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LERZAN ERKILIÇ

MEHMET BORA KAYDAN

FERENC KOZAR

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## Description of a new species of Eriococcidae (Hemiptera: Coccoidea) from Turkey

Lerzan ERKİLİÇ<sup>1</sup>, Mehmet Bora KAYDAN<sup>2,\*</sup>, Ferenc KOZÁR<sup>3</sup>

<sup>1</sup>Biological Agriculture Consulting and Engineering Company P.O. Box: 23 Erzin, Hatay - TURKEY

<sup>2</sup>Plant Protection Department, Faculty of Agriculture, Yüzüncü Yıl University, 65080 Van - TURKEY

<sup>3</sup>Plant Protection Institute, Hungarian Academy of Sciences, Herman Ottó út 15. 1022 Budapest, H-1525 P.O. Box 102 - HUNGARY

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**Abstract:** A new species of Eriococcidae (Hemiptera: Coccoidea), *Proteriococcus lauri* Erkiç sp. nov., collected on *Laurus nobilis* in Turkey is described and illustrated based on the adult female, and first-instar nymph.

**Key words:** New species, Eriococcidae, fauna, Turkey

### Türkiye'den yeni bir Eriococcidae (Hemiptera: Coccoidea) türü

**Özet:** Bu çalışmada *Laurus nobilis* üzerinden toplanan yeni bir Eriococcid (Hemiptera: Coccoidea) türü, *Proteriococcus lauri* Erkiç sp. nov.'nin ergin dişi ve birinci dönem larvası tanımlanmış ve çizimleri yapılmıştır.

**Anahtar sözcükler:** Yeni tür, Eriococcidae, fauna, Türkiye

### Introduction

The world fauna of the family Eriococcidae, or felt scales, is not well understood and the number of new genera and species is continuously increasing (Miller and Gimpel, 2000; Ben-Dov et al., 2006). A similar trend was shown by Kozár and Drozdjak (1986) for the Palaearctic region. In the Palaearctic region 179 species in 25 genera of Eriococcidae are known. Recently, Hodgson and Trencheva (2008) redescribed *E. roboris* and described one species on *Quercus* sp. The richest country for eriococcid species in the

Palaearctic region is Russia, with 43 species (Ben-Dov et al., 2006). Considering the distribution data given in ScaleNet, the number of Eriococcidae species in the Mediterranean subregion, including the Eurosiberian, Mediterranean, and Irano-Turanian faunas, reaches up to 100 species.

The scale insect fauna of Turkey was studied in detail by Bodenheimer (1953), who recorded 6 species of Eriococcidae. Later, Uygun et al. (1998), Önder et al. (2000), and Karsavuran et al. (2001) recorded *Gossyparia spuria* (Modeer) from *Ulmus* spp. Kaydan

\* E-mail: borakaydan@yyu.edu.tr

et al. (2001) published 2 new eriococcid species for Turkish fauna from Middle Anatolia (Turkey). Ülgentürk et al. (2003) identified 11 eriococcid species, 9 of which were newly recorded for the Turkish fauna. Kaydan et al. (2005) added 3 new felt scale species from Ankara for the Turkish scale insect fauna. In the last species list of scale insects of Turkey (Kaydan et al., 2007), among the 267 scale insect species recorded, only 20 eriococcid species were known in 3 genera. More recently, 2 new genera (*Borchseniococcus* Kaydan and Kozár, and *Kotejacoccus* Kaydan and Kozár) and 2 new species (*Kotejacoccus turcicus* Kaydan and Kozár, and *Borchseniococcus duzgunesae* Kaydan and Kozár) were described and some more faunistic data (5 new records of eriococcid species) from the Eastern Anatolian region were added by Kaydan and Kozár (2008). With these studies, the number of eriococcid species in Turkey reached 27. These new data suggest that many new species are waiting to be discovered and emphasise the necessity of revising the eriococcid fauna of Turkey.

The aim of this work was to describe a new species of eriococcid collected recently from *Laurus nobilis* (Lauraceae) in Turkey. This plant is commonly called laurel, bay laurel, or bay tree. It is a characteristic plant species of the macchia bush in the Mediterranean region, and originated in Anatolia (Davis, 1978). Bay laurel is very common in all regions that have a typical Mediterranean climate. To date, 47 scale insect species (in 4 families and 25 genera) have been recorded on *L. nobilis* all over the world, but no eriococcid species have been recorded from it (Ben-Dov et al., 2006). Among these 47 scale insect species, only 5 of them (in 2 families and 4 genera) have been recorded in Turkey (Kaydan et al., 2007).

## Materials and methods

The scale insect samples were collected from Hatay-Harbiye. Specimens were collected on pieces of host plant that were put into a plastic bag and taken to the laboratory for examination. Specimens were prepared for light microscopy using the methods of Kosztarab and Kozár (1988). Morphological terms follow those of Williams (1985), Kosztarab and Kozár (1988), Foldi and Kozár (2007), Kozár et al. (2007), and Kaydan and Kozár (2008). Measurements and

counts were taken from all specimens. Data given separately refer to the holotype; the size ranges include the paratypes and are given in parentheses when they differ from those of the holotype.

In the present paper, we follow the generic concepts of Borchsenius (1949), Danzig (1980), Kosztarab and Kozár (1988), Tang and Hao (1995), Tereznikova (1981), and Köhler (1998), which are based mostly on those of Signoret (1875).

For comparison the original description and drawing of Borchsenius (1960), and a female in a paratype slide was studied [label data: paratype 17=58, *Proteriococcus acutispinus* Borchs *Quercus* sp. (in original paper *Pasania* sp. mentioned as a host plant!) China, Yunnan, south of Midu, 19. IV. 57 y. Nb52, 3699 N. Borchsenius].

Both dry and mounted materials were deposited in the Plant Protection Department, Faculty of Agriculture, Yüzüncü Yıl University, Van, Turkey, and the Plant Protection Institute, Hungarian Academy of Sciences, Herman Ottó út 15. 1022 Budapest, H-1525 P.O.Box 102, Hungary.

## Results and discussion

A new species of Eriococcidae was collected on *Laurus nobilis*. This new species is described and illustrated based on the adult female and first-instar nymph. In total, the number of scale insects (Hemiptera: Coccoidea) known in Turkey has increased to 274, and the number of species in the family Eriococcidae to 28.

The new species belongs to the tribe Acanthococcini (sensu Koteja, 1974), but differs from members of the genus *Acanthococcus* by its intermediate type (spine-like with pointed and curved apex) marginal dorsal setae, by the strongly sclerotised dermal opening of macrotubular ducts, and by presence of sclerotised protuberances, which are different from the more common microtrichia (spiculae of Williams (1985) or spinulae of Kaydan and Kozár (2008)). The new species appears most closely related to *Proteriococcus acutispinatus* Borchsenius, 1960; however, a generic revision including all Palaearctic genera should clarify this decision.

*Proteriococcus* Borchsenius, 1960

Type species: *Proteriococcus acutispinus* Borchsenius, 1960

**Adult female.** *Venter:* Antennae 6-7 segmented. Legs long, with tibia longer than tarsus; meso- and metathoracic coxae with microtrichia, and metathoracic coxa also with small pores; claw of all legs with denticle. Setae short and hair-like; also with enlarged setae submarginally in one species. Multilocular pores each with 5 loculi; macrotubular ducts of 2 sizes and with a sclerotised ring surrounding dermal opening; both pores and ducts present in moderate numbers, forming a band around body margin and scattered over derm. Microtubular ducts present on margin, few, long, with oval-shaped dermal opening, some of them divided in middle.

*Dorsum:* Anal lobes well developed, conical with sclerotised teeth; dorsal surface of each lobe with 3-4 intermediate type (spine-like with pointed and curved apex) setae, ventral surface of each lobe with a long apical seta and shorter subapical seta. Anal ring sclerotised, well developed, with anal ring pores in one row and with 6-8 setae, all longer than diameter of ring. Setae of intermediate and conical type. With or without a marginal row of enlarged intermediate type of setae. Macrotubular ducts heavily sclerotised, each with inner gland ductule ending in a simple sclerotised hole; terminal gland simple. Microtubular ducts numerous, long with a small dermal orifice or an expanded oval, sometimes bilocular orifice. Microtubular ducts opening at base of most dorsal seta but present only in *P. lauri*. Whole surface covered by minute conical sclerotised protuberances.

***Proteriococcus lauri* Erkiliç sp. nov.**

**Material examined:** **Holotype** adult female, **Turkey**, Hatay-Harbiye, N: 36°07', E: 36°08', 239 m altitude, on leaves of *Laurus nobilis*, L. Erkiliç, 26.v.2008. Deposited in scale insect collection of Van Yüzüncü Yıl University (Turkey).

**Paratypes:** Five adult females and 9 first-instar nymphs with same data as holotype; 4 adult females and all nymphs deposited in the scale insect collection of the Van Yüzüncü Yıl University (Turkey), and 1 adult female on 1 slide in the collection of Plant Protection Institute, HAS (Hungary).

**Diagnosis of adult female:** *Proteriococcus lauri* can be diagnosed by the following combination of features: marginal dorsal setae long, intermediate type (spine-like with pointed and curved apex), 7 segmented antenna, 3 dorsal anal lobe setae, well separated marginal row of spines, microtubular ducts on base of some marginal and dorsal enlarged setae, serrated surface on cauda and frontal lobes, strongly sclerotised dermal opening of short macrotubular ducts and absence of multilocular pores on dorsum.

**Description:**

**Adult female:** (Figure 1)

**Live appearance:** Adult females dark red; found on the both side of leaves in white felt-like test; full with eggs of same colour as female.

**Mounted female:** Body elongate oval (Figure 1), 2.28 (2.30-2.38) mm long and 1.32 (1.28-1.36) mm wide. Frontal lobes present. Eyes situated on venter near margin.

**Venter.** Labium 3-segmented, 90 (95-85) µm long, 80 (70-95) µm wide; basal segment not well developed, but with 2 setae present on each side; median setae on apex of labium 10 (8-10) µm long. Stylet loop long, reaching to level with area between mesothorax legs and metathoracic legs. Antenna 7 segmented, 260 (260-290) µm, length of segments (in µm): I: 40 (50-52.5), II: 40 (35-45), III: 45 (37.5-45), IV: 52 (45-55), V: 30, VI: 30 (25-32.5), and VII: 45(35-45); segment II with 1 sensory pore; segment III with almost parallel sides; each segment covered with a few, strong hair-like setae; apical segment with apical seta 70 (62.5-72.5) µm long; apical segment also with 3 fleshy setae, each 37.5 (35-40) µm long; 2 preapical segments each also with 1 sensory falcate seta 35 (35-40) µm long. Legs well developed, comparatively small: prothoracic legs: coxa 120 (115-125) µm, trochanter 70 (60-75) µm, femur 140 (130-155) µm, tibia 125 (100-125) µm, tarsus 100 (90-105) µm and claw 25 (22.5-30) µm, trochanter+femur 190 (170-215) µm, tibia+tarsus 225 (180-225) µm, tarsal digitules 45 (40-50) µm, claw digitules 35 (27.5-35) µm; mesothoracic legs: coxa 135 (120-135) µm, trochanter 70 (60-70) µm, femur 140 (135-140) µm, tibia 120 (110-130) µm, tarsus 110 (100-120) µm and claw 27.5 (25-30) µm, trochanter+femur 190 (160-190) µm, tibia+tarsus 230 (200-240) µm, tarsal digitules 45 (40-50) µm, claw digitules 30 (27.5-35) µm.

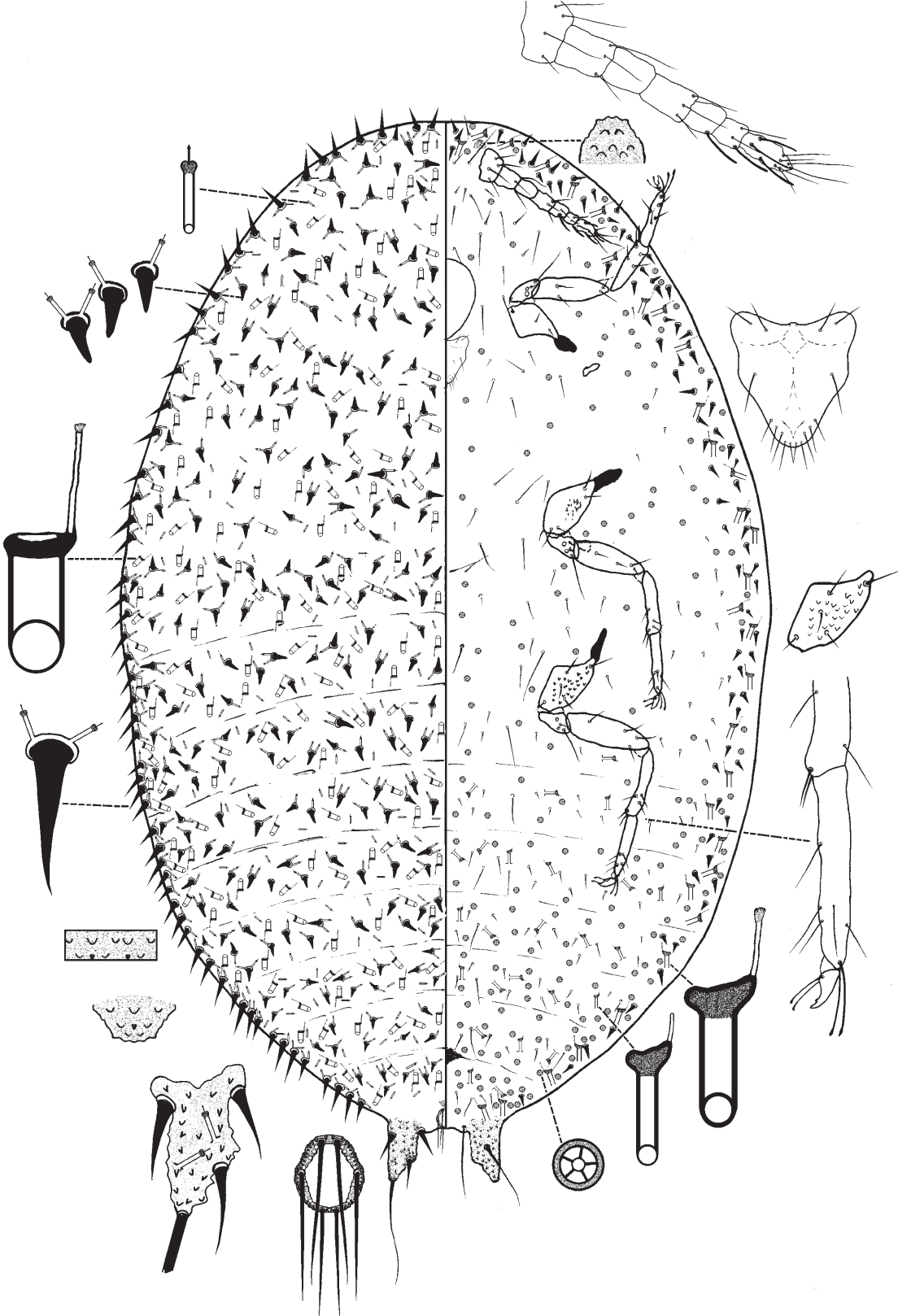


Figure 1. Adult female of *Proteriococcus lauri* Erkiñç sp. nov.

$\mu\text{m}$ ; metathoracic legs: coxa 135 (120-130)  $\mu\text{m}$ , trochanter 70 (60-70)  $\mu\text{m}$ , femur 165 (130-160)  $\mu\text{m}$ , tibia 125 (110-135)  $\mu\text{m}$ , tarsus 125 (105-120)  $\mu\text{m}$  and claw 30 (27.5-30)  $\mu\text{m}$ , trochanter+femur 210 (180-210)  $\mu\text{m}$ , tibia+tarsus 240 (210-240)  $\mu\text{m}$ , tarsal digitules 45 (42.5-45)  $\mu\text{m}$ , claw digitules 32.5 (27.5-30)  $\mu\text{m}$ , each slightly knobbed. Mesothoracic and metathoracic coxae with microtrichia on anterior surface. Each trochanter with 2 pores (campaniform sensilla) on each side. Claw with a small denticle. Legs with a few hair-like setae, and with 1 sensory pore on tarsus. Tibiae each with 4-5 setae, tarsi each with 5 setae. Multilocular pores each 3-5  $\mu\text{m}$  in diameter and with 5 loculi, distributed in sparse rows on all abdominal and thoracic segments. Diameter of anterior spiracles 45 (40-50)  $\mu\text{m}$ ; spiracular peritreme 22.5 (20-25)  $\mu\text{m}$ . Derm with a sparse covering of scattered flagellate hair-like setae, each about 12.5-110  $\mu\text{m}$  long. Enlarged setae each 17.5-30  $\mu\text{m}$ , without microtubular duct at base, situated on submargin in 2 or 3 rows. Macrotubular ducts of 2 sizes; larger one each 3.5-5.0  $\mu\text{m}$  wide and 17.5-20.0  $\mu\text{m}$  long, placed on submargin; smaller one each 2.5  $\mu\text{m}$  wide and 12.5-15.0  $\mu\text{m}$  long, scattered on abdominal segments. Microtubular ducts on margin present but few, cruciform pores absent. Internal genital organ not seen. Suranal setae hair-like.

**Dorsum.** Marginal dorsal setae long, intermediate type (spine-like with pointed and curved apex), each 25-60  $\mu\text{m}$ , other dorsal setae conical, each seta 15-40  $\mu\text{m}$  long, setae on thorax, head, and anterior abdominal segments slightly larger than setae on last 2 or 3 abdominal segments, arranged in transverse rows across each body segment, rows irregular on head. Macrotubular ducts wide, each 7.5-10  $\mu\text{m}$  wide and 17.5-22.5  $\mu\text{m}$  long, scattered throughout dorsum, generally in segmental bands. Microtubular ducts long, each 10-12.54  $\mu\text{m}$  long and 1.0-1.5  $\mu\text{m}$  wide, with circular dermal orifice, scattered over dorsum, with 0-3 (generally 1 or 2) openings at base of each dorsal seta and marginal seta. Anal ring strongly sclerotised, with 16-20 pores on inner side and large teeth on outer side, 52.5 (50-55)  $\mu\text{m}$  in diameter, with 6 setae, each 105-135  $\mu\text{m}$  long; anal ring situated on margin of dorsum. Anal lobes strongly developed and sclerotised, each with 3 enlarged intermediate type of setae, each 35-50  $\mu\text{m}$  and 2-4 microtubular ducts on dorsal surface; apical seta 230 (190-262.5)  $\mu\text{m}$ ;

subapical setae 65 (60-80)  $\mu\text{m}$  long. Cauda present with large protuberances as on dorsal surface.

**Comment:** The adult female of *P. lauri* similar to *P. acutispinus* (i) by presence of intermediate type of marginal dorsal setae, (ii) by presence of sclerotised protuberances on anal lobes and other parts of the body, (iii) by strongly sclerotised anal lobes, (iv) by strongly sclerotised dermal opening of short macrotubular ducts, (v) by oval, sclerotised orifice of microtubular ducts, by presence of frontal tubercles and cauda, (vi) by long stylet loop, (vii) by absence of pores on coxae, (viii) by absence of cruciform pores.

*P. lauri* differs from *P. acutispinus*: (i) by presence of microtubular ducts associated with base of dorsal spines, (ii) by absence of multilocular pores on dorsum, (iii) by presence of some microtubular ducts with bilocular opening, (iv) by smaller number of spines on dorsum, (iv) by absence of longitudinal row of longer spines on middorsum, (v) by clearly separated marginal row of spines on body margin.

**First-instar nymph:** (Figure 2)

**Live appearance:** First-instar nymph dark red; found in the white felt-like scale of adult female.

**Mounted first-instar nymph:** Body elongate oval (Figure 2), 390 (370-500)  $\mu\text{m}$  long and 200 (170-250)  $\mu\text{m}$  wide. Frontal tubercle absent. Eyes situated on venter near margin.

**Venter.** Labium 3-segmented, 40 (30-40)  $\mu\text{m}$  long, 35 (35-42.5)  $\mu\text{m}$  wide; basal segment not well developed, but with 2 setae present on each side; median setae on apex of labium 1.5 (1-2.5)  $\mu\text{m}$  long. Stylet loop long, reaching past coxae of posterior legs. Antenna 6 segmented, 90 (85-100)  $\mu\text{m}$ , length of segments ( $\mu\text{m}$ ): I: 15 (17.5-20.0), II: 17.5 (15-17.5), III: 15 (15-17.5), IV: 10, V: 11 (10.0-12.5) and VI: 20 (17.5-20)  $\mu\text{m}$ ; each segment covered with a few, strong hair-like setae; apical segment with apical seta 52.5 (50.0-60.0)  $\mu\text{m}$  long; apical segment also with 3 fleshy setae, each 22.5 (20-22.5)  $\mu\text{m}$  long; 2 preapical segments each also with 1 sensory falcate seta 20.0 (17.5-22.5)  $\mu\text{m}$  long. Legs well developed, comparatively large: anterior legs: coxa 27.5 (27.5-32.5)  $\mu\text{m}$ , trochanter 17.5 (20)  $\mu\text{m}$ , femur 45  $\mu\text{m}$ , tibia 27.5 (25-27.5)  $\mu\text{m}$ , tarsus 37.5 (37.5-40)  $\mu\text{m}$  and claw 12.5  $\mu\text{m}$ , trochanter+femur 60  $\mu\text{m}$ , tibia+tarsus 65 (60-65)  $\mu\text{m}$ , tarsal digitules 25 (20-25)  $\mu\text{m}$ , claw

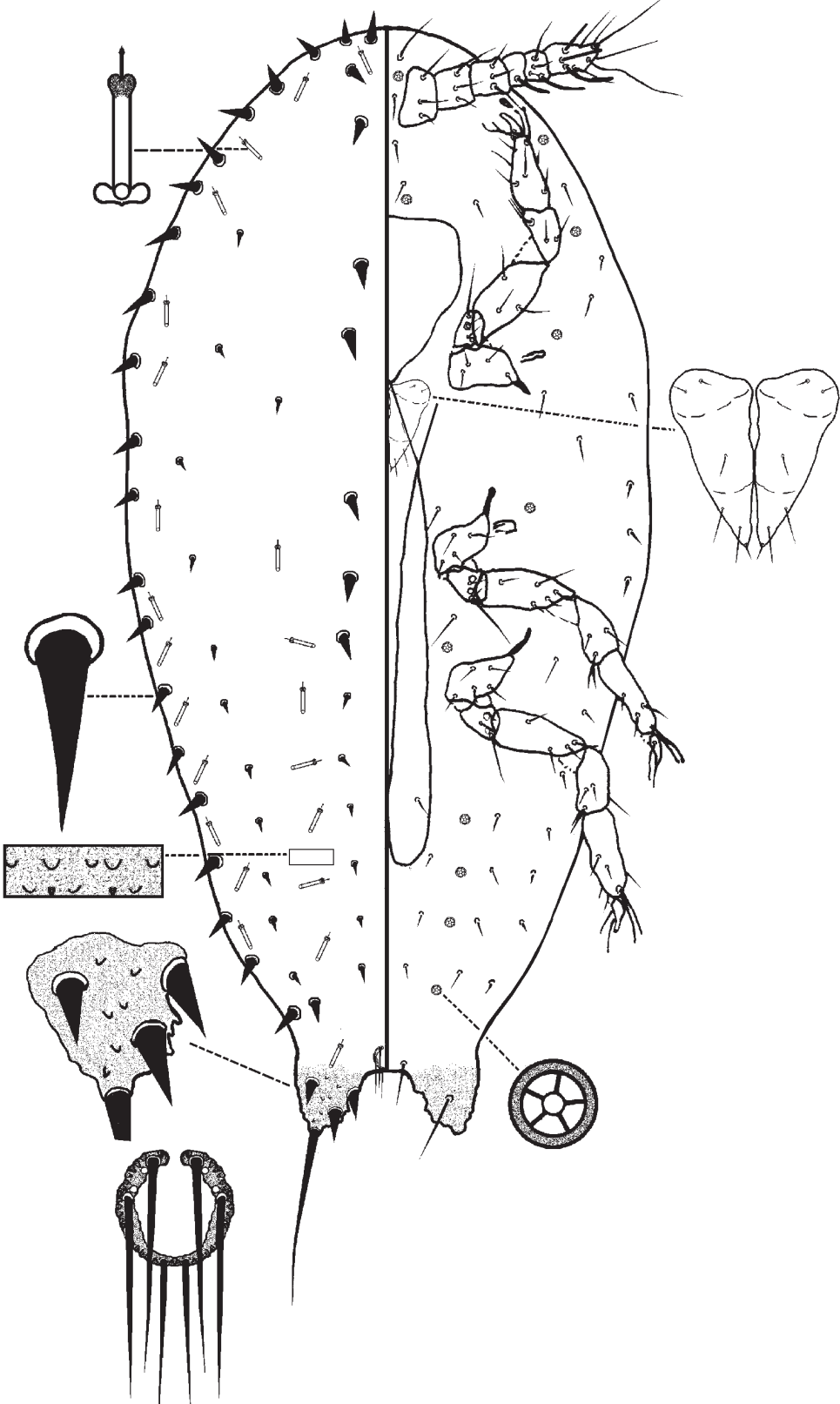


Figure 2. First-instar nymph of *Proteriococcus lauri* Erkiçiç sp. nov.

digitules 20 (17.5-20)  $\mu\text{m}$ ; mesothoracic legs: coxa 35 (30-35)  $\mu\text{m}$ , trochanter 20 (20.0-22.5)  $\mu\text{m}$ , femur 40 (40-45)  $\mu\text{m}$ , tibia 27.5 (25-30)  $\mu\text{m}$ , tarsus 40  $\mu\text{m}$  and claw 15 (12.5-17.5)  $\mu\text{m}$ , trochanter+femur 55 (60)  $\mu\text{m}$ , tibia+tarsus 65 (70)  $\mu\text{m}$ , tarsal digitules 25  $\mu\text{m}$ , claw digitules 17.5  $\mu\text{m}$ ; metathoracic legs: coxa 30 (30-35)  $\mu\text{m}$ , trochanter 20 (15-20)  $\mu\text{m}$ , femur 50 (42.5-45)  $\mu\text{m}$ , tibia 30 (30-32.5)  $\mu\text{m}$ , tarsus 42.5 (35-45)  $\mu\text{m}$  and claw 15 (15-17.5)  $\mu\text{m}$ , trochanter+femur 60  $\mu\text{m}$ , tibia+tarsus 67.5 (65-70)  $\mu\text{m}$ , tarsal digitules 20 (22.5-27.5)  $\mu\text{m}$ , claw digitules 15 (15.0-17.5)  $\mu\text{m}$ , each slightly knobbed. Each trochanter with 2 pores (campaniform sensilla) on each side. Claw without denticle. Tibia each with 4-5 setae; tarsus with 5 setae. Multilocular pores each 3-5  $\mu\text{m}$  in diameter and with 5 loculi (sometimes 7-locular pores near anterior spiracle), distributed in sparse rows on all abdominal and thoracic segments. Diameter of anterior spiracles 20 (17.5-20.0)  $\mu\text{m}$ ; spiracular peritreme 5  $\mu\text{m}$ . Derm with a sparse covering of scattered flagellate hair-like setae, each about 7.5-25  $\mu\text{m}$  long. Macrotubular and microtubular ducts absent. Suranal setae hair-like.

**Dorsum.** Marginal setae long, strong, conical, pointed on apex, each 15-25  $\mu\text{m}$ . Dorsal setae conical, each seta 7.5-25  $\mu\text{m}$  long, setae on thorax, head, and anterior abdominal segments larger than setae on last

6 abdominal segments, arranged in 2 rows across each body segment, rows irregular on head. Microtubular ducts long, each 1.0-1.5  $\mu\text{m}$  wide and 10  $\mu\text{m}$  long, with circular dermal orifice, situated on the margin and middle of body. Anal ring sclerotised, with 2-4 pores inner side and large teeth outer side of anal ring, 20 (15.0-22.5)  $\mu\text{m}$  in diameter, with 6 setae, each 35-45  $\mu\text{m}$  long; anal ring situated on margin of dorsum. Anal lobes strongly developed and sclerotised, each with 3 enlarged setae each 17.5-22.5  $\mu\text{m}$ ; apical seta 100 (90-105)  $\mu\text{m}$ ; subapical setae 35 (30-37.5)  $\mu\text{m}$  long.

**Etymology.** The new species is named after the name of the host plant, *Laurus nobilis*.

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