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**DESCRIPTIONS OF THE FIRST-INSTAR NYMPHS OF THREE SPECIES OF
LEPIDOSAPHES SHIMER AND A SPECIES OF *INSULASPIS* MAMET
(HEMIPTERA: DIASPIDIDAE).**

ABSTRACT

DESCRIPTIONS OF THE FIRST-INSTAR NYMPHS OF THREE SPECIES OF *LEPIDOSAPHES* SHIMER AND A SPECIES OF *INSULASPIS* MAMET (HEMIPTERA; DIASPIDIDAE).

The first-instar nymphs of two species of the genus *Lepidosaphes* (namely *L. beckii* (Newman) and *L. ficus* (Signoret)) are described and illustrated and compared with the first-instar nymph of *L. ulmi*. The first-instar nymph of *Insulaspis tapleyi* (Williams) is also described and illustrated, and the differences between *I. tapleyi* and *I. pallidula* (Green) are discussed. Keys are provided for the separation of the first-instar nymphs of these five species.

Key words: Egypt, *Citrus*, *Ficus*, *Mangifera indica*, *Psidium*, *Juniperus*.

INTRODUCTION

The first-instar nymphs of several species of diaspidid have been described and their importance in species and generic diagnoses has been emphasised by several authors. Thus, Takagi (1969) provided excellent descriptions of the first instars of seven diaspidid tribes, Howell & Tippins (1975) described the first instars of *Haliaspis* and then (1976) the nominal type species of eight diaspidid tribes, including the Lepidosaphidini, while Ghabbour (1995) described the first instars of three species of *Aonidiella* Berlese & Leonardi.

The genus *Lepidosaphes* Shimer is quite large and contains a number of species of considerable economic importance, particularly *L. beckii* (Newman), *L. ficus* (Signoret) and *L. ulmi* (Linnaeus). The description of the first-instar nymphs of these three species is, therefore, important for a proper understanding of this genus. The first-instar nymphs of *L. beckii* and *L. ficus* are described and illustrated below and compared with the first-instar of *L. ulmi*, previously described by Howell & Tippins (1976). In addition, because the genus *Insulaspis* Mamet is close to *Lepidosaphes*, the 1st-instar nymph of *Insulaspis tapleyi* (Williams) is also described and illustrated and compared with the first-instar nymph of the very similar to *I. pallidula* (Green). Borchsenius (1963) assigned 32 species to the genus *Insulaspis* but there is very little information on the first instars of this genus. The nymphs of

Lepidosaphes and *Insulaspis* are compared and keys are provided for the separation of the five species discussed in this paper.

All specimens are deposited in the Collection of the Ministry of Agriculture, Plant Protection Research Institute, Department of Scale Insects, Nadi El-Said Str., Dokki-Giza, Egypt.

LEPIDOSAPHES Shimer

Lepidosaphes Shimer, 1868: 372.

Type species: *Lepidosaphes ulmi* L.

Lepidosaphes beckii (Newman) (Figs 1,4a,5a)

First-instar nymph.

Body: elliptical, about 310µm long and 150µm wide; derm membranous except for sclerotised areas on pygidial margin. Verrucose structures present on cephalic region between eyespots and on prepygidial region. Caudal setae long and slender; length about 75µm. Anus minute, removed about 2x to 3x its diameter from pygidial apex.

Pygidial margin: median pair of lobes reduced to small projections; second pair of lobes well developed, about 20µm long, 8µm wide, with 2 notches on both sides; third pair of lobes reduced to sclerotised projections. Gland spines and setae present (see under venter).

Dorsal surface:

Ducts: a single pair of large, one-barred 8-shaped ducts present anteriorly on cephalic region.

Setae: on head: two pairs of long setae present on margin anteriorly and two setae submedially posterior to each 8-shaped duct. On thorax and abdomen: with a row of submarginal setae present, one on each of posterior six abdominal segments, and with a row of seven pairs of submedian setae on metathoracic and abdominal segments.

Margin & ventral surface:

Antennae: six-segmented, all segments annulated except segment I. Segment VI subequal in length to segments II to V inclusive. Segments I and II each with a long seta; segment V with a stout seta; segment VI with 5 stout setae and 2 flagellate setae terminally.

Legs: well developed, posterior legs slightly larger. All digitules knobbed and exceeding claw in length (tarsal digitules about 21µm long). Trochanter of each leg with two sensoria on ventral surface and one long slender seta. Femur well developed, 3x as long as wide. Coxae each with a minute seta.

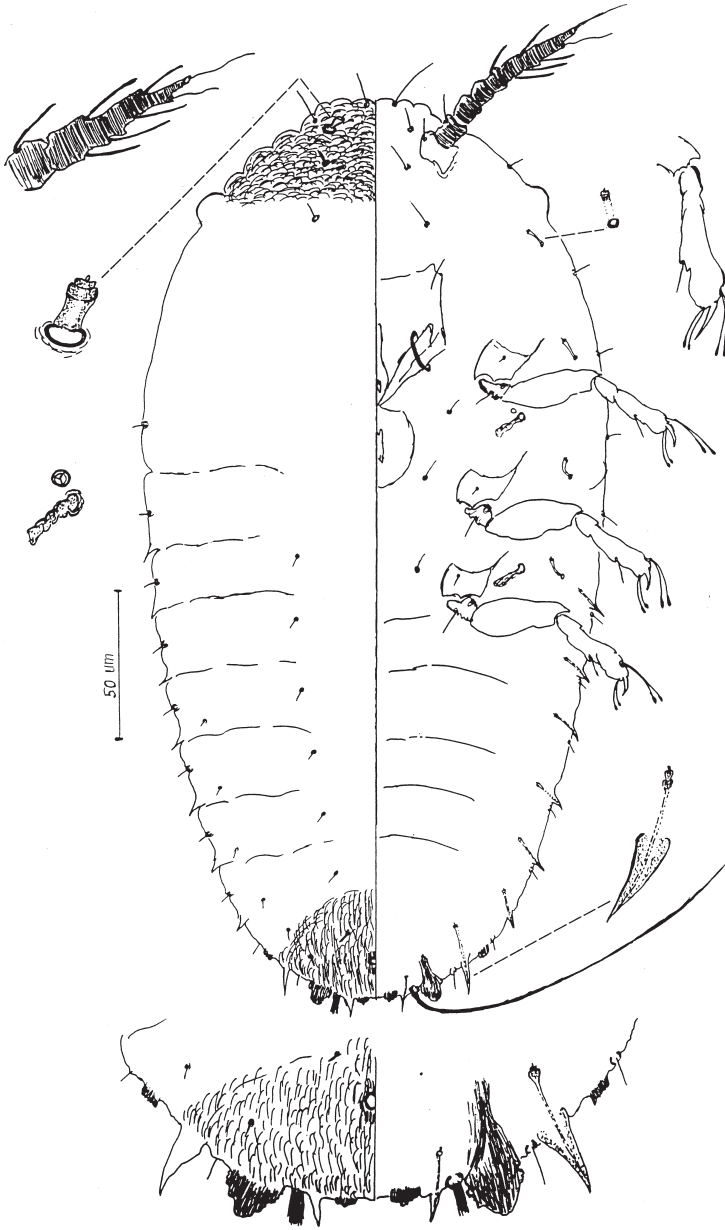


Fig. (1) : *Lepidosaphes beckii* 1st instar nymph

Fig. 1. *Lepidosaphes beckii* (Newman). 1st-instar nymph.

Spiracles: with a single trilocular pore associated with each anterior spiracle only.

Setae: with one pair of long setae on margin of head and three pairs submedially on head; with no setae submarginally or submedially on abdomen; with short setae present marginally on each segment, totalling 12 on each side posterior to eyespots. With a pair medially on each thoracic segment.

Ducts: with 4 pairs of submarginal microducts present, one near each eye and in pairs on each thoracic segment.

Gland spines: with eight pairs of marginal gland spines present, one pair laterally on metathoracic segment and one pair on each abdominal segment, each associated with a one-barred microduct. Gland behind second pygidial lobe about 2x size of other glands.

Material examined: Egypt, Tanta, ex *Citrus* sp., 11.III.1997, M.W. Ghabbour; Giza, El-Saff, ex *Citrus* spp, 27.IV.1998, M.W. Ghabbour. 9 slides.

Lepidosaphes ficus (Signoret) (Figs 2,4b,5b)

First-instar nymph.

Body: oval, about 290µm long and 125µm wide; derm membranous except for sclerotised areas on pygidial margin and a verrucose structure between eyespots. Caudal setae long and slender; length about 90µm. Anus minute, removed about 3x to 4x its diameter from pygidial apex.

Pygidial margin: median pair of lobes absent; second pair of lobes well developed, about 14µm long and 5µm wide, with one notch on outer margin only; third pair of lobes reduced to sclerotised projections. Gland spines and setae present (see under venter).

Dorsal surface:

Ducts: a single pair of large, one-barred 8-shaped ducts present anteriorly on cephalic region.

Setae: on head: two pairs of long setae present on margin anteriorly and two setae submedially posterior to each 8-shaped duct on verrucose sclerotisation. On thorax and abdomen: without submarginal setae on abdominal segments, but with a row of ten submedian setae on thoracic and abdominal segments.

Margin & ventral surface:

Antennae: six-segmented, not annulated. Segment VI subequal in length to segments II to V inclusive. Segments I and II each with a long seta; segment V with a stout seta; segment VI with 4 stout setae and 2 flagellate setae terminally.

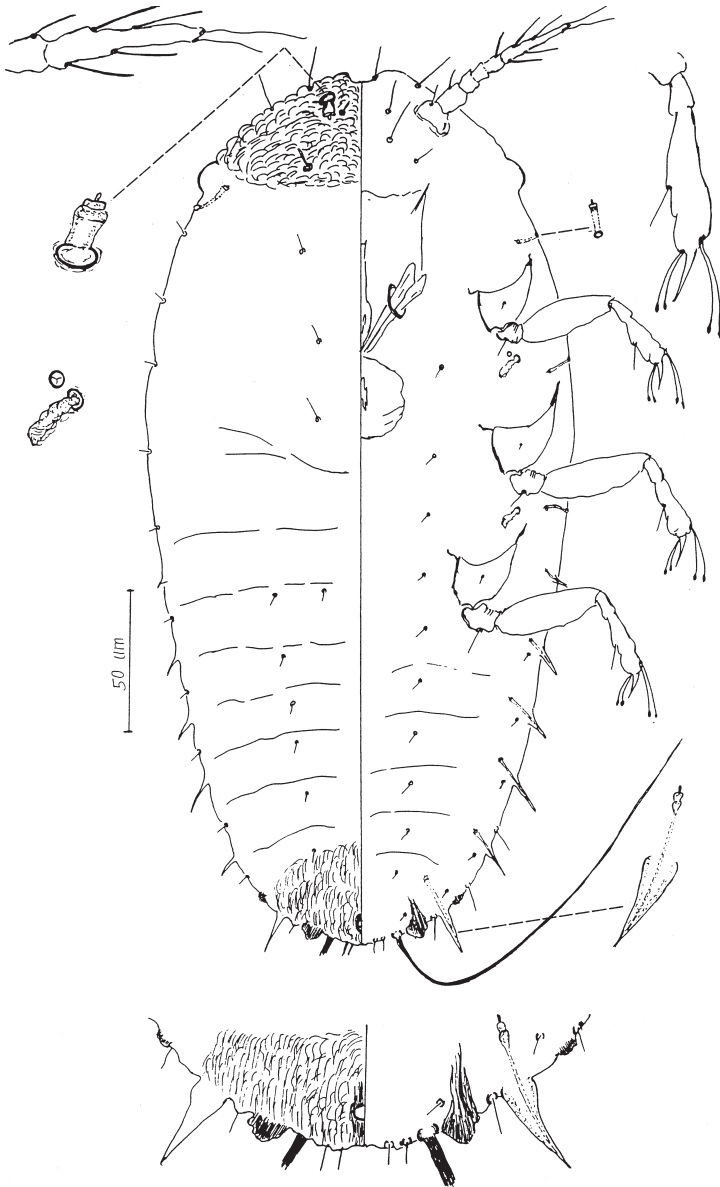


Fig. (2). *Lepidosaphes ficus*. 1st instar nymph

Fig. 2. *Lepidosaphes ficus* (Signoret). 1st-instar nymph.

Legs: well developed, posterior legs slightly larger. All digitules knobbed and exceeding claw in length (tarsal digitules about 23µm long). Femur well developed, 2.5x as long as wide. Trochanter triangular, each with two sensoria on ventral surface and one long slender seta. Coxae each with a minute seta.

Spiracles: with a single trilocular pore associated with each anterior spiracle only.

Setae: on head: with four pairs of long setae (about 12µm long) and one pair of short setae submedially. On thorax and abdomen: submarginal setae six, one per segment on abdomen; submedian setae in a row of ten, one per segment on each thoracic and abdominal segment; marginal setae short, one on each thoracic segment posterior to eyespot and on more anterior abdominal segments, totalling 10; in addition, with five pairs of long setae in pygidial area, of which two pairs between caudal setae.

Ducts: with 4 pairs of submarginal microducts present, two pairs just posterior to each eyespot and a pair laterad to each spiracle.

Gland spines: with six pairs of marginal gland spines present, each associated with a one-barred microduct: one small pair marginally on metathoracic segment and one pair on abdominal segments II to VI; more posterior gland spines larger, particularly that just anterior to second pair of pygidial lobes.

Material examined: Egypt: El-Arish, on leaves and branches of *Ficus* sp., 21.VIII.1997, M.W. Ghabbour; as previous but at Matrouth, 15.VI.1998. 12 slides.

Key to first-instar nymphs of three species of *Lepidosaphes*:

- 1. Antennae annulated; with eight pairs of marginal gland spines; setae absent ventrally on abdomen*L. beckii* (Newman)
 - Antennae not annulated; with six or seven pairs of marginal gland spines; setae present ventrally on abdomen.....2
- 2. Verrucose area present between eyespots; median pygidial lobes absent; with four pairs of stout setae on VIth antennal segment; with six pairs of marginal gland spines*L. ficus* (Signoret)
 - Verrucose area absent from between eyespots; median pygidial lobes reduced to small sclerotized projections; with five stout setae on VIth antennal segment; with seven pairs of marginal and submargin gland spines...
.....*L. ulmi* (L.) (Figs 4c,5c)

INSULASPIS Mamet

Insulaspis Mamet, 1950: 32.

Type species: *Lepidosaphes vermiculus* Mamet.

Insulaspis tapleyi (Williams) (Figs 3,4d,5d)

First-instar nymph.

Body: elongate, about 260 μ m long and 130 μ m wide; derm entirely membranous except for sclerotised pygidial lobes. With an unsclerotised verrucose area on cephalic region between eyespots and also dorsally on prepygidial area. Caudal setae long and slender, length about 60 μ m and about 1/5 body length.

Pygidial margin: median pair of lobes reduced to a pair of sclerotised points; second pair of lobes well developed, about 18 μ m long and 7 μ m wide, with two notches on each margin; third pair of lobes reduced to minute tooth-like projections. Anus minute, removed about 2-3x its diameter from pygidial apex. Gland spines and setae present (see under venter).

Dorsal surface:

Ducts: a single pair of large, one-barred 8-shaped ducts present anteriorly on cephalic region.

Setae: with four pairs of long setae present on margin of head and prothorax; with two pairs of setae submedially on head. On thorax and abdomen: submedian in a row of eight setae on meso- and metathorax and abdominal segments; submarginal also in a row of eight setae on meso- and metathorax and abdominal segments.

Margin & ventral surface:

Antennae: six-segmented, all segments annulated except segment I. Segments I and II each with a long seta; segment V with a stout seta; segment VI as long as segs II-V combined, with 4 stout setae and 2 flagellate setae apically.

Legs: well developed. All digitules knobbed and exceeding claw in length, tarsal digitules about 16 μ m long. Femur large and well developed. Trochanter triangular, each with two sensoria on ventral surface and one long slender seta. Coxae each with a minute seta.

Spiracles: with a single trilocular pore associated with each anterior spiracle only.

Setae: on head: with four pairs of long setae submedially. On thorax and abdomen: with three pairs of setae medially on prothorax; submedial setae absent; submarginal setae: six pairs, one per segment on meso- and metathorax and four anterior abdominal segments.

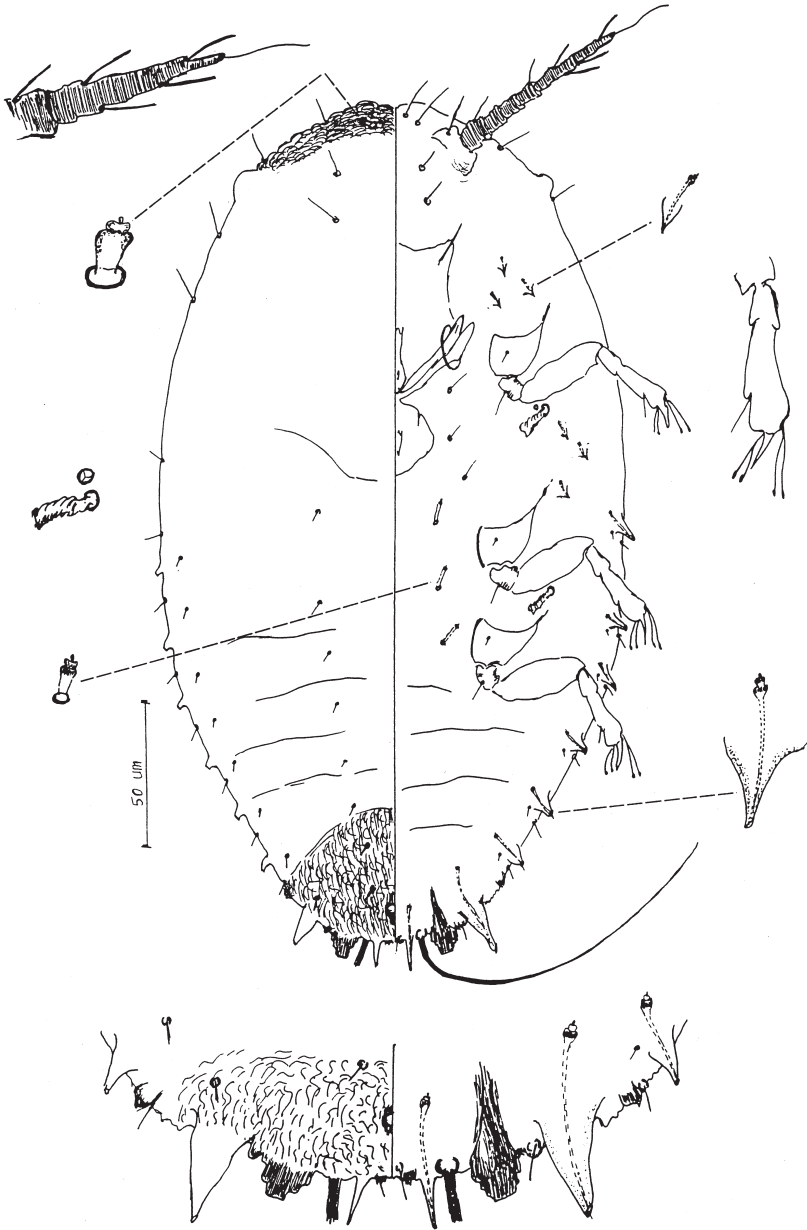


Fig. 3. *Insulaspis tapleyi* (Williams). 1st-instar nymph.

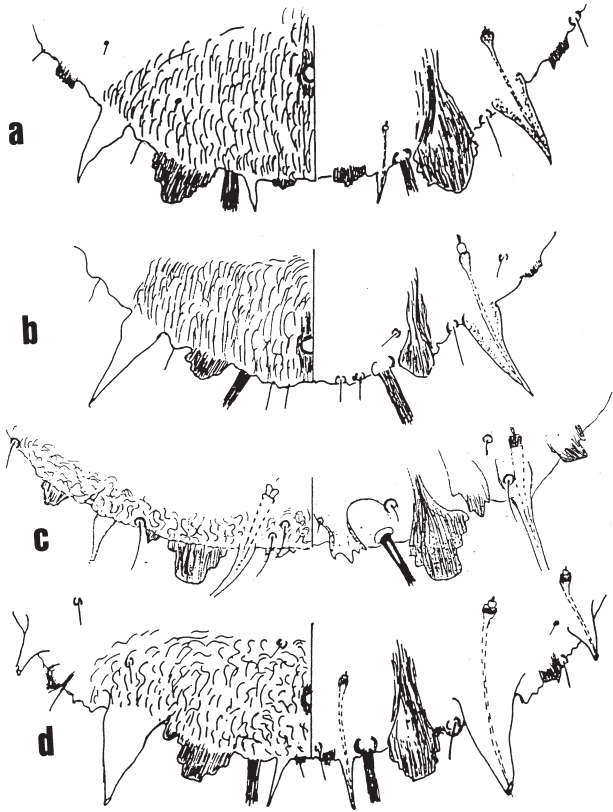


Fig. 4. Pygidium margins of **a.** *L. beckii*; **b.** *L. ficus*; **c.** *L. ulmi*; **d.** *I. tapleyi*.

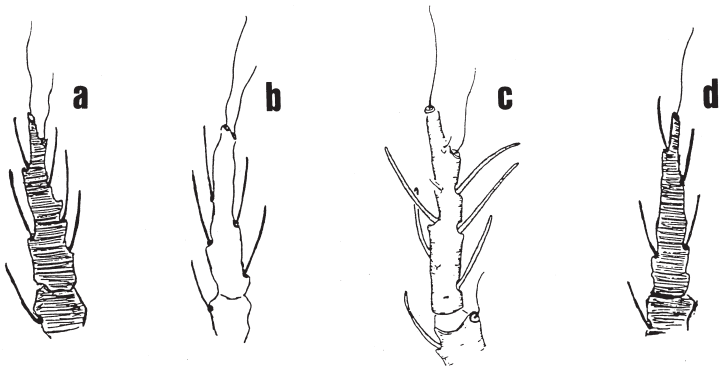


Fig. 5. Terminal antennal segments of **a.** *L. beckii*; **b.** *L. ficus*; **c.** *L. ulmi*; **d.** *I. tapleyi*.

Ducts: with 3 gland tubercles present just anterior to each procoxa and 3 more between each anterior spiracle and mesocoxa. With a pair of ventral microducts present just mesad to each coxa.

Gland spines: with eight pairs of marginal gland spines present, on metathorax and each abdominal segment, each gland spine associated with a one-barred microduct; most posterior pair of gland spines quite large.

Material examined: Egypt: Giza, on leaves of *Mangifera indica*, Aug. 1997, M.W. Ghabbour; as previous but Minia, May 1998; Alexandria, on leaves of *Psidium* sp., July 1997, M.W. Ghabbour; as previous but Giza, May 1998. 10 slides.

Remarks: *Insulaspis pallidula* has also been collected in Egypt (on *Citrus aurantifolia* (lime) leaves, Qualubiya (April 1997) and Alexandria (August 1997) and on *Juniperus* sp., Giza (March 1998); total 7 slides). The 1st-instar nymph of *Insulaspis tapleyi* closely resembles that of *Insulaspis pallidula*. The most important morphological differences between these two species are presented in the following key:

- 1 - Antennae annulated; with a quite large verrucose structure on cephalic region; with 6 pairs of gland tubercles on pro- and mesothorax; with three microducts ventrally, one on each thoracic segment.....
.....*Insulaspis tapleyi* (Williams)
- Antennae not annulated; with a very narrow verrucose structure on cephalic region; with 8-10 pairs of gland tubercles on pro- and mesothorax; with five pairs of microducts ventrally, one on each thoracic segment and on abdominal segments II and III..... *Insulaspis pallidula* (Green)

DISCUSSION

It is clear that *Lepidosaphes* and *Insulaspis* are very closely related. Based on the material examined, the first-instar nymphs of these two genera can be separated using the following key:

- 1 - Apical segment of antennae with one long flagellate seta; presence of gland tubercles on prothorax; thorax with median microducts*Insulaspis* sp.
- Apical segment of antennae with two long flagellate setae; absence of gland tubercles on prothorax; thorax without median microducts
.....*Lepidosaphes* sp.

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