

**MORPHOLOGICAL STUDIES ON THE WHITE PEACH
ARMORED SCALE *PSEUDAULACASPIS PENTAGONA*
(TARGIONI – TOZZETTI) (HEMIPTERA: COCCOIDEA:
DIASPIDIDAE)**

**ZEINAT K. MOHAMMAD, GAMAL EL-DEEN H.
MOHAMMED AND FATMA A. M. MOHAMMAD**

*Plant Protection Research Institute, Agricultural Research Center,
Dokki, Giza, Egypt.*

ABSTRACT

The first, second female and male nymphal instars, prepupa, pupa and adult male of *Pseudaulacaspis pentagona* (Targioni – Tozzetti) are described and illustrated. A key to differentiate the nymphal instars and key to sexual dimorphism in the second nymphal instars were constructed.

INTRODUCTION

White peach armored scale, *Pseudaulacaspis pentagona* (Targioni – Tozzetti, 1886) is one of the principal armored scale pests in the world (Beardsley & Gonzalez, 1975). The main aims of this work were systematic study including description of adult male, nymphal instars (according to the recent taxonomic status) and developing a key to differentiate between the nymphal stages of *P. pentagona* and a key to sexual dimorphism in the second nymphal instars was constructed.

MATERIAL AND METHODS

P. pentagona was collected from Peach, *Prunus persica* from Qalyubiya, Egypt. The collecting, separating and preserving of different stages, has been in the Scale insect and Mealybug department in the authors' collection.

The collected specimens of immature instars [i.e. first, second (female and male) nymphal instars, prepupa and pupa] were prepared on clean microscope slides according to Brain method (1915) due to their minute size.

The specimens of adult male were prepared for microscopic study according to the method introduced by Theron (1958) and followed by Ghauri (1962), Giliomee (1967), Afifi & Kosztarab (1967) and Afifi (1968, 1969).

Taxonomic studies were carried out by examining and identifying the collected specimens according to all available description and keys. The diagnostic characters and key to each stage were given provided with illustrations in plates. Each plate has a center body outline of the whole slide mounted specimen. The left half of the drawing represented the dorsal surface. The right half specimens represented the ventral surface.

Antenna was enlarged to 1500 x in the first nymphal instar while enlarged to 4000 x in the drawing of the second (female and male) nymphal instars. Macroducts was enlarged to 4000 x in the second nymphal instar male while enlargement to 3000 x in the drawing of the second female nymphal instar. Setae were enlarged to 2000 x in the drawing of the second (female and male), the pre pupa- male and the pupa- male nymphal instars. Gland spines enlarged to 4000 x in the first nymphal instar. 8-shaped duct was enlarged to 5000 x in the first nymphal instar. Tarsus and claw was enlarged to 1500 x in the first nymphal instar while enlarged to 1000 x in the drawing of the adult male. Gland tubercles were enlarged to 4000 x in the drawing of the second (female and male) nymphal instars. Wing was enlarged to 150 x in the adult male. Pygidium was enlarged to 1500 x in the first nymphal instar while enlarged to 1000 x in the drawing of the second (female and male) and the pre pupa- male nymphal instars. Measurements were rounded up to the nearest micron by ocular micrometer.

RESULTS AND DISCUSSION

Systematic position

Systematic position of the white peach scale, *Pseudaulacaspis pentagona* (Targioni – Tozzetti, 1886) (Order: Hemiptera, Super family: Coccoidea, Family: Diaspididae, Sub family: Diaspidinae, Tripe: Diaspidini, Sub tripe: Diaspidina)

Synonymy

1886: *Diaspis pentagona* Targioni – Tozzetti, as quoted in Davidson *et al.* (1983).

1889: *Diaspis amygdali* Tryon, Repott on Fungous Pests, p. 89

1892: *Diaspis lanatus* Morgan and Cockerell, Jour. Inst. Jamaica, 1:137.

- 1894: *Diaspis patelliformis* Sasaki, Bull. Agric. Coll., Univ. Tokio, p. 107.
- 1894: *Chionaspis prunicola* Maskell, Trans. N. Z. Inst., 27:49
- 1895: *Aspidiotus vitiensis* Maskell, as quoted in Davidson *et al.* (1983).
- 1898: *Diaspis geranii* Maskell, as quoted in Davidson *et al.* (1983).
- 1898: *Diaspis amygdali rubra* Maskell, Trans. N. Z. Inst., 30:228.
- 1901: *Aulacaspis (Diaspis) pentagona* (Targioni- Tozzetti), as quoted in Davidson *et al.* (1983).
- 1903: *Aulacaspis pentagona* (Targioni- Tozzetti), Fernald, Catalogue of Coccidae, p. 234.
- 1921: *Pseudaulacaspis pentagona* (Targioni), MacGillivray, as quoted in Williams and Watson (1990).
- 1926: *Saskiaspis pentagona* (Targioni), Kuwana, The Diaspine Coccidae of Japan IV, p. 9, illus.
- 1937: *Pseudaulacaspis pentagona* (Targioni – Tozzetti), Ferris, Atlas of Scale Insects, Ser. 1: 109.
- 1941: *Aspidiotus lanatus* (Cockerell), Ferris, Atlas of Scale Insects, Ser. 1:109.
- 1970: *Pseudaulacaspis pentagona* (Targioni), Takagi, as quoted in Williams and Watson (1990).

Morphological characteristics

Biological study of the species *P. pentagona* reveals that this species has three instars in the female and five instars in the male (Milan and Tiempo, 1989)

1. Description of first nymphal instar (Pl. 1)

General appearance: The newly hatched nymph is very small, elongate, oval, light yellow in colour, totally bare of any wax secretion. The crawler moves about until it discovers a suitable place of settle on. After settling, fine threads of wax wick appear cottony; begin to exude from the body and this secretion continuous until the insect is completely covered with white filament. Hence the common name is "white cap".

Body: Slide mounted specimen elongate-oval, widest at thoracic region, flat, about 282 μ long and 162 μ wide. Derm membranous, except for weak sclerotization on pygidium.

Segmentation: Segments marked, clearly by intersegmental dermal furrows in dorsal abdominal segment.

Head: Antennae 6 jointed, terminal joint is the longest, about as long as the five preceding joints, measurements in microns about as follows: I, 12; II, 9; III, 3; IV, 3; V, 7.5; VI, 30. Segment I with 2 setae each about 13 μ long; segment II with 1 seta about 12 μ long; segment III and IV without setae; segment V, with 1 long setae about 18 μ long, and segment VI annulated with 5 long setae and on elongate terminal setae about 18 μ long.

Eyes: One pair submarginal, elongate ovoid about 9 μ long and 6 μ wide.

Mouth parts: Normal, beak broad, about 27 μ long and 26 μ wide, with a very long rostral loop about 462 μ long; beak with no seta.

Thorax: Legs: Well developed, about equal in size; all coxae with one long median seta. Trochanter triangular each with 1 seta. Femur about large and well developed. Tibia and tarsus without setae. Tarsus and claw each with two knobbed digitules which exceeding claw in length; claw without denticle. Measurements of posterior legs in microns, about as follows: coxa 15 x 21; trochanter 7.5 x 9; femur 30 x 13.5; tibia and tarsus 33 x 4.5; claw 3. Tarsal digitules about 15 μ long and claw digitules about 12 μ long.

Spiracles: Anterior and posterior spiracles identical; each about 12 μ long and about 6 μ wide at atrium; spiracular disc pores absent.

Abdomen: Pygidial margin with three pairs of lobes, median pair of lobes well developed, trilobed, middle prominent, each rounded anteriorly, about 9 μ long and 9 μ wide, second pair of lobes bi-lobed, each rounded anteriorly, about 5 μ long and 5 μ wide, third pair of lobes reduced to sclerotised projections about 3 μ long and 3 μ wide.

Anal ring: About 3 μ in diameter and situated about 4 times its diameter anterior the pygidial apex. One pair of long caudal setae present, about 81 μ long, about one-fourth length of body.

Body setae: On dorsum, arranged marginally as follows: 4 pairs of long setae on cephalic and thoracic region, each about 14 μ long, and one pair of short seta on thoracic region and abdominal segment I -VI. 4 pairs of submedially setae present on head anterior and posterior to each 8-shaped duct. One pair of curved row, each with 8 submedian setae on thorax and abdomen.

On venter, 6 pairs of setae in a submarginal row on head, pro- and mesothoracic, 9 pairs of setae in a submarginal row on metathoracic and on abdominal segment associated with every gland spines; on head, one long marginal pair of setae present, each about 15 μ long, and 2 pairs of short submedian setae present; on thorax just posterior the mouth parts one small pair of setae present.

Ducts: Arranged as follows: a single pair of large "one-barred" 8-shaped present on cephalic region, about 12 μ long, three pairs of microducts, each about 8 μ long forming 2 rows on thoracic region.

Gland spines: With 9 marginal gland spines present venterly, about 8 μ long and 5 μ wide, each associated with one microduct; one pair on metathoracic segment and one pair on each abdominal segment; gland spine anterior to second pair of pygidial lobes much longer about 12 μ .

Material examined: 10 specimens were collected of *P. persica*, Qalyubiya governorate (Kafr Shokr), March 15, 1999, collector authoress.

N.B.: Three thoracic pairs of microducts present on first male nymphal instar only.

2. Description of second female nymphal instar (Pl. 2).

General appearance:

Scale: Just after the first moult, the scale begins to form, white in colour, circular, traces of the white cap subcentral of scale, about 654 μ long and 511 μ wide. About the end of this stage, the scale enlarged. In other words; it becomes about 774 μ long and 619 μ wide, and appears in two different distinct areas, an orange-yellow small exuvia, with anterior traces of white cap and a yellowish white larger scale.

Body: Slide mounted specimen membranous, broadly oval, yellow, flat, rounded at the posterior end about 440 μ long and 274 μ wide. Pygidium sclerotized.

Segmentations: Segments generally fused, dorsally and ventrally marked with intersegmental dermal furrows.

Head: Antennae tuberculate, about 6 μ long and 5 μ wide, with one curved; lateral stout seta about 6 μ long.

Eyes: Apparently absent.

Mouth part: Normal, beak about 42 μ long and 36 μ wide, with a long rostral loop.

Thorax: Cephalothorax as large as abdomen. Leg wanting.

Spiracles: Anterior and posterior spiracles identical; each about 17 μ long and 6 μ wide at atrium; anterior spiracle associated with 6 triloculer pores.

Abdomen: Eight segments easily recognized by the marginal notches, lobes and segmental marginal setae. Pygidium well developed, large, sclerotized at the dorsal and ventral surface. Pygidial margin with three pairs of lobes, L₁ non-zygotic, about 24 μ long and 12 μ wide; L₂ about 9 μ long and 8 μ wide; L₃ the smallest, about 9 μ long and 12 μ wide.

Anal ring: Slightly circular, about 9 μ in diameter; anal opening anterior to the pygidial apex about 4 times its diameter.

Body setae: On dorsum, 5 pairs of fine long marginal setae about 17 μ long, on pygidium and one small seta about 6 μ long on prepygidial, two longitudinal curved rows of 9 pairs of submedian setae located on thorax and abdominal segment, each about 3 μ long.

On venter, 11 pairs of setae arranged marginally, extend from head to pygidium region, generally as follows: 3 pairs on head, 2 pairs on pro-, one pair on both meso- and metathorax and one pair on abdominal segment I, II and III. One pair of submarginal row, each composed of 11 setae extend from head to pygidial region.

Ducts: On dorsum, 6 submarginal pairs of "two-barred" type, about 17 μ long and 6 μ wide; arranged as follows: 4 pairs on pygidium, and 2 pairs on prepygidium.

On venter, microducts about 8 μ long arranged as follows: 6 submarginal pairs on head and thorax; 5 submedian pairs on pro-, mesothorax and abdominal segment II, III and IV; one pair posterior mouth part, and 3 pairs posterior to anterior spiracle and 2 pairs near posterior spiracle. 2 pairs of minute macroducts on thoracic region.

Gland spines: 8 marginal pairs of gland spines, about 18 μ long and 6 μ wide at base; associated with one microducts extend from the apex of pygidium to abdominal segment I.

Gland tubercles: One and two pairs of gland tubercles present submarginally on meso- and metathoracic respectively, associated with one microducts, about 9 μ long and 3 μ wide at base.

Material examined: 10 specimens were collected of *P. persica*, Qalyubiya governorate (Kafr Shokr), October 1, 1999, collector authoress.

3. Description of second male nymphal instar (Pl. 3).

General appearance:

Scale: Scale begins to form just after the first moult. White in colour, elongate oval, about 655 μ long and 369 μ wide. Traces of white cap appear at the anterior end of the scale and white narrow layer of wax secretion at the posterior end; with growth, the scale becomes more elongated.

Body: Slide mounted specimen ovoid, about 428 μ long and 274 μ wide, yellow and elongate by age; derm membranous.

Segmentation: Segments generally fused, more or less marked in pygidial part of abdomen and thorax.

Head: Antennae tubercle, about 3 μ long and 5 μ wide, with one lateral stout seta about 6 μ long.

Eyes: Apparently absent.

Mouth parts: Normal, beak about 43 μ long and 45 μ wide, with a long rostral loop.

Thorax: Cephalothorax as large as abdomen. Legs lacking.

Spiracles: Anterior and posterior spiracles identical; each about 18 μ long and about 6 μ wide at atrium; anterior spiracle associated with 6 trilocular pores near atrium.

Abdomen: Eight segments easily recognized by lobes and segmental marginal setae. Pygidium well developed; each of abdominal segments VIII, VII and VI with a pair of sclerotized well developed lobes L_1 , L_2 and L_3 successively, all lobes entire tapering anteriorly toward a fine point. L_1 bi-lobed about 12 μ long and 9 μ wide; L_2 bi-lobed about 6 μ long and 5 μ wide; L_3 about 3 μ long and 3 μ wide.

Anal ring: Circular, about 9 μ in diameter, spaced about 4 times its diameter from the posterior apex.

Body setae: On dorsum, marginal setae short about 6 μ long on head; each thoracic segment and on each abdominal segments, to tallying 12 pairs; in addition, with 5 pairs of long setae each about 17 μ long in pygidial area; with 3 pairs of setae submarginally on head and prothoracic; with 2 pairs of setae submedially on head. On thoracic and abdomen, two rows of submedian of 9 pairs of setae on mesothorax, metathorax and abdominal segments.

On venter, on head, 2 pairs of long marginal setae and 2 pairs of setae submedially in front of the mouth part about 12 μ long. On thorax, 2 pairs of short setae near the mouth parts and anterior spiracle, each seta about 3 μ long. 7 pairs of submedian setae are on mesothorax, metathorax and posterior abdominal segments, with 6 pairs of submarginal setae on posterior abdominal segments.

Ducts: On dorsum, macroducts of "two-barred" type about $12\ \mu$ long and $6\ \mu$ wide, arranged submarginally on thoracic and abdominal segments I-IV and submedian on abdominal segments II-VI; 11 pairs of microducts about $9\ \mu$ long and $3\ \mu$ wide arranged on submarginal thoracic region and submedian metathorax and abdominal segments I-II. Cluster of 8 ducts present on pygidium.

On venter, macroducts of "two-barred" type same size as those of dorsal surface, arranged as follows: 5 pairs on thoracic areas; 23 pairs on abdomen forming 12 longitudinal rows. Microducts about $9\ \mu$ long and $3\ \mu$ wide, arranged on cephalic region and on thorax. 2 pairs of minute macroducts present on thoracic region.

Gland spines: with 4 pairs of marginal gland spines each about $9\ \mu$ long present on abdominal segments, each associated with one microduct.

Gland tubercles: Cluster of 3 pairs present near anterior spiracle; one pair on mesothoracic and 2 pairs on metathoracic region; each about $9\ \mu$ long.

Material examined: 10 specimens were of *P. persica*, Qalyubiya governorate (Kafr Shokr), October 15, 2000, collector authoress.

4. Description of male prepupa (Pl. 4)

General appearance

Scale: Elongate oval, white to dirty white with weak medium carina; about $988\ \mu$ long and $511\ \mu$ wide. Exuvia is terminal.

Body: Slide mounted specimen light yellow in colour, about $797\ \mu$ long and $345\ \mu$ wide at mesothorax.

Setae and disc pores: Setae present on head and abdominal segments; disc pores absent.

Head: Not separated from prothorax, broadly rounded toward apex; without any ridges.

Eyes and head setae: Dorsal and ventral eyes absent. Dorsal head setae: 2 pairs of minute setae present, each about $6\ \mu$ long. Ventral head setae: 1 pair on apical margin of head, 4 pairs forming 2 rows on each side of median line; each seta about $4.5\ \mu$ long.

Antennae: Long, parallel side structures, rounded at apex, about $234\ \mu$ long and $39\ \mu$ wide, segments not distinctly. Antennae without setae.

Thorax: Fused with head and abdomen. All thoracic setae absent.

Wing buds: Elongated, broad posteriorly, about 138 μ long and 96 μ wide.

Spiracles: Anterior and posterior spiracles identical; each about 33 μ long and 15 μ wide at atrium.

Legs: Poorly developed in this stage, fore leg obviously smaller than mid and hind leg, the different parts of leg not distincted except for coxae, length and wide of fore leg about 39 x 48 μ ; length and wide of posterior leg about 132 x 48 μ . Leg setae are undetectable.

Abdomen: Abdominal segments narrowing posteriorly.

Abdominal setae: On dorsum, one submarginal row of 6 pairs of minute setae present, each about 6 μ long, one submedian row of 5 pairs of minute setae present, each about 6 μ long.

On venter, 7 pairs of minute marginal setae present, each about 6 μ long, 5 pairs of submarginal row of minute setae present, each about 6 μ long.

Genital segment: Ventrally, tube-shaped structure of the developing aedeagus internally in segments V- VIII present about 102 μ long.

Material examined: 10 specimens were collected of *P. persica*, Qalyubiya governorate (Kafr Shokr), April 15, 2001, collector authoress.

5. Description of male pupa (Pl. 5)

General appearance

Scale: Similar to the scale of prepupa in shape and colour, but differ in size about 1119 μ long and 524 μ wide.

Body: Slide mounted specimen elongate, gradually narrowing posteriorly into a tubular genital segment, about 845 μ long and 318 μ wide at mesothorax.

Setae and disc pores: Setae present on head and abdominal segment; pores absent.

Head: Broadly; fused with thorax and apically rounded, free from ridges.

Eyes and head setae: One pair of dorsal simple eyes is present, about 24 μ in diameter and separated by about 21 μ ; ventral simple eyes absent. Dorsal head setae absent. Ventral head setae; one pair of minute marginal seta present about 6 μ long.

Antennae: Unsegmented, tapering apically, about 372 μ long and 45 μ wide.
Antennae without setae.

Thorax: Fused with head and abdomen, without any setae or pores.

Wing buds: Elongated, broad posteriorly, about 276 μ long and 96 μ wide.

Spiracles: Anterior and posterior spiracles identical; each about 27 μ long and 9 μ wide at atrium.

Legs: Poorly developed in this stage, the different parts of leg distinct except tarsus and claw; Leg setae undetectable. Legs about equal in size, length and wide of posterior leg about; coxa 60 x 63, trochanter 45 x 45, femur 45 x 60, tibia-tarsus 147 x 42 μ .

Abdomen: Abdomen completely membranous, about 258 μ long and 288 μ wide.

Abdominal setae: On dorsum, 6 pairs of marginal setae present, each about 6 μ long; 3 and 6 pairs of double submarginal rows of setae present on each side; 6 pairs of submedian row of setae present, forming 2 rows.

On venter, 7 pairs of minute submedian setae present forming 2 rows, each seta about 3 μ long.

Genital segment: Cylindrical, slightly narrowing to blunt apex, about 123 μ long and 102 μ wide at base. Ratio its length to the total length 1: 7. One pair of long setae about 27 μ long; one pair of short setae and 2 pairs of minute setae present on base of dorsal and ventral surface of the genital segment.

Material examined: 10 specimens of *P. persica*, Qalyubiya governorate (Kafr Shokr), October 15, 2001, collector authoress.

6. Description of adult male (Pl. 6)

General appearance

Scale: Male scale white, but sometimes discolored, elongate-oval, exuvia terminal, about 1309 μ long and 417 μ wide. With a median carina, or ridge, which, at times, is nearly obscured.

Body: Slide mounted specimen colour orange yellow, eyes black, wing whitish hyaline, about 930 μ long including genitalia and 243 μ wide.

Head: Rough conical. Midcranial ridge (mcr) marked only by a slender sclerotization ventrally, Postoccipital ridge (por) well developed with a heavily sclerotized lateral short branch on each side, distance from apex to (por) about

63 μ . Geana large and membranous; width at genae about 75 μ , genal setae absent. Postocular ridge (pocr) well developed, posteriorly bounding the ocular sclerites (ocs).

Head with one pair of dorsal head setae (dhs) and one pair of dorsal apical setae; with 3 pairs of ventral head setae (vhs) along midcranial ridge (mcr), and one pair of ventral head setae (vhs) anterior ventral simple eyes (dse).

Eyes: two pairs of simple eyes, and one pair of ocelli (o) present. Dorsal simple eyes (dse) submarginally located, about 30 μ in diameter, separated by about 36 μ . Ventral simple eyes (vse) about 27 μ in diameter, separated by about 24 μ submedially located. Spotlike ocellus (o) is faintly sclerotized.

Antennae: Filiform, ten segmented, about 516 μ long, antennal bases separated by about 15 μ , the ratio of the antennal length to total length of body 0.5 : 1. Scape (scp) broadly conical, widest segment, free from setae; pedicel oval. Setae numerous, giving antennae bushy appearance. Pedicel (pdc) with 4 setae, each flagellar segment with 10-13 setae, most of which are noticeably longer than the segment bearing them; and terminal flagellar segment with 13 long setae and one apical fleshy seta, length of antennal segments as follows:

Scape	pedicel	F1	F2	F3	F4	F5	F6	F7	F8	Total
21	24	42	60	66	57	63	57	60	66	516

Thorax: Length from postoccipital ridge (por) to mesopostphragma (phr₂) about 327 μ long and 243 μ wide at mesothorax.

Prothorax: Membranous, short and wide. Dorsally, without sclerotized structures; pronotal ridge (prnr) occasionally distinguished as faint sclerite, posttergites (pt) small. Ventrally, Prosternum (stn₁) triangular about 57 μ long, and posteriorly bounded by a transverse prosternal ridge (stn₁ r). All prothoracic setae absent.

Mesothorax: With heavily sclerotized dorsum. Dorsally, prescutum (prsc) apical, slightly sclerotized, prescutal ridges (prscr) well developed; scutum (sct) with a large rectangular sclerotized area about 30 μ long and 132 μ wide. Scutellum (scl) subtriangular about 105 μ long and 210 μ wide, with a strong scutellar ridge (sclr); the ratios of its length to the length of scutum (sct) 1 : 3.5. Subepisternal ridge (ser), well developed. Mesosternum (stn₂) (= basisternum) about 81 μ long and 84 μ wide, bounded anteriorly by the marginal ridge (mr) which extends laterally beyond the basisternum, and latero-posteriorly by the precoxal ridge (pcr₂). Furca (f) strongly developed. Mesothoracic setae: Regular

setae (tegs) 3 on each side, on scutum (sct), one minute pair of setae present; other setae absent.

Metathorax: Entirely, membranous dorsally, small sclerite supporting halteres present. Metasternum (stn₃) present as weakly sclerotized region, metapleural ridge (plr₃) is well developed, extending to coxal base. Metathoracic setae absent.

Spiracles: Anterior and posterior spiracles each about 30 μ long and about 12 μ wide at atrium.

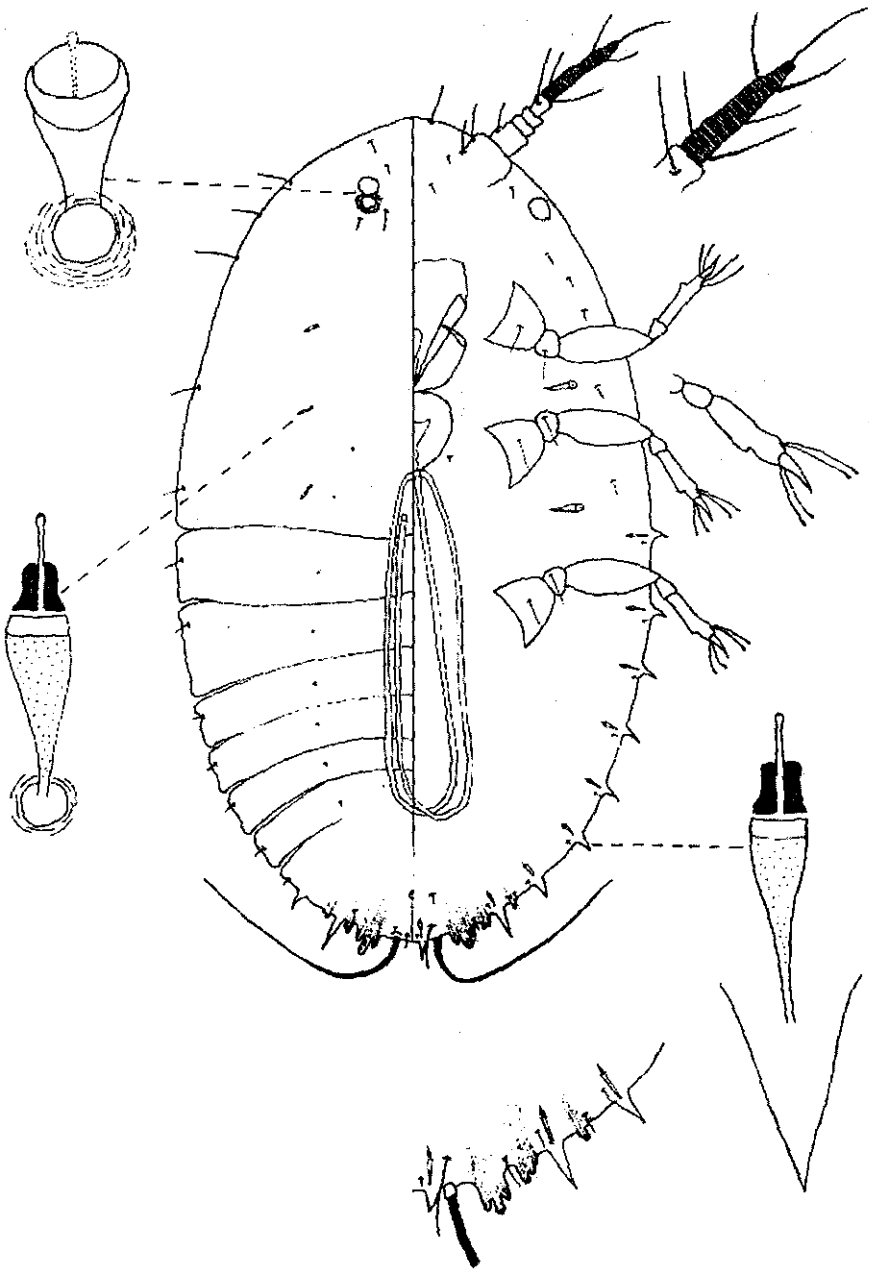
Legs: Well developed, with numerous associated long setae on tibia-tarsus. Ratio of legs to entire body length, 1: 2. Coxa with 4 setae, trochanter with 1 setae, femur with 6-7 setae, tibia-tarsus with 21-27 setae. Protibia without spurlike setae. Length of segments as follows:

Coxa	Trochanter	Femur	Tibia-Tarsus	Claw	Total
66	57	99	171	30	423

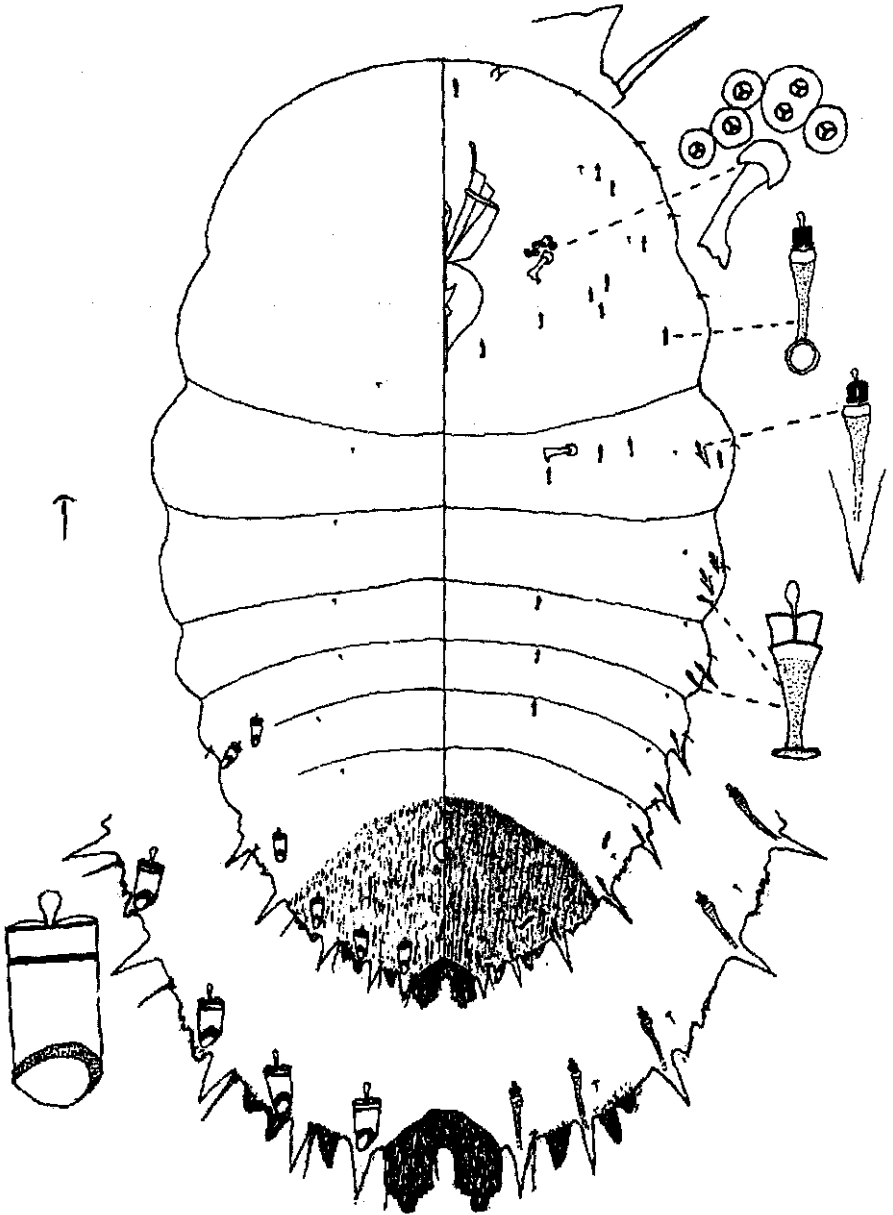
Wings: One pair of wing present, each about 390 μ long and 162 μ wide, with typical venation, one main vein forking anteriorly to radial and posteriorly to medial, neither vein reaching margin; surface covered with microtrichia. Wings with a pair of halteres (reduced wings), each with long hooked seta or hamulus at apical end, these compound structures are called hamulohalteres (h): length of haltere about 45 μ and 12 μ wide; with one apically hooked seta about 30 μ long.

Abdomen: Abdominal segments entirely membranous except for faint sclerotization at segmentation lines; with 8 segments visible dorsally, 7 ventrally. Dorsally, abdomen slightly fusiform, broad at proximal end, widening somewhat at segment I and II then tapering to narrow genital segment, about 228 μ long, not including genital segment, and about 234 μ wide at abdominal segment one. Dorsomarginal setae absent, 8 pairs of forming submedian row of abdominal dorsal setae (ads) on abdominal segments I – VIII. Ventrally, one long abdominal ventral setae (avs) about 21 μ long on abdominal segments VIII and 6 pairs of short abdominal ventral setae (avs) about 12 μ long on abdominal segments II – VII; two rows of 7 pairs of submarginal setae present; two rows of 7 pairs of submedian setae present; two rows of 6 pairs of median setae present.

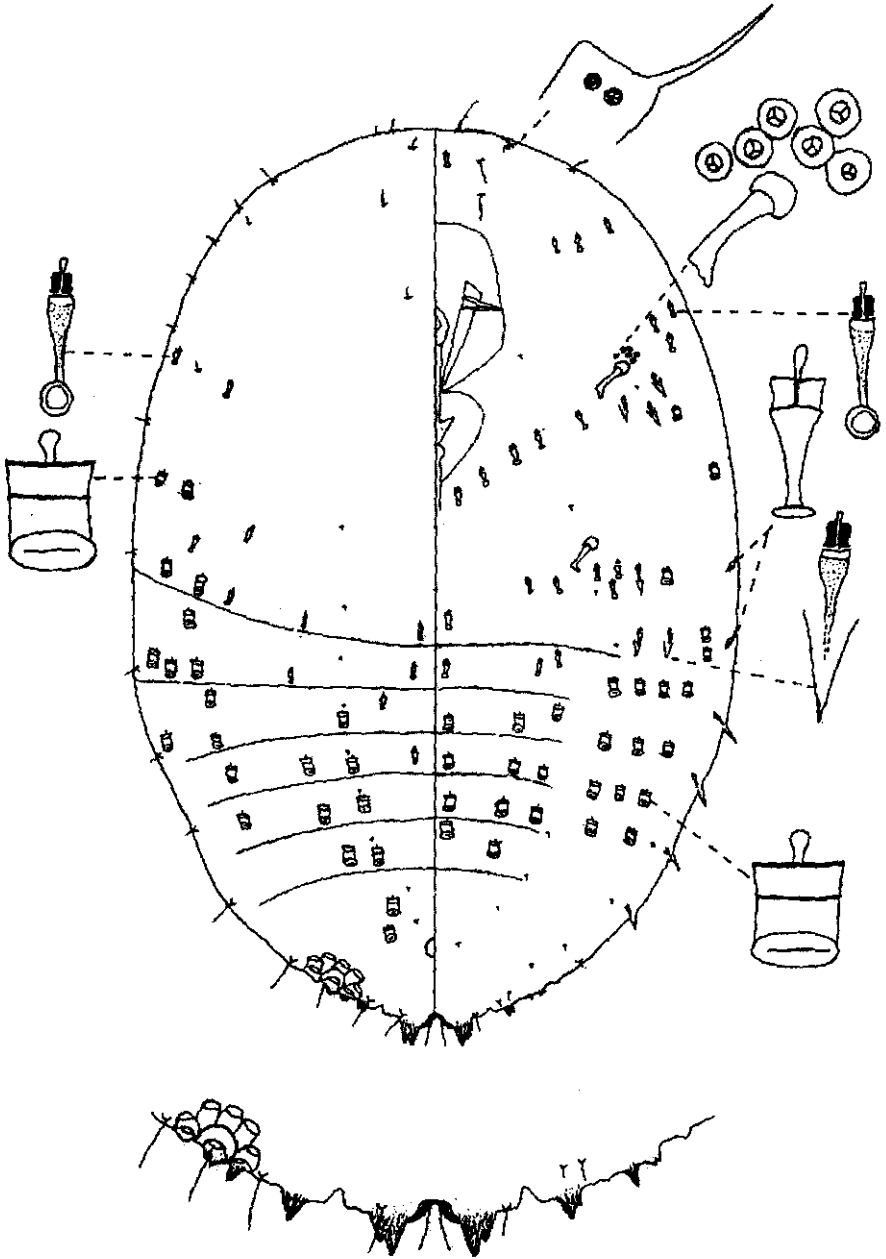
Genital segment: Genital segment, subquadrate, with stylet (st) about 240 μ long, the end of stylet (st) not sclerotized. Genital capsule with one pair of long seta dorsally about 24 μ and 2 pairs of setae about 18 μ on genital segment (gts).



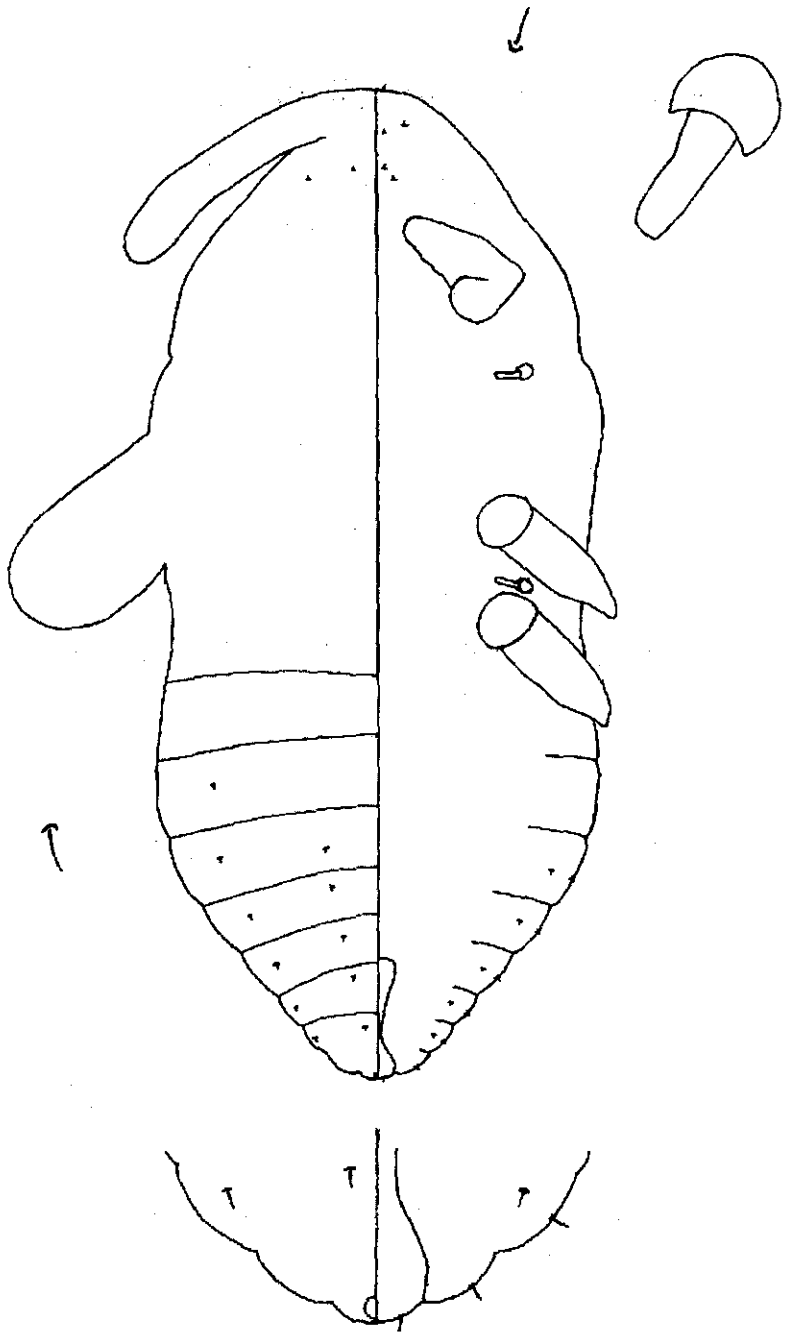
Pl.1: First nymphal instar of *Pseudaulacaspis pentagona* (Targioni -Tozzetti)



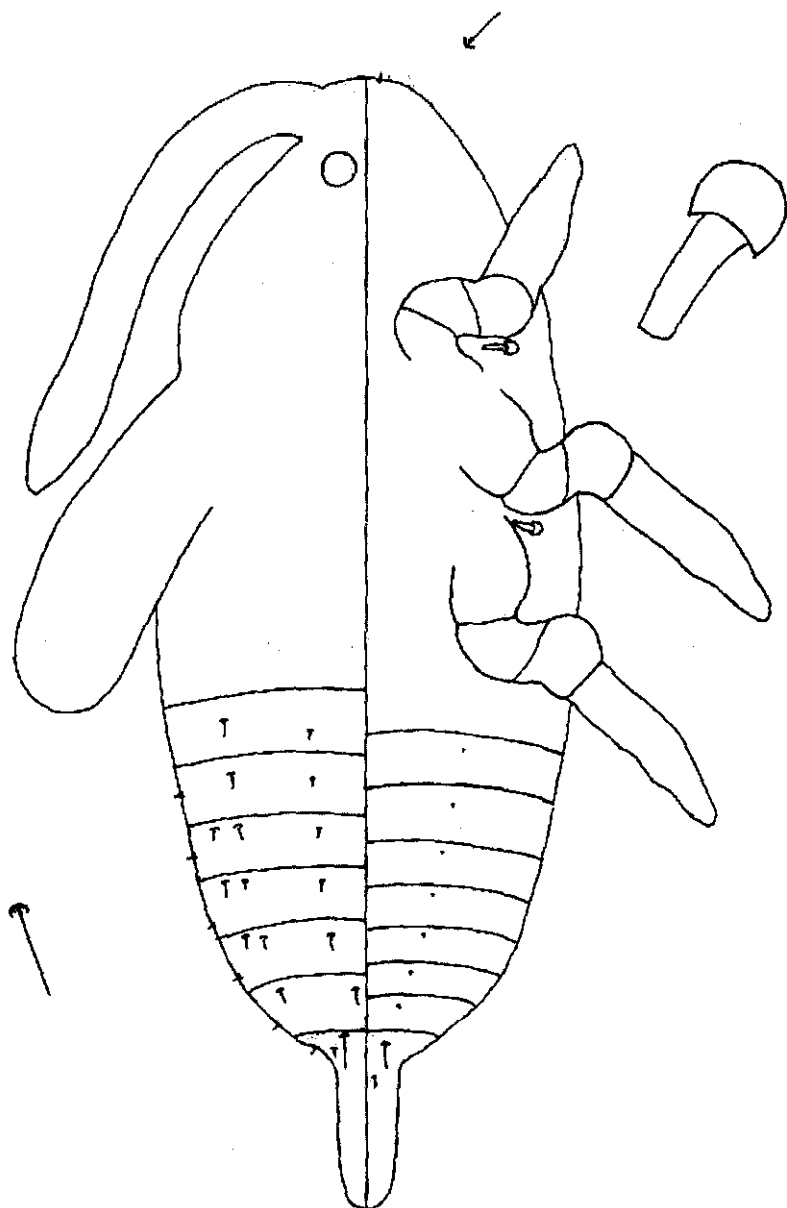
Pl. 2: Second female nymphal instar of *Pseudaulacaspis pentagona* (Targioni - Tozzetti)



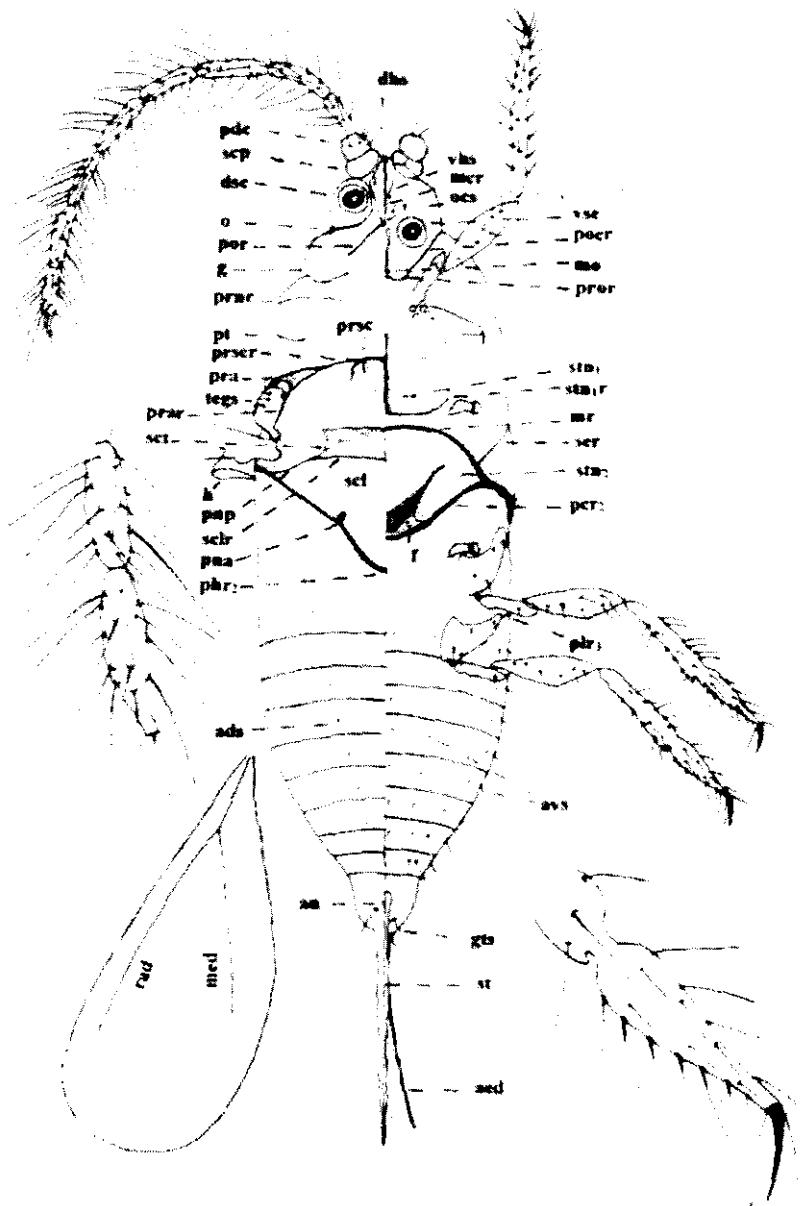
Pl. 3: Second male nymphal instar of *Pseudaulacaspis pentagona* (Targioni – Tozzetti)



Pl. 4: Male prepupa of *Pseudaulacaspis pentagon*



Pl. 5: Male pupa of *Pseudaulacaspis pentagona* (Targioni – Tozzetti)



Pl. 6: Adult male of *Pseudaulacaspis pentagona* (Targioni – Tozzetti)

Material examined: 10 specimens were of *P. persica*, Qalyubiya governorate (Kafr Shokr), April 15, 2000 and November 1, 2001, collector authoress.

List of abbreviation

ads = abdominal dorsal setae	pocr = postocular ridge
aed = aedeagus	por = postoccipital ridge
an = anus	pra = prealare
avs = abdominal ventral setae	prar = prealare ridge
dhs = dorsal head setae	prnr = pronotal ridge
dse = dorsal simple eyes	pror = preoral ridge
f = furca	prsc = prescutum
g = gena	prscr = prescutal ridge
gts = setae of genital segment	pt = posttergite
h = hamulohaltera	rad = radius
med = media	scl = scutellum
mcr = midcranial ridge	sclr = scutellar ridge
mo = mouth opening	scp = scape
mr = marginal ridge	sct = scutum
o = ocellus	ser = subepisternal ridge
ocs = ocular sclerite	st = stylet
pcr ₂ = precoxal ridge of mesothorax	stn ₁ = prosternum
pdc = pedicel	stn ₂ = mesosternum
phr ₂ = mesopostphragma	stn _{1r} = prosternum ridge
plr ₃ = metapleural ridge	tegs = tegular setae
pna = postnatal apophysis	vhs = ventral head seta
pnp = posterior notal wing process	vse = ventral simple eyes

Key to immature stages of *Pseudaulacaspis pentagona* (Targioni – Tozzetti)

- 1- Legs present 2
 - Legs absent second nymphal instar (male & female).
- 2 (1)- Three pairs of segmented legs; antennae segmented.....
 First nymphal instar.
- Three pairs of unsegmented legs; antennae unsegmented, saclike..... 3

- 3 (2)- Abdominal segmented 9 small, with penial sheath developing internally, dorsal simple eyes absent **Prepupa (male).**
- Abdominal segmented 9 or penial sheath elongate, dorsal simple eyes present **Pupa (male).**

Key to Sexual dimorphism in the second nymphal instar of *Pseudaulacaspis pentagona* (Targioni – Tozzetti).

- Macroducts present dorsally and ventrally, dorsal cluster macroducts present on abdomen; microducts present on dorsal and ventral; antennae with 2 terminal setiform sensory seta present; four pairs of gland spine present on ventral margin **Male.**
- Macroducts present ventrally only; cluster macroducts absent; microducts present ventrally only; antennae without terminal setiform sensory seta; eight pairs of gland spine present on ventral margin **Female.**

REFERENCES

- AFIFI, S. A. (1968):** Morphology and taxonomy of the adult males of the families Pseudococcidae and Eriococcidae. (*Bull. Br. Mus. Nat. Hist. Entmol. Suppl. 13: 210 pp*).
- AFIFI, S. A. (1969):** Systematics status of the family Conchaspidae, based on the males of the *Conchaspis lata* Hempel (Homoptera: Coccoidea). *Va. Polytech. (Inst. Res. Div. 36: 25-37)*.
- AFIFI S. and M.KOSZTARAB (1967):** Studies on the morphology and taxonomy of the males of *Antonina* and one related genus (Homoptera : Coccoidea: Pseudococcidae). (*Bull. Va. Polytech. Inst. Res. Div. 15: 43 pp*).
- BEARDSLEY, J. w. and R. H. GONZALEZ (1975):** The biology and ecology of armored scale. (*Ann. Rev. Entomol., 20, 47-73*).
- BRAIN, K. (1915):** Report on the plant pathologist. (*Rep. Agric, Malto, 14-17*).
- GHAURI, M. S. K. (1962):** The morphology and taxonomy of the male scale insect (Homoptera: Coccoidea). (*Bull. Br. Mus. Nat. Hist. Entmol. 221 pp*).

- GILIOMEE, J. H. (1967):** The morphology and taxonomy of the adult males of the family Coccoidea (Homoptera: Coccoidea). (*Bull. Br. Mus. Nat. Hist. Entmol. Suppl.* 7: 168 pp).
- MILAN, p. p. and V. P. TIEMPO (1989):** Biology and natural enemies of the cassava scale insects, *Pseudaulacaspis pentagona* (Targioni Tozzetti). (*Baguio (Philippines)*. 1-3).
- THERON, J. G. (1958):** Comparative studies on the morphology of the males scale insect. (Hemiptera: Coccoidea). (*Annale Univ Stellenbosch*, 34 (A.1): 71 Pp).