

Orijinal araştırma (Original article)

Description of a new species of *Luzulaspis* Cockerell (Hemiptera: Coccoomorpha: Coccidae) from Turkey

Luzulaspis Cockerell (Hemiptera: Coccoomorpha: Coccidae) cinsine ait yeni bir tür tanımlanması

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Summary

A new soft scale insect species, *Luzulaspis filizae* Kaydan *sp. nov.* (Hemiptera: Coccoomorpha: Coccidae), is described and illustrated based on the adult female and first-instar nymph. The new species was collected on *Carex* sp. (Cyperaceae) in Adana, Turkey.

Keywords: Eriopeltinae, *Scotica* group, woolly ovisac, *Hadzibejliaspis*, *Poaspis*

Özet

Bu çalışmada Adana'da (Türkiye) *Carex* sp. (Cyperaceae) üzerinden toplanan bir yumuşak kabuklubit (Hemiptera: Coccoomorpha: Coccidae) türü *Luzulaspis filizae* Kaydan *sp. nov.*'un ergin dişi ve birinci dönem nimfi tanımlanarak çizimleri verilmiştir.

Anahtar sözcükler: Eriopeltinae, *Scotica* grup, yünümsü yumurta kesesi, *Hadzibejliaspis*, *Poaspis*

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Introduction

Coccidae family (Sternorrhyncha: Hemiptera: Coccoomorpha) is the third largest scale insect family worldwide, with over 1157 species in 160 genera (Ben-Dov et al., 2015). In the Palaearctic zoogeographical region 318 species in 63 genera are known (Ben-Dov et al., 2015). The family members are always covered by a soft, waxy covering which varies considerably in both texture and structure between the families (Ben-Dov, 1997). Ten subfamilies are recognized in the Coccidae based on the morphology of the adult females (Hodgson, 1997).

Females in the family Eriopeltinae are characterized by producing a woolly ovisac which covers partly or entirely the body of adult female (Hodgson, 1994). The subfamily contains 13 genera, namely *Eriopeltis* Signoret, *Exaeretopus* Newstead, *Hadzibejliaspis* Koteja, *Lecanopsis* Targioni Tozzetti, *Luzulaspis* Cockerell, *Poaspis* Koteja, *Psilococcus* Borchsenius, *Scythia* Kiritshenko, *Vittacoccus* Borchsenius (Palearctic distribution), *Idiosaissetia* Brain, *Membranaria* Brain (African or Asiatic distribution) and *Symonicoccus* Koteja & Brookes and *Waricoccus* Brookes & Koteja (Australian distribution) (Hodgson, 1994). The genus *Luzulaspis* is characterized by the following features: (i) flattened (rarely convex) body; (ii) well developed 8-segmented antennae; (iii) legs well developed, slender; (iv) claw digitules each with an apical knob about as wide as base of claw; (v) dorsal setae spine-like or hair-like (vi) tubular ducts numerous on entire dorsum except head and finally (vii) two spiracular setae. The genus is most close to *Poaspis* in sharing the distribution of large ventral setae and the structure (sieve like) of the prevulvar pores. But, *Luzulaspis* differs from *Poaspis* in having lower numbers of ventral setae (especially interantennal setae) (much more in *Poaspis*), lower numbers of marginal setae which are also thinner (larger and more numerous in *Poaspis* (Koteja, 1979).

Seventeen *Luzulaspis* species are currently known worldwide of which 11 have a Palaearctic distribution, four are Nearctic, one is Afrotropical and one is Oriental in distribution (Ben-Dov et al., 2015). Koteja (1979) indicated that the genus *Luzulaspis* inhabited three centres of distribution, namely Europe, Far East and North America. According to earlier records, the genus occurs mainly in continental climates, with a few found in the Mediterranean region (except some records in France and the Turkish Republic of Northern Cyprus) up to now (Şişman & Ülgentürk, 2010). Like related genera such as *Exaeretopus*, *Poaspis* and *Hadzibejliaspis*, *Luzulaspis* adult females produce an ovisac which covers all the female body moreover all members of these four genera infest generally monocotyledonous plants such as Poaceae, Juncaceae, Cyperaceae. *Luzulaspis* members were especially recorded on Juncaceae, Poaceae and Cyperaceae, with an exception of some Fagaceae records from Romania (Ben-Dov et al., 2015).

In Turkey, the family Coccidae contains 28 genera and 67 species with a Palaearctic distribution in general (Kaydan et al., 2013). Although there are some records on the genera; *Eriopeltis* (1 species), *Exaeretopus* (3), *Lecanopsis* (3), *Scythia* (2), *Vittacoccus* (1) belonging to the Eriopeltinae, up to now there are no records of any species from the genus *Luzulaspis* in Turkey.

In the present study we describe one new *Luzulaspis* species, collected in Turkey and provide a revised identification key to species in the genus. In addition, the first-instar nymph of the new species is described and illustrated.

Materials and Methods

Scale insect samples were collected in Turkey (Balcalı, Adana) in 2015. Specimens were taken from *Carex* sp. (Cyperaceae) in natural areas. Collecting data, province, locality, date of collection, collector, host plant and collection number are given.

Specimens were slide-mounted for light microscopy using the method of Kosztarab & Kozár (1988). Morphological terminology that of Koteja (1979) and Hodgson (1994) for description of the new soft scale insect species were followed. Measurements and counts of the new species were taken from all available material.

Most part of the type material is deposited in the Coccoidea Collection in Çukurova University, Plant Protection Department, Balcalı, Adana, Turkey (KPCT) and one paratype is deposited in the Scale Insect Collection of Plant Protection Department in Ankara University, Agriculture Faculty, Ankara, Turkey.

Results

Luzulaspis Cockerell

Signoretia Targioni Tozzetti, 1868. Homonym of *Signoretia* Stal, 1859, in Hemiptera.

Signoretia; Targioni Tozzetti, 1869. Misspelling of genus name.

Signoretia; Signoret, 1872.

Luzulaspis Cockerell, 1902. Replacement name for *Signoretia* Targioni Tozzetti, 1868

Type species: Aspidiotus luzulae Dufour, by monotypy. Homonym of *Signoretia* Stal, 1859, in Hemiptera.

Generic diagnosis. Adult female. Ovisac elongate, almost parallel sided, white, 3–6 mm long, covering the female entirely. Postreproductive female sclerotized, shrinking and falling out of ovisac, except when parasitized. Teneral female elongate, parallel sided, rounded or slightly tapered at both ends, dorsum slightly convex, venter almost flat; usually yellowish with two red dorsal stripes (Kosztarab & Kozár, 1988).

Venter. Antennae slender, 8-segmented. Labium cube shaped, with 5 pairs of setae, stylet loop about as long as labium. Legs slender, anterior legs always shorter, tibio-tarsal articulatory sclerosis present, claw digitules large, with expanded apical knob. Spiracular pore bands mostly of quinquelocular pores; 2 subequal spiracular setae in each group. Marginal setae spinelike or hair-like, usually intervals between setae about equal to length of setae or greater, body setae of various lengths, interantennal setae of various lengths, up to 150 µm long, numbering 10–25. Microducts normally form a marginal row, 1 or 2, rarely 3 campaniform pores, 2–3 µm in diameter at the base of each antennae. Multilocular pores usually with 8–10 loculi, forming transverse bands on abdominal sternites 6–8, rarely on anterior segments. Tubular ducts of various sizes. Microducts 1.0–1.5 µm in diameter, forming a subequal band, also present on medial area of head, thorax and in some species on abdomen (Kosztarab & Kozár, 1988).

Dorsum. Body setae of various shapes and sizes, from small hair-like to large conical. Minute simple pores 2 µm in diameter, scattered over entire surface. Discoidal pores with a sieve-like structure, 3–6 µm in diameter in a medial longitudinal band on thorax and abdomen. Tubular ducts numerous on body surface. Anal ring 45–80 µm in diameter, with 6 setae, each 110–180 µm long. Anal plates triangular, each with 4 apical setae (Kosztarab & Kozár, 1988).

Seventeen *Luzulaspis* species are currently known worldwide, namely; *Luzulaspis americana* Koteja & Howell, *L. bisetosa* Borchsenius, *L. borealis* Koteja & Howell, *L. caricicola* (Lindinger), *L. caricis* (Ehrhorn), *L. crassispina* Borchsenius, *L. dactylis* Green, *L. frontalis* Green, *L. grandis* Borchsenius, *L. kozstarabi* Koteja & Kozár, *L. luzulae* (Dufour), *L. macrospinus* Savescu, *L. minima* Koteja & Howell, *L. nemorosa* Koteja, *L. rajae* Kozár, *L. saueri* Lepage & Giannotti, *L. scotica* Green.

Koteja (1979), separated the genus *Luzulaspis* in five groups; the *Scotica*, *Luzulae*, *Bisetosa*, *Frontalis* and *Grandis* groups. He stated that the first three groups represented natural assemblages while the remaining two were recognized on the basis of some morphological similarity although this might have been artificial.

The new species described in this paper belongs to *Scotica* group which differs from the other *Luzulaspis* groups in having (i) strong, conical marginal setae situated in one row, in distances equal to or 2–3 times greater than the length of setae and (ii) small, conical or nearly parallel-sided subequal setae on the dorsal surface. Currently seven species referred to *Scotica* group are known worldwide namely; *Luzulaspis americana*, *L. minima*, *L. rajae*, *L. caricis*, *L. dactylis* Green, *L. borealis* Koteja & Howell, *L. scotica* Green.

In this study *Luzulaspis filizae* Kaydan, *sp. nov.* is described and illustrated based on the adult female and first-instar nymph.

Key to adult female *Luzulaspis* (*Scotica* group). The key is after Koteja (1979), Koteja & Howell (1979) and Kozstarab & Kozár (1988) with additions and changes.

- 1 – Antennae situated distinctly closer to apex of labrum than to anterior body margin; large marginal setae on head twice longer than those of lateral edge, long ventral setae absent from medial parts of thorax *Luzulaspis americana* Koteja & Howell
- Antennae situated half way from anterior body margin to apex of labrum or slightly closer to latter; large marginal setae on head and lateral margin subequal, intervals between setae subequal to length of setae, occasionally greater 2
- 2- Setae on inner edge of tibia subequal to or shorter than tibia width, spiracular and lateral marginal setae subequal in length, sometimes the former shorter 3
- Setae on inner edge of tibia at least twice as long as tibia width, spiracular setae longer than lateral marginal setae 6
- 3- Marginal setae all subequal in length, round, each 7–14 µm long; antennae 290–360 µm long..
..... *Luzulaspis minima* Koteja & Howell
- Marginal setae on head and anal lobes longer than other marginal setae, up to 25 µm long, antennae longer than 400 µm 4
- 4- Two apical marginal setae on head and apical setae of anal lobe thick, twice as wide at base as other marginal setae; interantennal setae less than 75 µm long..... *Luzulaspis rajae* Kozár
- Two apical marginal setae on head and apical setae of anal lobe only slightly thicker than other marginal setae, but never larger than twice as wide at base as other marginal setae; interantennal setae longer than 75 µm long 5
- 5- Marginal setae between anterior and posterior spiracular setae numbering 16–21; 18–22 pores in spiracular pore band; spiracular setae and other marginal setae almost of the same length of other marginal setae *Luzulaspis caricis* (Ehrhorn)
- Marginal setae between anterior and posterior spiracular setae numbering 27–31; 42–52 pores in spiracular pore band; spiracular setae longer than other marginal setae
..... *Luzulaspis filizae* Kaydan *sp. nov.*
- 6- Antennae 370–460 µm long, *Luzulaspis dactylis* Green
- Antennae 460–550 µm long..... 7
- 7- 10–14 interantennal setae; 22–27 marginal setae between anterior and posterior spiracular setae
..... *Luzulaspis borealis* Koteja & Howell
- 13–31 interantennal setae; 26–39 marginal setae between anterior and posterior spiracular setae
..... *Luzulaspis scotica* Green

***Luzulaspis filizae* Kaydan sp. nov.** (Fig. 1, 2)

Type material. Holotype: adult female, Turkey, Adana, Balcalı, ex. *Carex* sp. (Cyperacea) 25 m., 07.v.2015, leg. A. F. Çalışkan, Paratypes: 5 adult females, 25 first instar nymphs same data as holotype,

Adult female

Living specimens. Oval, yellowish-pink, partly enclosed in a white, waxy, sub-spherical egg-sac (Fig. 2 a, b).

Mounted specimens. Body oval, 5.50–6.45 mm long, 2.2 mm (1.85–2.44) wide.

Venter. Derm membranous, dermal spinules present medially on thoracic and abdominal segments. Antennae 8 (rarely 7) segmented; length of segments in μm : I 62–85; II 70–75; III 150–180; IV 90–113; V 70–85; VI 45–50 (in 7 segmented antennae 70); VII 45 (in 7 segmented antennae 60–70) and VIII 45–55. Scape with 3 flagellate setae, segment II with 2 flagellate setae, III and IV each with 1 flagellate seta, V with 2 flagellate setae, VI with 1 fleshy seta, VII with 1 fleshy seta + 1 hair-like seta, and VIII with 3 fleshy setae + 5 hair-like setae. Legs well developed, narrow. Tibio-tarsal sclerosis present (Fig. 2 e). Measurements of hind leg: coxa 260–280 μm long; trochanter + femur 390–420 μm ; tibia 390–420 long and 35–40 wide; tarsus 170–190 μm long; claw without a denticle, 30–40 μm ; claw digitules longer than claw, as wide as half width of claw, slightly broadened apically (Fig. 2 e), tarsal digitules longer than claw, thin and with a small apical swelling, 70–80 μm long. Spiracles 80–105 μm long, 45–70 μm wide in peritreme. Spiracular disc pores, each 6–8 μm wide with 5 loculi (sometimes 7 or 8), forming a loose band of with 24–32 (anterior), 39–52 (posterior) pores from each spiracle to body margin,. Simple pores scattered. Pregenital disc pores mostly with 10–12 loculi (Fig. 2 f), each 8–10 μm wide, numerous around genital opening, becoming progressively less numerous across anterior abdominal segments. Tubular ducts of two sizes: large tubular ducts 14–17 μm long, 6–7 μm wide, with a long, thin inner ductule and small terminal gland; small ducts 15–17 μm long, 4.3–5.0 μm wide, with a long, thin inner ductule and small terminal gland. Larger tubular ducts present on body margin, small ducts in transverse rows on abdominal segments, present in mid area of thorax and head. Microducts particularly small, with small opening 2.0–2.5 μm in diameter, present sparsely on head and thorax, submarginally on abdomen,. Body setae very small, about 10–15 μm long, scattered; with 6 or 7 pairs of interantennal setae, 35–125 μm long; with 1 pair of pregenital setae present medially on last 4 or 5 abdominal sternites, each 80–125 μm long.

Margin. Marginal setae, each about 10–15 μm long on thorax and abdomen, setae on anal lobes and head apex up to 20–25 μm . Spiracular setae strong, wide, curved, each 30–35 μm long; with marginal setae between anterior and posterior spiracular setae numbering 29–39.

Dorsum. Derm membranous, with segmentation apparent on thorax and abdomen. Eyespots not seen. Preopercular pores 7–8 μm wide, forming a sparse, irregular band 3–4 pores wide from anal plates to metathoracic segment. Tubular ducts same shape and size as larger type those on on venter. Body setae short almost parallel side, about 7–10 μm long, sparse. Anal ring with 6 setae, each about 150–175 μm long. Anal plates subtriangular, each plate 70–125 μm wide, 90–135 μm long, with three apical or subapical setae, each 20–25 μm long.

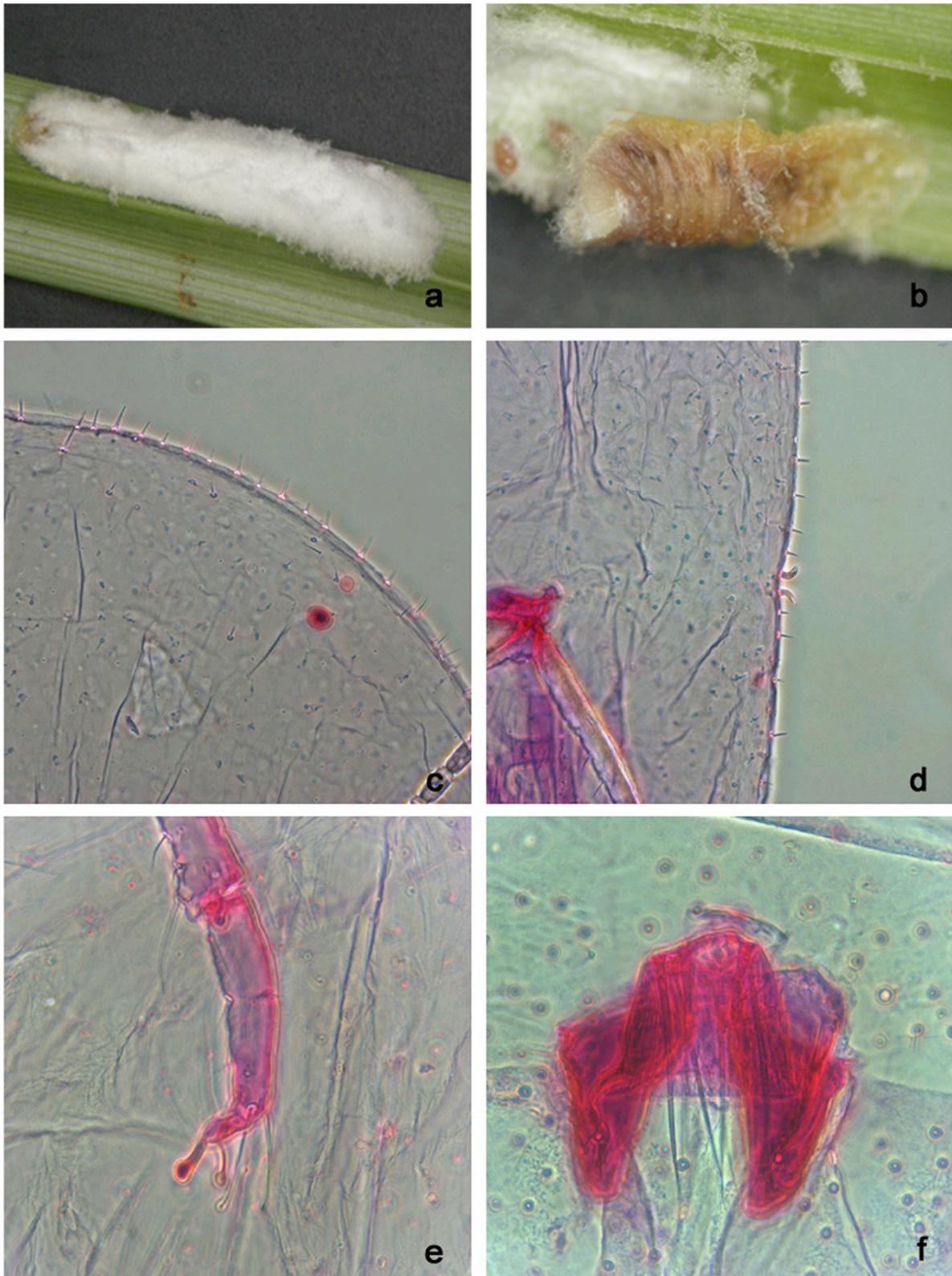


Figure 2. *Luzulaspis filizae* Kaydan *sp. nov.*, adult female, a. ovisac, b. female body, c. marginal setae on apex of head, d. spiracular setae, e. hind leg with tibio-tarsal sclerosis and enlarged claw digitules, f. anal plates.

First-instar nymph (crawler) (Fig. 3)

Living specimens. Body yellowish, elongate oval and flattened. Legs and antennae well developed.

Mounted specimens. body elongate oval 550–590 µm long and 185–230 µm wide. Eyes situated dorso-marginally.

Venter. Antennae 6 segmented, 135–145 µm long, third segment slightly longer than others. With 1 pair of interantennal setae each 32–36 µm long and 3 pairs of hairlike setae on middle of abdominal segments V–VII. Minute spinelike setae with 10 setae on abdominal segments in submarginal rows, 4 on thorax and 1 on head at the base of antennae. Legs subequal, well developed. Measurements of hind leg: coxa 45 µm long; trochanter + femur 80–85 µm; tibia 60 µm; tarsus 40–45 µm long; claw without a denticle, 15 µm long; claw digitules longer than claw, slightly broadened apically, tarsal digitules longer than claw, thin and with a small apical swelling 30–35 µm long. Spiracles 20–25 µm long, 6–8 µm wide in peritreme. Spiracular disc pores, each 4–6 µm in diameter, with 3–8 (generally 5) loculi, 2 or 3 pores in each row to spiracular setae. Loop of mouth stylets 100–120 µm long, reaching the mid thorax. Ventral microducts present submarginally, each 2 mm wide, with 2 between spiracles, and 6 between inner and outer submarginal setae in abdominal region.

Margin. Marginal setae spine-like, with 16 setae anteriorly between anterior spiracular setae, 3 between each anterior and posterior spiracular setae, 7 or 8 found between posterior spiracular setae and anal lobe on each side. Setae on head and thorax are larger than those on abdomen. Spiracular setae 1 pair in each atigmatic area, each setae 5 µm long, 3 µm wide, narrower at apex.

Dorsum. With minute simple pores present in submarginal area of abdomen. Anal plates well developed, each with an apical seta 162–200 µm long. Anal ring round, with simple pores and 6 short setae, each 50–55 µm long.

Etymology. The species is named after Dr. A. Filiz Çalışkan (Çukurova University Agriculture Faculty, Plant Protection Department, Balcalı, Adana, Turkey) who collected the species.

Host plant. *Carex* sp. (Cyperaceae).

Distribution. Turkey (Adana).

Comments. *Luzulaspis filizae* Kaydan *sp. nov.* can be distinguished from other *Luzulaspis* species by the combination of the following characters; (i) setae on inner edge of tibia subequal to or shorter than tibia width; (ii) marginal setae on head and anal lobes longer than those on lateral margin, up to 25 µm long; (iii) antennae longer than 400 µm; (iv) marginal setae between anterior and posterior spiracular setae numbering 29–39; (v) up to 52 pores in each spiracular pore band and (vi) spiracular setae at least two times longer than other marginal setae. *Luzulaspis filizae* is closest to *L. caracis* in having marginal setae on head and anal lobes longer than those on lateral margin, setae on inner edge of tibia subequal to or shorter than tibia width, but differs from *L. cariacis* in having: (i) marginal setae between anterior and posterior spiracular setae numbering 29–39; 42–52 pores in spiracular pore band (16–21 marginal setae; 18–22 pores in *L. caricis*) and spiracular setae longer than other marginal setae in length (almost the same size in *L. caricis*). *Luzulaspis filizae* is also close to *L. rajae* but differs from this species in having: (i) two apical marginal setae on head and apical setae of anal lobes slightly thicker than other marginal setae, but never larger than twice as wide at base as other marginal setae (thicker in *L. rajae*) and (ii) interantennal setae longer than 75 µm (shorter in *L. rajae*).

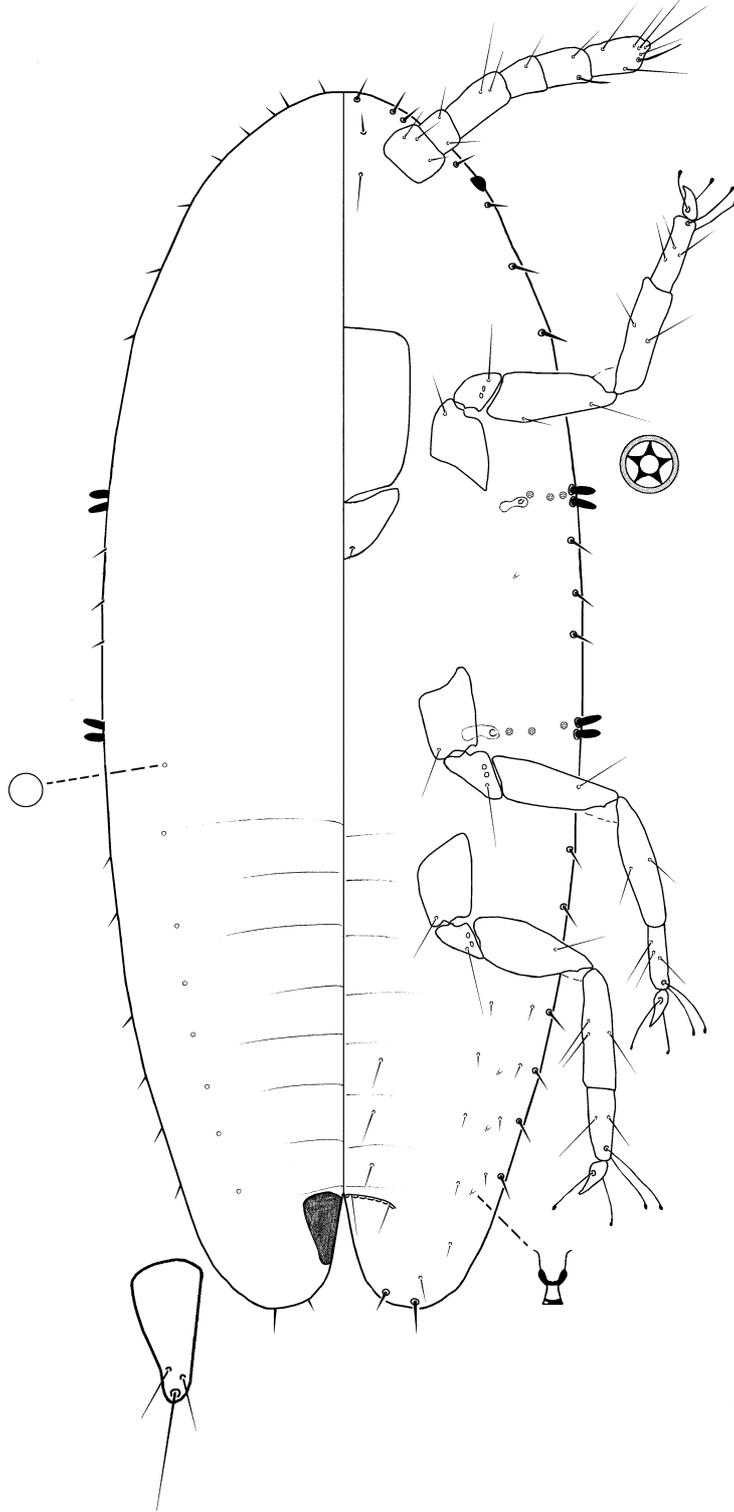


Figure 3. *Luzulaspis filizae* Kaydan *sp. nov.*, first instar nymph.

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References

- Ben-Dov, Y. 1997. "Diagnosis, 3-4". In: *Soft Scale Insects: Their Biology, Natural Enemies and Control* [Vol. 7A] (Eds: Y. Ben-Dov & C.J Hodgson). Elsevier, Amsterdam and New York. 452 pp.
- Ben-Dov Y., D.R., Miller & G.A.P., Gibson, 2015. *ScaleNet: A Database of the Scale Insects of the World* (Web page: <http://www.sel.barc.usda.gov/SCALENET/SCALENET.HTM>) (Date accessed: April 2015).
- Cockerell, T.D.A., 1902. New genera and species of Coccidae, with notes on known species. *Annals and Magazine of Natural History* (Ser. 7), 9: 20-26.
- Hodgson, C.J. 1994. *The Scale Insect Family Coccidae: An Identification Manual to Genera*. CAB International, Wallingford, Oxon, UK. 639 pp.
- Hodgson, C.J. 1997. "Systematics, 111-136". *Soft Scale Insects: Their Biology, Natural Enemies and Control* [Vol. 7A] (Eds: Y. Ben-Dov & C.J Hodgson). Elsevier, Amsterdam and New York. 452 pp.
- Kaydan, M. B., S. Ülgentürk, & L. Erkiliç, 2013. Checklist of Turkish Coccoidea (Hemiptera: Sternorrhyncha) species. *Turkish Bulletin of Entomology*, 3 (4): 157-182.
- Kosztarab, M. & F. Kozár, 1988. *Scale Insects of Central Europe*. Akademiai Kiado, Budapest, 456 pp.
- Koteja, J. 1979. Revision of the genus *Luzulaspis* Cockerell (Homoptera, Coccidae). *Polskie Pismo Entomologiczne*, 49: 585-638.
- Koteja, J. & J.O., Howell, 1979. *Luzulaspis* Cockerell (Homoptera: Coccidae) in North America. *Annals of the Entomological Society of America*, 72: 334-342.
- Signoret, V., 1872. *Essai sur les cochenilles ou gallinsectes (Homopteres - Coccides)*, 9e partie. *Annales de la Societe Entomologique de France (serie 5)*, 2: 33-46.
- Sisman, S. & S. Ulgenturk, 2010. Scale insects species (Hemiptera: Coccoidea) in the Turkish Republic of Northern Cyprus. *Turkish Journal of Zoology*, 34: 219-224.
- Targioni Tozzetti, A., 1868. *Introduzione alla seconda memoria per gli studi sulle cocciniglie, e catalogo dei generi e delle specie della famiglia dei coccidi*. (In Italian). *Atti della Società italiana di scienze naturali*, 11: 721-738.
- Targioni Tozzetti, A., 1869. *Sopra due generi di cocciniglie (Coccidae)*. (In Italian). *Bollettino della Società Entomologica Italiana, Firenze*, 1: 257-267.