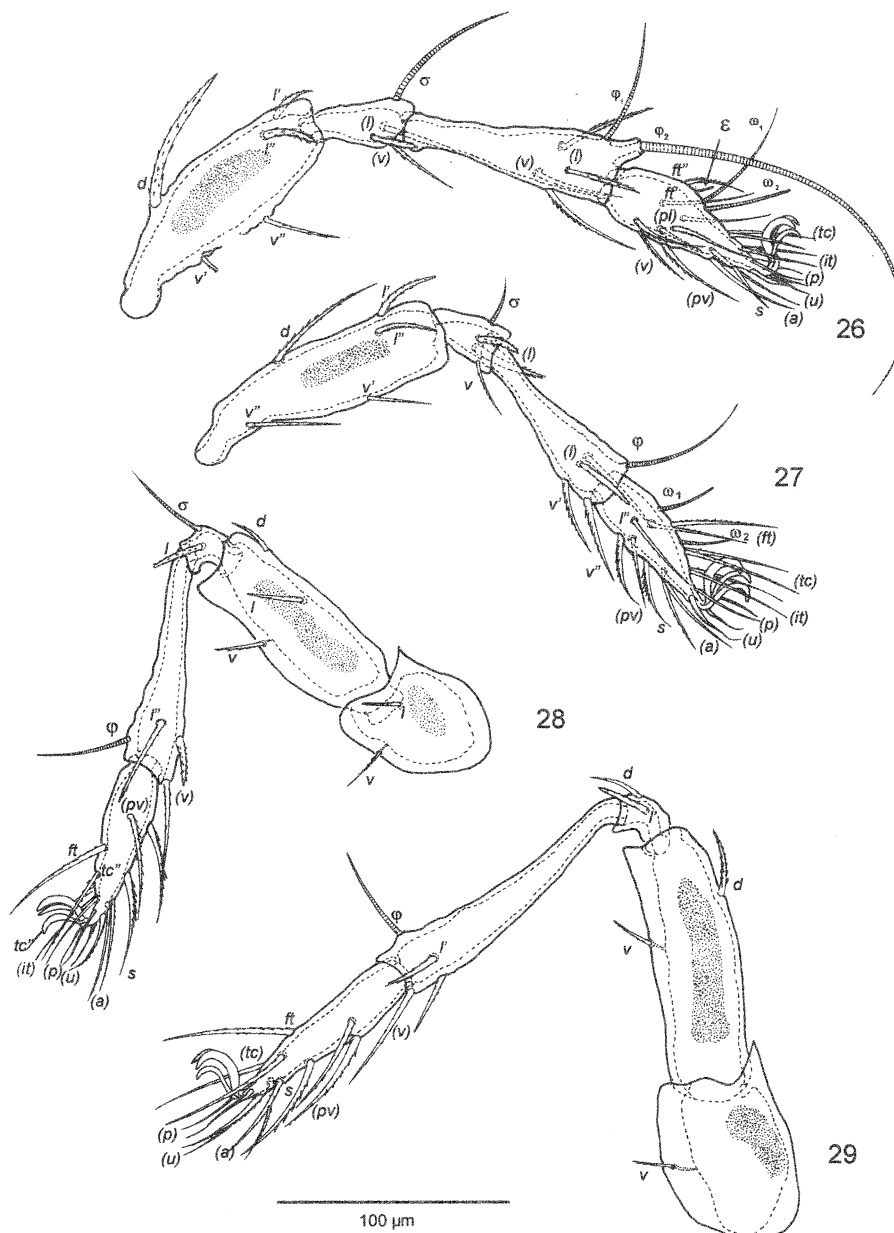
MATERIAL EXAMINED: Twenty three specimens. Sample S208 (Demirli-Carsamba) collected from orchards and S29, S198 (Piraziz); S30 (Giresun); S24, S172, S207 (Demirli-Carsamba); S25-28, S31, S199 (Özlü-Tirebolu) collected from hedge plants in January and March 1999.

DESCRIPTION: Mean length 856 (range 1000-730); mean width 595, (range 690-450), $n = 8$.



FIGS 21-25: *Xenillus tegeocranus* (Hermann, 1804) adult.

21. — Dorsal view. 22. — Ventral view. 23. — Detail of sensillus and notogastral setae. 24 — Bidentate cuspidal apices. 25 — Prodorsum, lateral aspect.



FIGS 26-29: *Xenillus tegeocranus* (Hermann, 1804) adult.

26. — Leg I, right, antiaxial view. 27. — Leg II, right, antiaxial view. — 28. Leg III, right, antiaxial view. 29. — Leg IV, right, antiaxial view.

Prodorsum (FIGS 21, 23-25). Prodorsal surface punctate, granulate (except interlamellar area), surface ventral to tutorium also alveolate. Rostrum slightly to distinctly concave medially, laterally with a small tooth. Rostral seta *ro* thin, setiform, barbed, inserted on small tubercle. Lamella *L* not reaching rostral margin. Lamellar cusp *cus* long, broad, with sharply pointed, darkly sclerotised medial tooth, much smaller lateral cuspidal tooth present in a few specimens. Intercuspidal mucro small, usually distinct (indistinct in a few). Lamellar seta *le* spiniform, long, distal half strongly barbed, inserted apically on cusp, lateral to medial tooth. Interlamellar area narrowly triangular. Interlamellar seta *in* long, thick, ensiform, distal half strongly barbed. Sensillus *ss* short, fusiform, strongly barbed. Tutorium *tu* narrow, long, extending anteriorly of rostral setal insertions.

Notogaster (FIGS 21, 23). Notogastral surface punctate and irregularly alveolate, dorsosejugal region granulate. Dorsosejugal suture *sj* straight. Eleven pairs of notogastral setae present, spiniform, distally strongly barbed, except humeral setae *c*₁ and *c*₂ very short, of equal length, bacilliform, minutely barbed, inserted close to each other, anteriorly to lyri fissure *ia*.

Ventral side (FIG. 23). Ventral surface punctate, with similar irregularly shaped alveolae as on dorsal surface. Epimeral setation 3-1-3-3. Epimeral setae thick, barbed. Anogenital setation 5-1-2-3 (a few individuals with unequal numbers of setae on the left and right side were encountered). Aggenital seta *ag* resemble epimeral setae. Anal setae smooth, adanal setae resemble notogastral setae.

Legs (FIGS 26-29). Setal formulae for legs: Leg I: 5-3-4-20; Leg II: 5-3-4-16; Leg III: 2-3-1-3-14; Leg IV: 1-2-2-3-12. Solenidial formulae typical for the genus. Solenidial morphology normal. The legs of the present species differ from the legs of the two liacarids discussed in the present paper by the slightly narrower and longer femora I-IV and the presence of thick, spine-like dorsal, ventral and lateral setae on the femora, genua and tibiae of legs I-IV.

REMARKS. The usual range of intraspecific variations was displayed by the Turkish individuals: 1) rostral margin slightly to distinctly concave medially; 2) cusps usually monodentate but in a few cases small

lateral cuspidal teeth present, as well as asymmetrical variation, with one cusp bidentate and the other monodentate; 3) mucro mostly distinct but indistinct to absent in a few specimens; 4) sensillar length varies slightly and 5) humeral notogastral setae differ slightly in length and width.

Xenillus setosus sp. nov.

(FIGS 30-33)

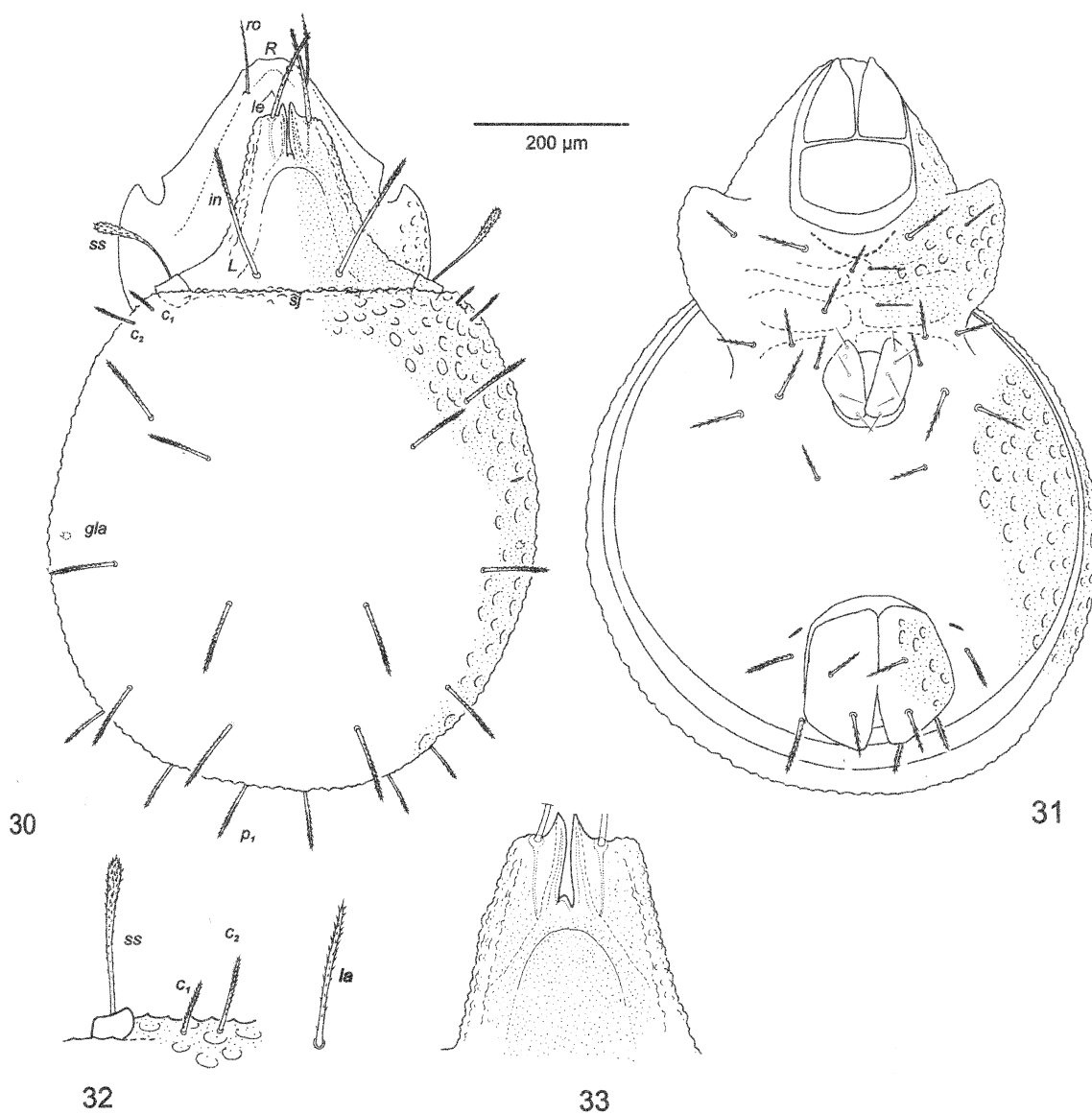
DIAGNOSTIC CHARACTERS. Lamellar cusp long, broad, with sharply pointed, darkly sclerotised medial tooth. Sensillus long, narrow, fusiform, barbed. Notogastral and ventral surfaces punctate, irregularly alveolate. Humeral notogastral setae *c*₂ approximately twice the length of *c*₁, remainder of notogastral setae considerably longer, distal halves strongly barbed.

MATERIAL EXAMINED. Holotype S32, female, collected from orchard leaf litter at Mersin-Trabzon, Turkey in January 1999. The holotype is deposited at the University of Ankara, Agricultural Faculty, Plant Protection Department, Ankara, Turkey.

DESCRIPTION. Length: 940; width 630 (holotype).

Prodorsum (FIGS 30, 32-33). Prodorsal surface punctate, laterally with irregularly shaped foveolae. Rostrum apically slightly concave apically, laterally with small teeth. Rostral seta *ro* setiform, thin, minutely barbed. Lamella *L* not reaching rostral apex, surface punctate, lateral margin irregularly granulate. Lamellar cusp *cus* long, broad, with sharply pointed, darkly sclerotised medial tooth, lateral tooth absent. Small intercuspidal mucro present. Lamellar seta *le* spiniform, long, distal half strongly barbed, inserted apically on cusp, laterally to medial tooth. Interlamellar area u-shaped. Interlamellar seta *in* long, spiniform, distal half strongly barbed. Sensillus *ss* long, head narrow, fusiform, strongly barbed.

Notogaster (FIGS 30, 32-33). Notogastral surface punctate, irregularly alveolate. Dorsosejugal region granulate. Dorsosejugal suture *sj* straight. Eleven pairs of long, spiniform notogastral setae present, distally strongly barbed, except humeral setae *c*₁ and *c*₂ much shorter, of different lengths, *c*₂ approximately twice the length of *c*₁.



FIGS 30-33: *Xenillus setosus* sp. nov. adult.

30. — Dorsal view. 31. — Ventral view. 32 — Detail of sensillus and notogastral setae. 33. — Detail of lamellar apices.

Ventral side (FIG. 31). Ventral surface punctate, irregularly alveolate. Epimeral setation 3-1-3-3. Anogenital setation 5-1-2-3. Genital setae thin, smooth. Aggenital *ag* and anal setae similar to epimeral setae. Adanal setae resembling notogastral setae, distal halves strongly barbed.

Legs. Typical of the genus.

REMARKS. *Xenillus selgae* Morell, 1987, described from Spain, is very similar to the new species but can be differentiated from it by the distinct narrowing of the lamellae in the region of the interlamellar setae, wider, more strongly outward curving medial cuspidal teeth and triangular interlamellar area.

ETYMOLOGY. The specific epithet «setosus» refers to the notogastral setae.

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We wish to thank Mrs. L. COETZEE (Department of Acarology, National Museum, Bloemfontein, South Africa) and Dr. Heather C. PROCTOR (Griffith University, Brisbane, Australia) for critically reading the manuscript and for valuable advice given.

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