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A systematic revision of the genus *Lecanopsis* Targioni Tozzetti (Hemiptera, Coccoidea, Coccidae)

Abstract - This paper deals with the results of a revision on the genus *Lecanopsis* Targioni Tozzetti (Coccidae) carried out during the last years. The revision highlighted synonymies among species and misidentifications of species erroneously placed in this genus. Before the present revision the genus included 17 species, but at the end of this study the number of *Lecanopsis* species was reduced to 11, plus 3 unrecognisable species. All the *Lecanopsis* species and their young instars (when known) have been redescribed and illustrated. In addition, two new species, *L. marottai* and *L. mirabilis*, recently collected in Italy, are described and illustrated.

Riassunto - *Revisione del genere* Lecanopsis *Targioni Tozzetti (Hemiptera, Coccoidea, Coccidae).*

Viene presentata la revisione del genere *Lecanopsis* Targioni Tozzetti (Coccidae). Vengono individuate sinonimie e errate identificazioni che riducono da 17 a 11 le specie assegnate al genere *Lecanopsis*. Tutte le specie sono ridescritte ed illustrate anche nelle forme giovanili, quando note. Due nuove specie, *L. marottai* e *L. mirabilis*, recentemente raccolte in Italia, vengono descritte e illustrate.

Key words: scale insects, taxonomy, distribution, description, new species, Palearctic fauna,

HISTORY OF THE GENUS

The genus *Lecanopsis* was established by Targioni Tozzetti in 1868 to include the species *Lecanopsis rhyzophila* that he collected near Florence. In 1874 Signoret, on the basis of notes and drawings sent to him by Targioni Tozzetti, published the first formal description of the genus *Lecanopsis* and of the species *Lecanopsis rhizophila*. The second species included in the genus was *L. formicarum* (Newstead, 1893). Later, Newstead (1896) added a new species, *L. brevicornis*, based on a 3rd-instar female. In 1921 Green recognised the 3rd-instar female of *L. brevicornis* as a young stage of *L.*

formicarum, outlined the life cycle of the species and synonymized *L. brevicornis* with *L. formicarum.* Nevertheless, Steinweden (1929), in his diagnosis of important genera of Coccidae, characterised the genus *Lecanopsis* on the type of *L. brevicornis* (=3rd-instar female of *formicarum*). He pointed out the great morphological difference between *L. brevicornis* (a 3rd-instar female) and *L. formicarum* (an adult female) and concluded that the latter should be removed from the genus. This confusion probably led to the misidentification of species that were later included erroneously in the genus (i.e. *L. nevesi* Gómez-Menor Ortega, 1946) or were excluded from it (i.e. *Filippia subterranea* Gómez-Menor Ortega, 1948).

In 1952 and 1960 respectively, Schmutterer and Rehaçek recognised the presence of male stages.

In 1952 and again in 1957, Borchsenius redefined the genus, based on morphological characters of the adult females, described several new species and pointed out the importance of the nymphal stages in the identification of the species. Unfortunately, he ignored the recording of the male stages by Schmutterer and Rehaçek (1952; 1960) and described the 2nd-instar male nymph as that of the 2nd-instar female nymph. The situation of the genus and its species, as presented by Borchsenius, lasted for some decades.

In 1982 Boratynski *et al.* clearly described and illustrated the male and female nymphal stages of a *Lecanopsis* (namely *Lecanopsis formicarum*) and elucidated its peculiar life cycle.

In 1993 Ben-Dov listed in his catalogue all the species included in the genus so making easier a future revision.

From this review it appears that, prior the 1994, the identity of the genus was accepted by coccidologists even if some authors (Danzig, 1980; Kosztarab & Kozár, 1988) assumed that it was in need of revision, mainly because of the poor description of several species.

In 1994 Hodgson, in his revision of the genera of Coccidae, pointed out the difficulty of clearly identifying the facies of the genus *Lecanopsis* and of its type species *L. rhyzophila*, and proposed to transfer the species previously included in the genus *Lecanopsis* (with the exception of the type species *L. rhyzophila*) to the genus *Paralecanopsis* (synonymized with *Lecanopsis* by Ben-Dov in 1980) in order to allow a proper diagnosis of this group. His proposal was in fact supported by convincing arguments (see Hodgson, 1994: 309). At that time, the conclusion of his study was accepted by the first author and a new species of *Lecanopsis* discovered in Italy was described as *Paralecanopsis clodiensis* Pellizzari (Pellizzari, 1995).

Nevertheless, this new situation appeared to be unsatisfactory and stimulated a deeper study on the identity of the genus, whose results were presented in 1998 at the VIII International Symposium on Scale Insect Studies and accepted by the convenors. On the basis of this study (Fontana & Pellizzari, 2001) the genus *Lecanopsis* proved to be a valid genus even if the type species *L. rhizophila* is unrecognisable. Subsequently all the species previously placed in the genus *Paralecanopsis*, were re-transferred to the genus *Lecanopsis*.

PRESENT SITUATION

Up to the present revision the genus comprised 17 species as follows (Ben-Dov, 1993; Hodgson, 1994; Pellizzari, 1995):

Lecanopsis aphenogastrorum Gómez-Menor Ortega, 1928
Lecanopsis ceylonica Green, 1922
Lecanopsis clodiensis (Pellizzari, 1995)
Lecanopsis fallax (Giard, 1893)
Lecanopsis festucae Borchsenius 1952
Lecanopsis formicarum Newstead, 1893
Lecanopsis iridis Borchsenius, 1952
Lecanopsis lineolatae King & Cockerell, 1897
Lecanopsis myrmecophila Leonardi, 1908
Lecanopsis nevesi Gómez-Menor Ortega, 1946
Lecanopsis radicumgraminis (Fonscolombe, 1834)
Lecanopsis rhizophila Targioni Tozzetti, 1868
Lecanopsis sacchari Takahashi, 1928
Lecanopsis shutovae Borchsenius, 1952
Lecanopsis taurica Borchsenius, 1952
Lecanopsis terrestris Borchsenius, 1952
Lecanopsis turcica (Bodenheimer, 1951)

Moreover, *Filippia subterranea* Gómez-Menor Ortega was listed as a synonym of *L. formicarum* and *L. porifera,* listed in the Ben-Dov's catalogue (1993) and in Koteja's list (1998), was synonymized with *L. turcica* by Hodgson in 1994.[(1)]

During the course of this revision, the types of the *Lecanopsis* species have been studied. Specimens of different species of *Lecanopsis,* preserved in Museums and Research Institutes, have been examined. When necessary, specimens have been remounted. The species that proved to belong to the genus *Lecanopsis* are redescribed and illustrated in the present paper. Besides, faunistic researches carried out in Italy led to the discovery of new species of the genus that are here described and illustrated. Keys are provided for separating the species, based on the morphology of adult females and on the morphology of the 1st instars, when available. A key to separate the different male and female stages is also provided.

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(1) While this revision was in press, another new species of *Lecanopsis*, namely *L. pellizzariae* Fontana & Malagnini, has been described and illustrated. The description has been published in the Boll. Zool. agr. Bachic., 33, Special Issue -Proceedings of the IX Symposium on Scale Insects Studies, Padua, Italy, 3-8 September 2001: 111-123.

METHODS AND TERMINOLOGY

Terminology follows that of Hodgson (1994). Measurements and numbers are from 10 specimens, when available, or more, and are given as ranges with mean in parentheses. With regard to distribution, countries reported in the literature that have changed their names in the meantime, are replaced with the present names (i.e. Slovenia or Croatia instead of Yugoslavia).

The drawings of the species and their instars are outlined pointing out the morphological characters useful for identifying the species. In some cases, morphological characters common to all the known species of *Lecanopsis* and possibly without systematic value (i.e. ventral dermal spinules, ventral and dorsal hair-like or spine-like setae, ventral and dorsal simple pores, microducts) were very difficult to detect, due to the poor condition of the examined specimens and are not reported in the drawings. For detailed drawings of a *Lecanopsis* see Boratynski *et al.* (1982) (*L. formicarum*), Hodgson (1994) (*L. turcica*), Pellizzari (1995) (*L. clodiensis*).

Abbreviations of depositories

BMNH: The Natural History Museum, London, United Kingdom; **DAAPE**: Dipartimento Agronomia Ambientale e Produzioni vegetali – Entomologia, Padova, Italy; **DBPI**: Dipartimento Biologia, Difesa e Biotecnologie agroforestali, Potenza, Italy; **DEAP**: Dipartimento di Entomologia e Zoologia agraria, Portici, Italy; **DERI**: Department of Entomology, Faculty of Agriculture, Rehovot, Israel; **IAZP**: Institute of Applied Zoology, Krakow, Poland; **IMZT**: Insect Museum, Department of Applied Zoology, Taiwan Agricultural Research Institute, Wufeng, Taichung, Taiwan; **MNCN**: Museo Nacional de Ciencias Naturales, Madrid, Spain; **MNHN**: Muséum Nationale d'Histoire Naturelle, Paris, France; **PPIB**: Plant Protection Institute, Hungarian Academy of Sciences, Budapest, Hungary; **PPSW**: Plant Protection Service, Wageningen, The Netherlands; **USNM**: United States National Museum of Natural History, Washington, DC, U.S.A.; **ZIAS**: Zoological Institute, Academy of Sciences, St. Petersburg, Russia; **ZMUA**: Zoologisch Museum, Universiteit van Amsterdam, Amsterdam, The Netherlands.

Abbreviations of Italian provinces

The name of Italian localities where specimens have been collected is followed by the abbreviation, in brackets, of the province of pertinence.
PD: province of Padua; VI: Vicenza; BL: Belluno; VE: Venice; TN: Trento; AO: Aosta; PG: Perugia; FI: Florence; AQ: L'Aquila; CH: Chieti; BA: Bari; FG: Foggia; IS: Isernia; PZ: Potenza; CE: Caserta; CT: Catania; SS: Sassari.

SPECIES ERRONEOUSLY PLACED IN THE GENUS *LECANOPSIS*

The study of the type material highlighted that some species placed in the genus *Lecanopsis* (Ben-Dov, 1993; Koteja, 1998) belong, in fact, to other genera as follows,

they are: *Lecanopsis nevesi* Gomez-Menor Ortega, *Lecanopsis lineolatae* King & Cockerell, *Lecanopsis ceylonica* Green, *Lecanopsis sacchari* Takahashi.

Rhizopulvinaria nevesi (Gómez-Menor Ortega, 1946)

Lecanopsis nevesi Gómez-Menor Ortega, 1946:88; Martin Mateo, 1984: 72; Ben-Dov, 1993: 158; Koteja, 1998: 96.
Rhizopulvinaria nevesi (Gómez-Menor Ortega, 1946); Pellizzari & Fontana, 1999.

TYPE MATERIAL EXAMINED. Syntypes of *Lecanopsis nevesi*: 6 adult females, **Spain,** Toledo, on *Santolina chamaecyparissus*, slides N° 11-941; n. HC 22;10-III, 928; HC-18, 928 (MNCN).

This species was collected at Toledo (Spain) on roots of *Santolina chamaecyparissus* (Compositae). The study of the type series revealed that the species assigned to *Lecanopsis* belongs to the genus *Rhizopulvinaria* Borchsenius without any doubt. Consequently the species was redescribed and transferred to this genus. Its correct placement is *Rhizopulvinaria nevesi* (Gómez-Menor Ortega, 1946) (Pellizzari & Fontana, 1999).

Pulvinaria lineolatae (King & Cockerell, 1897) n. comb.

Lecanopsis lineolatae King & Cockerell, 1897: 90; Fernald, 1903: 210; Ben-Dov, 1993: 158.

TYPE MATERIAL EXAMINED. Syntype of *Lecanopsis lineolatae*: 1 adult female, **USA**, Massachusetts, Lawrence, 15.VI.1894, leg. G. B. King in nests of *Crematogaster lineolata* (USNM).

The species was found in the nest of *Crematogaster lineolata* at Lawrence (Massachusetts) and there are no further records. The original description cast strong doubt on its real pertinence to the genus *Lecanopsis* ("presence of three stigmatic spines, one long, two shorter; marginal spines fairly large; skin without any distinct marks"). The type has been checked and proved to be a *Pulvinaria*. D. Miller (Systematic Entomology Laboratory, USDA, Beltsville) who checked the type arrived to the same conclusion (1999, personal communication). Subsequently the species is transferred to the genus *Pulvinaria*.

Membranaria ceylonica (Green, 1922) n. comb.

Lecanopsis ceylonica Green, 1922:1026; Venkatraman, 1941: 850; Tang, 1991: 23; Ben-Dov, 1993:156.

TYPE MATERIAL EXAMINED. Lectotype of *Lecanopsis ceylonica*, 1 adult female, **Sri Lanka**, Pattipola, 22.V.1911, slide labelled "Type", N°1940, 180 (BMNH). Paralec-

totypes, 1 adult female, 5 1st-instar nymphs, 1 2nd-instar nymph, same date and locality, slide N° 1940, 180 (BMNH).
OTHER MATERIAL EXAMINED: 2 adult females, Pakistan, Chharrpani, on *Sorghum*, 17.VI.1960 - 228, slides N° 6138-17560 (BMNH).

The species was first recorded from Sri-Lanka (= Ceylon) and later in India (Coimbatore) (Venkatraman, 1941) on roots of grass and in Pakistan on *Sorghum*. According to the original material, the description and drawings by Green and the redescription and drawings by Venkatraman (l.c.), this species exhibits morphological characters that exclude it from the genus *Lecanopsis*. They are: presence of two spiracular conical setae set far apart, tibia and tarsus fused together, absence of the dorsal row of preopercular pores in the adult female, absence of the typical marginal minaret–like setae in the 1st instar. This species is clearly a member of the subfamily Eriopeltinae and according to the identification key to genera of Coccidae and the redescription of the genera (Hodgson, 1994), it belongs to the genus *Membranaria* Brain. Consequently the species is transferred to the genus *Membranaria*.

Membranaria sacchari (Takahashi, 1928) n. comb.

Lecanopsis sacchari Takahashi, 1928: 345; Tao et al., 1983: 91; Tang, 1991: 25; Ben-Dov, 1993:159.

TYPE MATERIAL EXAMINED. Syntypes of *Lecanopsis sacchari*: 9 adult females, **Taiwan**, Taichu, October 29, 1923, leg. Yanagihara; 6 adult females, Taiwan, Kori, May 16, 1927, on *Miscanthus* sp. (Gramineae), leg. Yanagihara (IMZT).

The species is recorded from Taiwan only and was collected on *Miscanthus* (Takahashi, 1928) and *Saccharum* (Tao *et al.*, 1983). The presence of the same morphological characters above reported for *L. ceylonica* excludes this species from the genus *Lecanopsis*. Consequently it is transferred to the genus *Membranaria*.

According to the type series, *M. sacchari* and *M. ceylonica* are very similar and could belong to the same species. According to the redescription by Hodgson (l.c.), they appear very similar to *Loemica* (synonymized with *Membranaria* by Hodgson (1994)) *ghesquierei* Laing, an African species. It is interesting to note that Venkatraman (1941) arrived at the same conclusion sixty years ago. At the end of his redescription of *Lecanopsis ceylonica* he wrote "This species is closely related to *Loemica ghesquierei* Laing, a subterranean form found on the roots of grass in the Belgian Congo". The genus *Membranaria* is the only genus in the Coccidae with the tibia and tarsus fused, as they are *L. ceylonica* and *L. sacchari*.

The exclusion of the species reported above from the genus *Lecanopsis* confirms that the genus has a Palearctic distribution.

UNRECOGNISABLE SPECIES

Three species of *Lecanopsis*, poorly described in the 19th century, not collected

again since and whose type material is definitely lost, belong to this group. Their identity can only be confirmed with further collecting at the original site.

Lecanopsis rhizophila Targioni Tozzetti in Signoret, 1874

Lecanopsis rhyzophila Targioni Tozzetti, 1868: 729 (not available under the article 12 of ICZN); Morrison & Morrison, 1966: 105; Hodgson, 1994: 310; Pellizzari, 1995: 36; Fontana & Pellizzari, 2001: 71.
Lecanopsis rhizophila Targioni Tozzetti (justified emendation of the spelling); Signoret, 1874: 93; Newstead, 1893: 205; Fernald, 1903: 210; Steinweden, 1929: 237; Green, 1934: 108; Goux, 1937: 95; Borchsenius, 1957: 98; Ben-Dov, 1993:159; Kozár & Walter, 1985: 77; Koteja, 1998: 96.

TYPE MATERIAL: adult female, Monte Morello (FI), **Italy**, near the roots of *Asperula*. Lost.

The species is credited to Targioni Tozzetti even if the first formal description was by Signoret, based on notes and drawings sent to him by Targioni Tozzetti in 1872. The type species has definitely been lost. Attempts to locate the original material of Targioni Tozzetti both in Florence and in the Signoret collection in Vienna, were unsuccessful. Attempts to find specimens of *Lecanopsis sp.* in the type locality (Monte Morello, Florence, Italy) in order to designate a topotype failed until now. Currently *L. rhizophila* is an unrecognisable species. Nevertheless, (according to the authoritative opinions of members of the International Commission for the Zoological Nomenclature), because it was clearly demonstrated that *L. rhizophila* is a species of *Lecanopsis* (Fontana & Pellizzari, 2001) it remains the type species of the genus even if its identity at species level is unclear (*species inquirenda*) (A. Minelli, I. M. Kerzhner and Y. Ben-Dov, personal communications, 1998).

Lecanopsis radicumgraminis (Fonscolombe, 1834)

Coccus radicumgraminis Fonscolombe,1834: 212.
Lecanopsis? radicumgraminis (Fonscolombe); Signoret, 1874: 95.
Lecanopsis radicumgraminis (Fonscolombe); Ben-Dov & Matile Ferrero (1989): 119; Ben-Dov, 1993:159; Koteja, 1998: 96.

TYPE MATERIAL: adult females, **France**, Saint-Canadet, on *Festuca caespitosa*. Lost.

On the basis of the original description and illustration this species has been definitely assigned to the genus *Lecanopsis* by Ben-Dov & Matile Ferrero (1989) as suggested by earlier authors (Signoret,1874) but an identification at specific level remains highly problematic. This unrecognisable species was collected in southern France (Saint-Canadet) under stones, near roots of *Festuca caespitosa*.

Lecanopsis fallax (Giard, 1893)

Spermococcus fallax Giard, 1893: CXCIX; Hodgson, 1994: 544.
Lecanopsis fallax (Giard); Borchsenius, 1957:111; Ben-Dov, 1993:156; Koteja, 1998: 94.

TYPE MATERIAL: adult females, **France**, Wimereux, on roots of different plats, especially grasses. Lost.

This species is currently accepted as a member of *Lecanopsis* (Borchsenius, 1957; Morrison & Morrison, 1966; Ben-Dov, 1993; Koteja, 1998). On the other hand, Hodgson (1994) considers that the original description is too poor to allow the placement of this species even at family level and retains it in the genus *Spermococcus* (unrecognisable). In fact, the description by Giard, who refers its species to a "Lecanite", is rather poor, nevertheless the meagre morphological and biological information provided is shared with *Lecanopsis*. The species was collected at Wimereux (northern France) on the roots of different plants, mainly Gramineae, in ant-nests, in sandy soils.

GENUS *LECANOPSIS* TARGIONI TOZZETTI, 1868

Rhizobium Targioni Tozzetti, 1867: 23. Type species not designated. Synonymized by Targioni Tozzetti, 1868:729 (emended to *Rhyzobium*): *nomen oblitum.*
Lecanopsis Targioni Tozzetti, 1868: 729, type species *Lecanopsis rhizophila* Targioni Tozzetti in Signoret, 1874, by subsequent designation and monotypy, Signoret, 1874: 93; Newstead, 1893: 205; Fernald, 1903: 210; Leonardi, 1920: 325; Steinweden, 1929: 237; Borchsenius, 1957: 91; Morrison & Morrison, 1966: 105; Danzig, 1980: 225; Kosztarab & Kozár, 1988: 192; Tang, 1991: 20; Ben-Dov, 1993:156; Koteja, 1998: 96; Fontana & Pellizzari, 2001: 71.
Lecaniopsis Lindinger, 1923: 148 (unjustified emendation).
Spermococcus Giard, 1893: CXCIX, type species *S. fallax* Giard, syn. by Lindinger, 1935: 135.
Paralecanopsis Bodenheimer, 1951: 329. Type species: *Paralecanopsis turcica* Bodenheimer, by original designation, syn. by Ben-Dov, 1980: 263. Hodgson, 1994: 432; Pellizzari, 1995: 36.

The history of this genus has been elucidated in a previous paper (Fontana & Pellizzari, 2001). Targioni Tozzetti gives no explanation for his action in synonymizing *Rhizobium* with *Lecanopsis*. The name *Rhizobium* has never been used for a scale insect since, while the name *Lecanopsis* is accepted and widely used. For this reason we propose to consider *Rhizobium* as a *nomen oblitum*. According to the Fourth edition of the International Code of Zoological Nomenclature (1999) it is possible to designate a senior synonym or homonym as *nomen oblitum* and place the latter as an invalid synonym in precedence of a widely-accepted younger synonym (Article 23.9.2).

General description of adult female

LIVING SPECIMENS: body oval, dorsally convex, reddish orange; anal cleft short, with inner margins of anal lobes closely approximated.
MOUNTED SPECIMENS: body oval, with short anal cleft. Length and width variable and depending either on the species, either (within the same species) on the feeding site, more or less favourable to the growth in the previous instar. Minimum length observed: 2.08 mm (in *L. turcica*), maximum: 8.5mm (in *L. clodiensis*). Derm membranous, with signs of segmentation on thorax and abdomen
VENTER: minute dermal spinules present medially on head, thorax and abdomen. Antennae short, 5-8 segmented. Legs well developed, usually stout. Tibio-tarsal sclerosis present. Tarsus usually slightly curved. Spiracles large, each located in a funnel-shaped cavity (peritreme cavity). Spiracular pores with 5-10 loculi present within each peritreme cavity and forming a group or a band between each anterior spiracle and body margin (rarely absent), spiracular pores in front of each posterior spiracle present or absent; if present, usually less numerous compared with anterior group of spiracular pores. Spiracular setae absent. Usually one pair of interantennal setae and one pair (sometimes 2 pairs) of pregenital setae. Pregenital multilocular pores present on abdominal sternites, more numerous near genital opening. Ventral microducts present on median part of head and thorax (detectable only in well stained specimens). Dorsal tubular ducts usually of two sizes, numerous on abdomen, present also on thorax, rare on head. Ventral simple pores scattered.
MARGIN: marginal setae hair-like, short, sometimes longer on anal lobes and head.
DORSUM: Preopercular pores with sclerotized rim forming a longitudinal median band, wide or narrow, usually extending from head or thorax to anal opening. The preopercular pores may have same diameter or different diameters. Tubular ducts of two sizes, numerous on abdomen, present on thorax also.

Distinguishing features of an adult female of *Lecanopsis* are: presence of a dorsal longitudinal median band of preopercular pores; spiracles large, each located in a funnel-shaped cavity; spiracular pores present within each peritreme cavity; absence of spiracular setae.

General description of 1st instar

LIVING SPECIMENS: crawlers orange or pinkish in colour; body flat, elongate oval, length in mm 0,6-0,83 (0,7), width 0,24-0,33 (0,26). Settled individuals longer and wider, slightly convex and covered with glassy wax test.
MOUNTED SPECIMENS: body elongate oval.
VENTER: antennae 6-segmented. Eye spots present on head margin. Legs well developed, subequal. Tarsal and claw digitules fine. Stylets in the crumena reaching (in the crawler) the 4th or 5th abdominal segment. Spiracles small. Spiracular disc-pores usually with 7-9 loculi (minimum observed 5, maximum 10) present in a loose group near each spiracle or distributed in groups of a few elements along ventral margin of

thorax. One or two spiracular pores in the peritreme cavity. Minute ventral setae in a submarginal row along body.
DORSUM: anal lobes well developed, each lobe with a long apical seta. Anal plates absent. Anal ring with 6 short setae.
MARGIN: marginal setae minaret-like, with a wide basal socket. The minaret-like setae may be present on margin of head, thorax and abdomen or only on head and abdomen.

The presence of marginal minaret-like setae and the absence of proper anal plates are significant features of the 1st instar of *Lecanopsis*. It was previously thought that the minaret-like setae were distributed only on dorsal margin of the body. The use of SEM microscopy demonstrated that the last two minaret-like setae are in fact on venter (Pellizzari & Fontana, 2001a).

General description of 2nd-instar female

LIVING SPECIMENS: yellowish-orange, oval, slightly convex, covered with a glassy wax test.
MOUNTED SPECIMENS: body oval, with signs of segmentation.
VENTER: dermal spinules present medially from head to last abdominal segment. Antennae reduced, conical, 5-6 segmented. Legs reduced, conical, with tibia and tarsus partially fused together (Fig.1, a, b, c). Claw without denticle. Claw and tarsal digitules about as long as claw. Spiracles opening in a peritreme cavity. Spiracular disc-pores with 7-10 loculi, usually present between each spiracle and body margin and forming a submarginal row or band extending from head to abdomen. Spiracular pores present also in the peritreme cavity. Ventral microducts present on medial part of head, and thorax and forming a group posterior to anterior spiracles (detectable only in well stained specimens). Ventral setae minute, scattered. Small simple pores scattered.
DORSUM: anal plates present, small, sub-triangular. Anal ring with 6 setae. Dorsal setae minute, scattered. Small simple pores scattered.
MARGIN: marginal setae small and conical or spine-like or hair-like. The conical setae have the same distribution as the minaret-like setae in the 1st instar.

A significant feature of the 2nd-instar female of *Lecanopsis* is the reduction of the antennae and legs and the submarginal row or band of spiracular pores extending from the head to the abdomen. This stage is immobile.

General description of 3rd-instar female

LIVING SPECIMENS: yellowish-orange, oval (sometimes with an irregular shape, due to pressure of host plant tissues), convex, covered with a glassy wax test.
MOUNTED SPECIMENS: body oval, with signs of segmentation.
VENTER: dermal spinules present medially from head to last abdominal segment. Antennae reduced, conical, 5-6-7-segmented. Legs reduced, stout, with a large coxa and all segments developed (Fig.1, d, e, f). Depending on the species the legs appear conical or subconical (i.e. *L. clodiensis*) or with more elongate segments (i.e. *L. formicarum*). Claw without denticle. Claw and tarsal digitules longer than claw. Spiracles

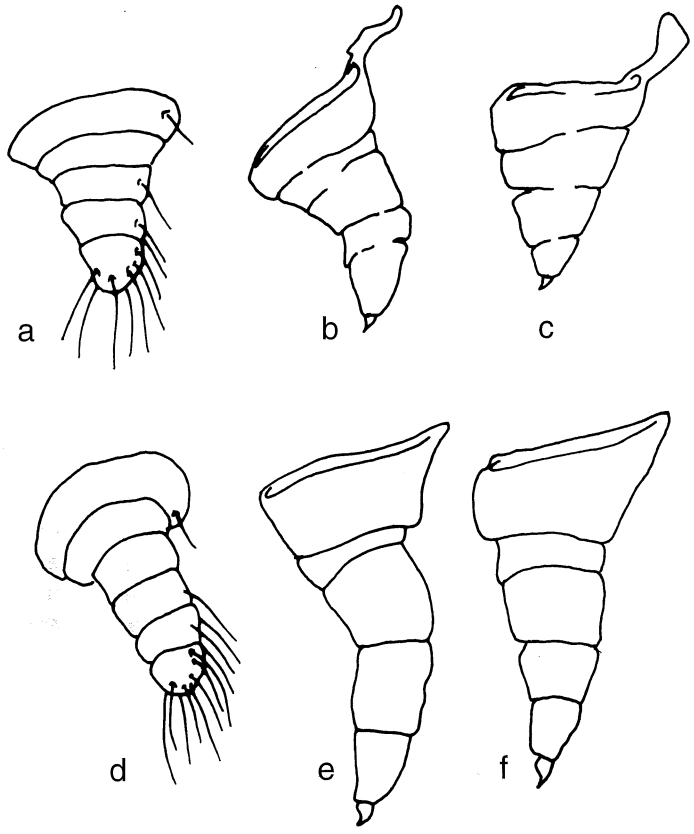

Fig. 1 - a) antenna of 2nd-instar female. b), c) legs of 2nd-instar female. d) antenna of 3rd-instar female. e), f) legs of 3rd-instar female.

opening in a large peritreme cavity. Peritreme cavity covered by numerous spiracular pores, so close to each other that it is difficult to count them. Spiracular disc-pores with 7-10 loculi, forming a group between each spiracle and body margin (in *L. turcica*) or forming a submarginal row from the head to abdomen. They present the same distribution as in the 2nd instar of the same species, but are usually more numerous. Ventral microducts present on medial part of head and thorax and forming a group posterior to anterior spiracles (detectable only in well stained specimens). Ventral setae minute, scattered. Small simple pores scattered.

DORSUM: anal plates present. Anal ring with 6 setae. Dorsal setae minute, scattered. Small simple pores scattered.

MARGIN: marginal setae usually conical on head margin and anal lobes, smaller and spine-like or hair-like on lateral margins. The conical setae have the same distribution as the minaret-like setae in the 1st instar.

Also in the 3rd-instar female, antennae and legs are reduced. The 3rd-instar female can be separated by the 2nd instar because of the short legs but with all segments developed and peritreme cavity filled by numerous spiracular pores. This stage is also immobile.

General description of 2nd-instar male

LIVING SPECIMENS: yellowish-orange, elongate oval, flat, covered with a glassy wax test.

MOUNTED SPECIMENS: body elongate, oval, with almost parallel sides; length in mm1,2-1,6; width mm0,5-0,7. Eyes small, marginal. Antennae well developed, 7-segmented. Legs long, well developed. Claw without denticle. Tarsal digitules longer than claw digitules. Spiracles small. Spiracular disc-pores with 7-10 loculi. They are present in the peritreme cavities and in a group between each spiracle and body margin. Usually there are several pores near anterior spiracles, 0-5 pores near posterior spiracles. Marginal setae present, longer and stouter on head and abdomen. One pair of interantennal setae present. One pair of large median setae on last five abdominal sternites. Minute setae scattered on dorsum and venter. Dorsal tubular ducts forming a single row across abdominal segment IV, with about 10-12 ducts on each side.

The presence of well developed antennae and legs and of the band of tubular ducts across the abdominal segment IV of dorsum are distinguishing characters of the 2nd-instar male.

General description of male puparium

The male puparium is known for *L. formicarum, L. turcica* and *L. clodiensis*. It encloses completely the prepupa and pupa stages and the male before swarming. It is elongate oval with almost parallel sides, consists of glassy thin wax and presents only a dorsal transversal suture, corresponding to the transverse dorsal row of tubular ducts in the 2nd-instar male, that separates the posterior operculum.

KEY TO INSTARS OF *LECANOPSIS*

1 Presence of minaret-like setae on body margin, at least on last abdominal segments and head.....**1st instar**
– Absence of minaret-like setae on body margin.....**2**

2 Antennae reduced, short, conical, legs reduced, short, stout, conical or subconical **3**
– Antennae and legs well developed, body shape large, oval or small, elongate oval, with sides almost parallel **4**

3 Antennae and legs reduced, conical. Legs with tibia and tarsus partially fused together. Peritreme cavity with spiracular disc-pores on its inner wall.....**2nd-instar female**
– Antennae reduced, conical. Legs reduced, conical or subconical, but with tibia and tarsus

not fused together. Peritreme cavity filled with spiracular disc-pores close set each other ..... **3rd-instar female**.

4 body shape large, oval, presence of dorsal preopercular pores forming a median band, presence of pregenital disc-pores. Tubular ducts scattered on dorsum and venter .... **adult female**.

– Body shape elongate oval, with sides almost parallel, dorsal preopercular pores and pregenital disc-pores absent. Tubular ducts forming a dorsal row across abdominal segment IV ..... **2nd-instar male**

KEY TO SPECIES OF *LECANOPSIS* (ADULT FEMALES)

The key omits *L. iridis* of which the adult female is unknown[2].

1 Groups of multilocular pores present on dorsum ..... ***L. mirabilis* n. sp.**
– Groups of multilocular pores absent on dorsum **2**

2 Preopercular dorsal pores distributed in a longitudinal median band, as wide as the space between legs or more **3**
– Preopercular dorsal pores distributed in a longitudinal median band narrower than the space between legs **6**

3 Preopercular pores not present on head; marginal setae long, stout..... ***L. taurica***
– Preopercular pores present on head; marginal setae short, slender..... **4**

4 Antennae 7-8-segmented, longitudinal band of preopercular pores as wide as space between legs; spiracular pores absent or rare in front of anterior spiracles ..... ***L. subterranea***
– Antennae 6-7-segmented. Longitudinal band of preopercular pores on dorsum wider than space between legs; numerous spiracular pores present in front of anterior spiracles (14-204)..... **5**

5 Antennae usually 7-segmented. Group of spiracular pores much more numerous (20-204) in front of anterior spiracles than in front of posterior spiracles (0-51) ..... ***L. clodiensis***
– Antennae 6-segmented, spiracular pores forming groups of about same number of pores (14-30 pores) in front of anterior and posterior spiracles ..... ***L. turcica***

6 Preopercular pores sparse and forming a very narrow longitudinal band (maximum width 2-4 pores) extending from head to anal region. Antennae 7-segmented. Spiracular pores sparse forming a narrow band of 3-12 pores from anterior spiracles to body margin and a

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[2] For the description of *L. pellizzariae*, a new species described while this paper was in press, see: Fontana P., Malagnini V., 2001- A new species of *Lecanopsis* Targioni Tozzetti, 1968 (Hemiptera: Coccoidea: Coccidae) from the Italian peninsula: description and remarks on its life history. - Boll. Zool. agr. Bachic., 33, Special Issue - Proceedings of the IX Symposium on Scale Insects Studies, Padua, Italy, 3-8 September 2001: 111-123.

group of 1-9 pores in front of the posterior spiracles. Legs small in comparison with body size ..... ***L. myrmecophila***

– Band of preopercular pores usually wider than above **7**

7 Spiracular pores forming an elongate, irregular band from each spiracle to body margin and extending with a few pores along the body margin, ... ***L. shutovae***

– Spiracular disk pores forming a band from each spiracle to body margin but not extending with a few pores along body margin **8**

8 Antennae 6-segmented; longitudinal band of preopercular pores extending from head at level of antennae, to level of genital region ..... ***L. aphenogastrorum***

– Antennae usually 7-8-segmented (rarely 6-segmented); longitudinal band of preopercular reaching the anal region. **9**

9 Spiracular pores near each posterior spiracle numbering 3-30 (9); longitudinal band of preopercular pores extending from prothorax. or mesothorax to anal region..... ***L. formicarum***

– Spiracular pores near each posterior spiracle usually absent (rarely 1-3); longitudinal band of preopercular pores extending from head to anal region. ..... ***L. marottai*** **n. sp.**

KEY TO SPECIES *OF LECANOPSIS* (1ST INSTAR)

This key is comprehensive only of the species (7) whose first instar is known.

1 Minaret-like setae present on head, thorax and abdomen **2**

– Minaret-like setae present on head and abdomen, absent on thorax **3**

2 Minaret-like setae numbering 4 on each side of head margin, from top to eye-spot ..... ***L. mirabilis*** **n. sp.**

– Minaret-like setae numbering 3 on each side of head margin, from top to eye-spot ..... ***L. turcica***

3 Spiracular disc-pores forming a distinct group near either spiracle. ..... ***L. clodiensis***

– Spiracular disc-pores forming 5 distinct groups each with a different number of pores (a group may consists of only one pore) on each ventral margin of thorax **4**

4 With 2 minaret-like setae on each side of margin of head ..... ***L. iridis***

– With 5 minaret-like setae on each side of margin of head **5**

5 With 5 minaret-like setae on each lateral margin of abdomen ..... ***L. subterranea***

– With 7 minaret-like setae on each lateral margin of abdomen **6**

6 Last 3 groups of spiracular disc-pores each consisting of only one pore ..... ***L. marottai*** **n. sp.**

– last 2 groups of spiracular disc-pores consisting at least of 2 pores (usually 3-4)..... ***L. formicarum***

Lecanopsis formicarum Newstead, 1893

Lecanopsis formicarum Newstead, 1893: 138. Schmutterer, 1952:560; Kozár & Walter, 1985: 77; Kosztarab & Kozár, 1988: 194; Tang, 1991: 24; Ben-Dov, 1993:157; Koteja, 1998: 95.
Lecanopsis brevicornis Newstead, 1896: 59, syn. by Green, 1921:193.
Lecanopsis butleri Green, 1917: 208, syn. by Green, 1921:193.
Lecanopsis terrestris Borchsenius, 1952: 287 **n. syn.**. Borchsenius, 1957: 102; Kozár & Walter, 1985: 77; Kosztarab & Kozár, 1988: 196; Ben-Dov, 1993:160; Koteja, 1998: 97.
Lecanopsis shutovae Borchsenius, 1957: 108 (in part, misidentification)
Filippia subterranea Gomez-Menor Ortega, 1948: 94, syn. by Ben-Dov, 1993: 157 (misidentification).
Paralecanopsis formicarum (Newstead); Pellizzari, 1995: 40; Gullan & Kosztarab, 1997: 39.
Paralecanopsis terrestris (Borchsenius); Pellizzari, 1995: 42.

ADULT FEMALE (Fig. 2)

LIVING SPECIMENS: orange, elongate, moderately convex with short anal cleft.
MOUNTED SPECIMENS: elongate elliptical, 3,3-5,7 (4,56) mm long and 2-3,8 (2,68) mm wide.
VENTER: derm membranous, with signs of segmentation on thorax and abdomen. Dermal spinules present medially from head to last abdominal segment. Antennae 7-8-(seldom 6) segmented. Legs stout. Femur stout, tibia straight, tarsus subconical and weekly curved, claw conical without denticle. Spiracles opening in a peritreme cavity. Spiracular pores with 5-8 loculi and a diameter of 5,5-7,4 μm, forming a elongate group of 12-118 (44,5) disc pores, near each anterior spiracle and a group of 3-37 (9,5), disc pores near each posterior spiracle. With 14-51 (22,7) spiracular disc-pores present in anterior peritreme cavity and 8-38 (21,7) in the posterior peritreme cavity. Pregenital disc-pores with 7-8 loculi and a diameter of 8-11 μm, numerous near the genital opening and on the last abdominal segments with a few in the first two abdominal segments. Small simple pores with sclerotized rim numerous, scattered all over venter. Tubular ducts of two sizes, numerous on abdomen, present also on thorax. Minute spine-like setae numerous, scattered. One pair of interantennal setae and one pair of pregenital setae.
MARGIN**:** marginal setae short, hair-like,. Setae on margin of anal lobes longer than other marginal setae.
DORSUM: derm membranous, with signs of segmentation on thorax and abdomen. Anal plates subtriangular with widely rounded angles. Preopercular pores of different sizes, with diameter of 4,8-12 μm, forming a narrow longitudinal band usually extending from mesothorax (seldom from prothorax) to anal region. Small simple pores scattered. Tubular ducts of two sizes present, less numerous than on venter. Minute hair-like setae scattered.

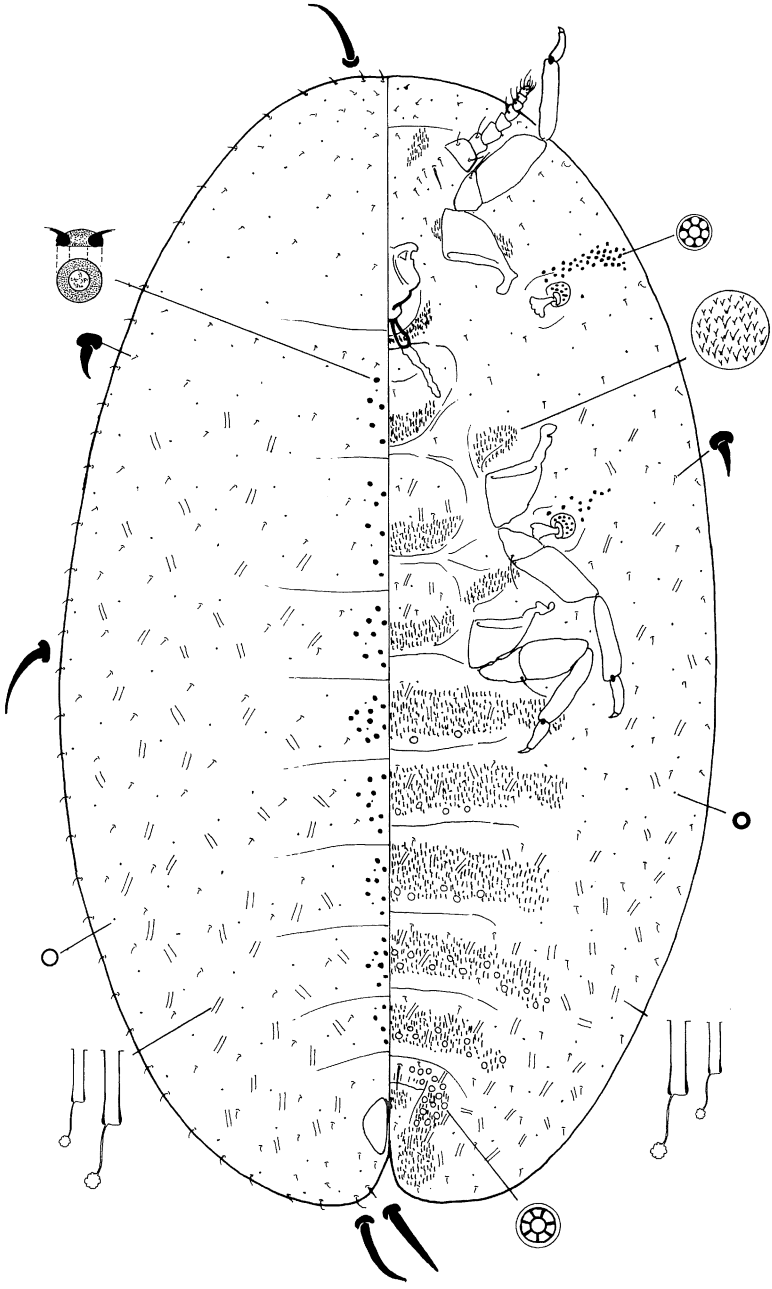

Fig. 2 - *Lecanopsis formicarum,* adult female.

FIRST INSTAR (Fig. 3)

LIVING SPECIMENS: yellowish, elongate and flattened. Legs and antennae well developed.
MOUNTED SPECIMENS: body elliptic, elongate, 0,517-0,57 mm long and 0,195-0,240 wide. Eyes large, situated dorso-marginally.
VENTER: antennae 6-segmented, 102-115 µm long, with a large apical seta on last segment. One pair of interantennal setae. Legs subequal. Tarsal digitules longer than the claws digitules. Loop of mouth stylets 249-265 µm long, reaching abdominal segment IV or V. Spiracular disc-pores with 5-9 loculi, forming 5 groups along ventral margin of thorax. First group, near anterior spiracle, with 4-8 disc pores, second group, near posterior spiracle, with 4-11 disc pores, third, near second group, always with 1 disc pore. Fourth and fifth groups have each 3-6 disc pores. Two-three (rarely 4-5) spiracular disc-pores within each peritreme cavity. Minute ventral setae forming a submarginal row around the body and two submedial longitudinal rows on abdomen.
MARGIN: marginal minaret-like setae present on margin of head and abdomen, absent on thorax. There are (on each side) 5 (seldom 4) minaret-like setae on the head margin, and 7 (seldom 6) on the abdomen.: two minaret-like setae are located on ventral margin of the last two abdominal segments, the other 5 are on dorsal margin of the other abdominal segments. The ventral or dorsal position of marginal minaret-like setae has been verified by SEM.
DORSUM: anal lobes well developed with apical seta 249-265 (260) µm long. Anal ring with 6 setae. Normal anal plates absent. Dorsal setae minute.

SECOND-INSTAR FEMALE (Fig. 4)

LIVING SPECIMENS: orange in colour, moderately convex, entirely enclosed in a wax glassy test.
MOUNTED SPECIMENS: Body oval, elongate, with signs of segmentation on thorax and abdomen.
VENTER: dermal spinules present medially from head to last abdominal segment. Antennae reduced, conical, 6-segmented, wide at base, with segments wider than long, except the apical segment. Legs reduced, sub-conical, wide at base, with tibia and tarsus partially fused. Claw and tarsal digitules about same length as claw. Labium short. Spiracles with 15-25 (19,5) spiracular disc-pores, with 6-11 loculi, within peritreme cavity. Spiracular disc-pores, with 6-11 loculi, forming a submarginal band, 1-3 pores wide, usually extending from head to last abdominal segments. Ventral setae small. Submarginal setae on head longer. One pair of interantennal setae and one pair of median setae on last abdominal segment. Small simple pores scattered all over venter.
MARGIN: marginal setae short, spine-like and conical on margin of head and anal lobes: these conical setae have same distribution as minaret-like setae in 1st-instar. Other marginal setae short and hair-like.
DORSUM: anal plates well developed, subtriangular. Anal ring with 6 setae. Small simple pores scattered all over dorsum. Dorsal setae very small.

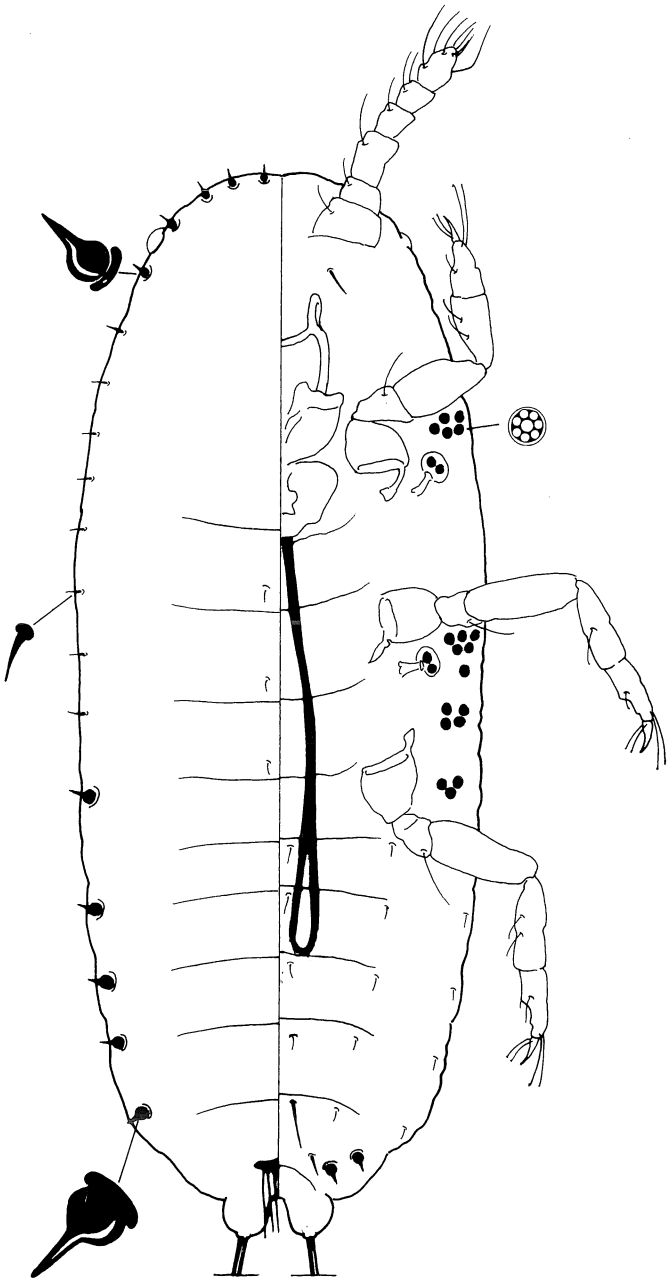

Fig. 3 - *Lecanopsis formicarum*, first instar.

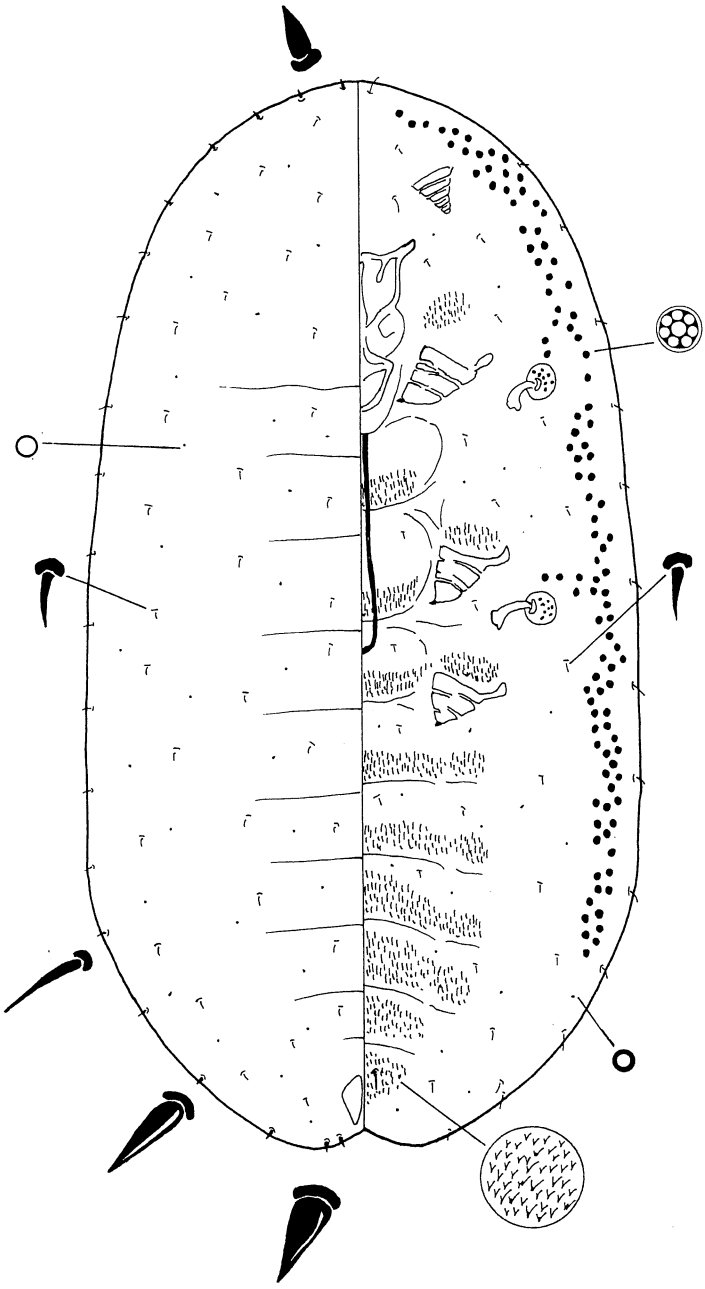

Fig. 4 - *Lecanopsis formicarum*, 2nd-instar female.

THIRD-INSTAR FEMALE (Fig. 5)

LIVING SPECIMENS: orange in colour, oval, moderately convex and entirely enclosed in a wax glassy test.
MOUNTED SPECIMENS: Body elongate, oval. Eyes very small, marginal.
VENTER: dermal spinules present medially from head to last abdominal segment. Antennae 7-segmented, short, conical, wide at base. Legs reduced, stout, with all segments well developed, tibia sub-cylindrical and tarsus sub-conical. Tarsal and claw digituli well developed, longer than claw. Loop of mouth stylets reaching mesosternum. Spiracles with peritreme cavity covered by disc pores, with 6-11 loculi, set very close to each other. Spiracular disc-pores with 6-11 loculi, forming a submarginal band, 2-5 pores large, from top of head to last abdominal segments and extending in front of each spiracular opening. Ventral setae small, scattered. One pair of interantennal setae. Small simple pores scattered.
MARGIN: marginal setae short and conical on head and on anal lobes. Conical setae have the same distribution as minaret-like setae in the 1st instar. Other marginal setae short and hair-like.
DORSUM: anal plates well developed, subtriangular. Anal ring with 6 setae. Dorsal setae small, scattered. Small simple pores scattered.

SECOND-INSTAR MALE (Fig. 6)

LIVING SPECIMENS: orange, elongate, flattened, entirely enclosed in a wax glassy test.
MOUNTED SPECIMENS: body elliptic elongate, 1,24-1,3 (1,26) mm long and 0,57-0,64 (0,62) mm wide. Eyes small, marginal.
VENTER: antennae 7-segmented. Legs well developed, long. Tarsal digituli longer than claw digituli. Loop of mouth stylets reaching prosternum. Spiracular disc-pores, with 7 or 8 loculi, forming a group of 8-17 (14) disc pores near each anterior spiracle and a group of 0-5 (1,5) near each posterior spiracle; spiracle with 15-22 (18,7) spiracular disc-pores in each peritreme cavity. Small simple pores scattered. One pair of interantennal setae. One pair of large, median setae, on each five posterior abdominal segments.
MARGIN: marginal setae thick and long (20-30 μm) on head and abdomen, smaller on thorax.
DORSUM: anal plates well developed, subtriangular. Small simple pores scattered. Dorsal setae small, scattered. Tubular ducts present in a medially interrupted row across fourth abdominal segment, with 10-14 ducts on each side.

PUPARIUM

Not seen. After Boratynski *et al.* (1982), the surface is "glassy, thin and smooth, with only one dorsal transversal suture, which separates the posterior operculum and encloses the developing male entirely on all sides, including the complete ventral surface".

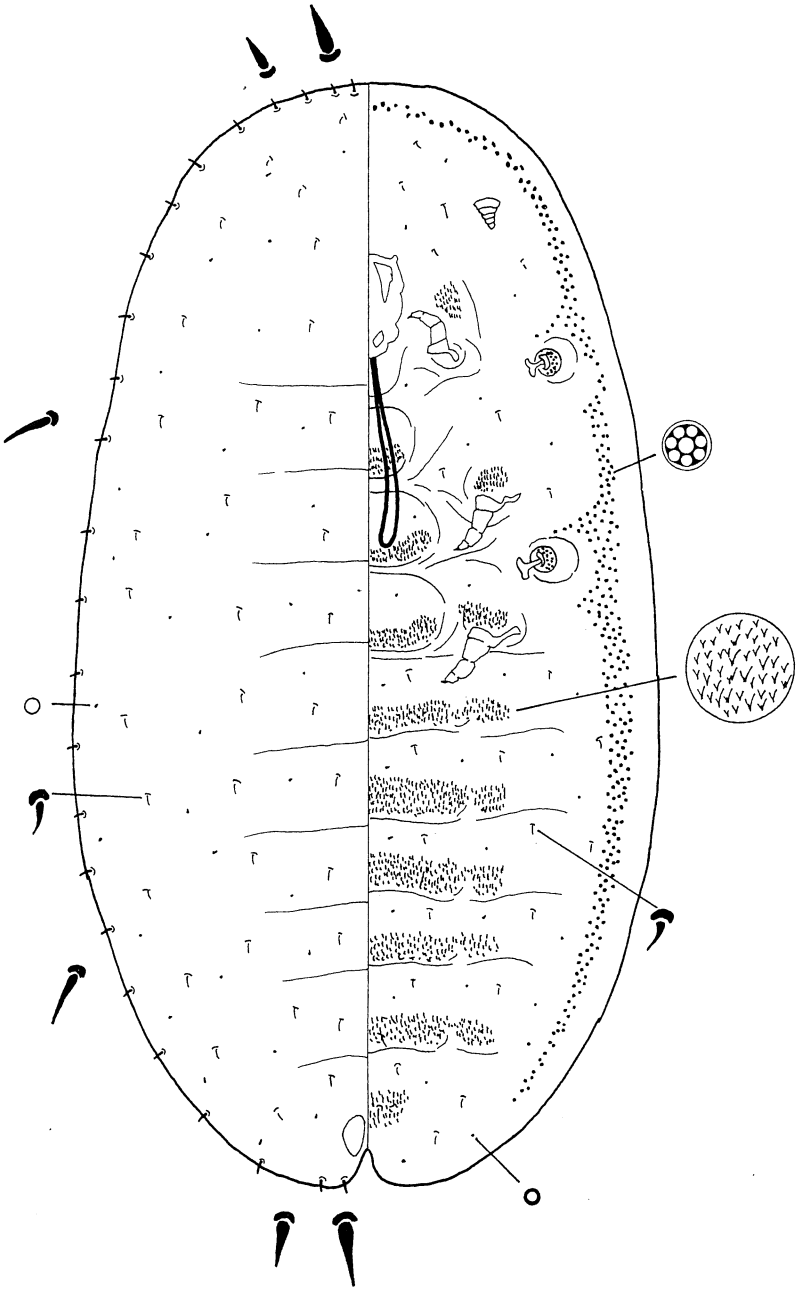

Fig. 5 - *Lecanopsis formicarum*, 3rd-instar female.

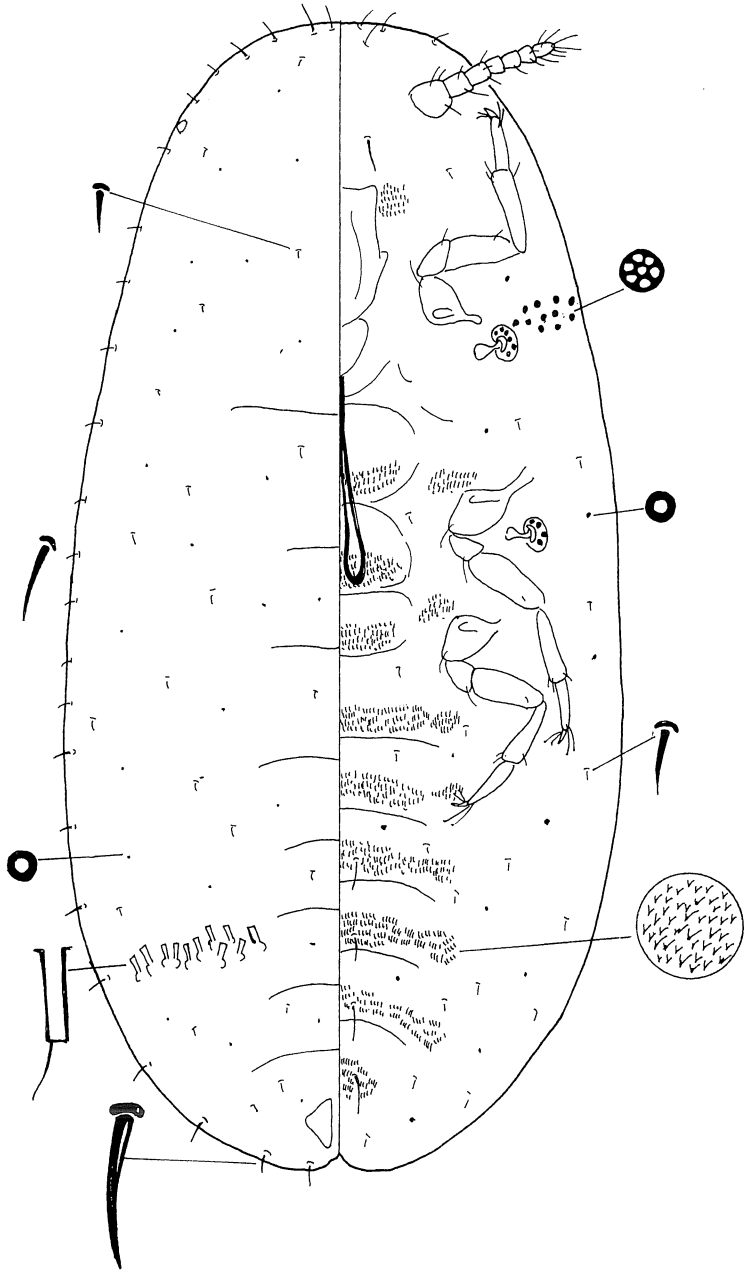

Fig. 6 - *Lecanopsis formicarum*, 2nd-instar male.

PREPUPA AND PUPA

Not seen. After Boratynski *et al.* (1982), the structure of these stages is similar to that of the other *Eriopeltini*.

ADULT MALE.

Not seen. Recorded by Boratynski *et al.* (1982).

TYPE MATERIAL EXAMINED. Syntypes of *L. formicarum*: 2 females, **UK**, Chesil Beach, 14.IV.1893, leg. C. W. Dale, slide N° 162; (BMNH) (specimen N° 1, marked with "L", is here designated as Lectotype and specimen N° 2 as Paralectotype); Topotype: Chesil Beach, 8.VI.1893, leg. C. W. Dale, 1 female, slide N° 169 A, (BMNH).
Type of *L. terrestris* Borchsenius: 1 female, **Ukraine**: Poltava, natural steppe, 28.IV.1925, (ZIAS).
Types of *L. shutovae* Borchsenius, 1952): 3 crawlers and 1 2nd -instar female, **Russia,** Primorje Territory: Grigorievka Village, Mikailovka district, 13.VII.1949, leg. Borchsenius, slide N° 579=50 (ZMAS); 2 3rd -instar females, same locality and date, slide N° 195=49, (ZIAS).

OTHER MATERIAL EXAMINED. **UK**?: no locality, leg. C. W. Dale, 2 adult females, slide N° BM. 1945, 121, (BMNH); Camberley, 1930, 3 adult females, leg. Green, slides N° 5057/1-2-3, (MNHN). **The Netherlands**: Loon op Zand, 4.V.1972, 10 adult females, leg. Tilburg, slides A-L (DAAPE); Loon op Zand, 4.V.1972, 21 adult females, leg. Tilburg, (PPSW); Rockanje, 30.V.1949, 1 adult female and crawlers, leg. Reyne, (ZMUA); Wageningen, 8.V.1943, 1 adult female, leg. Hille Ris Lambers, (ZMUA). **Denmark**: Vederso, Klit, Jylland, 25.V.1949, 1 adult female, leg. Skorgaard, slide N° 8528, (MNHN). **France**: M. Ventouse, Vaucluse, 1400 m, 29.V.1936, 2 adult females, leg. Balachowsky, slide N° 5055/1-2 (MNHN). **Italy**: Pian delle Fugazze (TN), 1200 m, 5.VII.1995, 1 adult female and crawlers, leg. Pellizzari, slide N° 742/1-4, (DAAPE); Col Perer (BL), 1000 m, 16.VIII.1985, 1 adult female, leg. Pellizzari, (DAAPE); Isola Vicentina (VI), 28.V.1996, 1 adult female, leg. Fontana, slide N° 54; 10.VI.1997, 3 adult females, leg. Fontana, slide N° 819/1-2 and N° 820 (DAAPE); Passo di Godi (AQ), 1 adult female, 6.V.1989, leg. Marotta, (DEAP); same locality, 24.V.2000, 6 adult females, leg. Fontana & Malagnini, slide N° 984/1-6; Pescasseroli (AQ), 11.V.1999,1 adult female, leg. Fontana, slide N° 883 (DAAPE); Valle Fiorita (IS), 7.VI. 2001, 2 adult females and crawlers, leg. Fontana, slide N° 1024/1-4 (DAAPE); Pignola (PZ), 25.V.1989, 1 adult female, leg. Marotta, slide N° 1989:160 (DBPI). **Hungary**: Nagykovàcsi, Keckha't, 14.VI.1982, 1 adult female, slide N° 1839b, (PPIB); Budapest, 31.VII.1978, 4 crawlers and 4 2nd-instar females, leg. Kozár, (PPIB); Batorliget, 27.III.1990, 1 adult female, leg. Malusa, slide N° 3741 (PPIB). **Ukraine**: Orsk, natural steppe, 20.IX.1935, 1 3rd-instar female, slide N° 154/38 (ZIAS) **Poland**: Kostize, 26.V.1978, 3 adult females, leg. Koteja, slide N° 4831, 4819 (IAZP); same locality, 17.V.1979, 2 adult females, leg. Koteja, slide N° 5467 (IAZP); same locality, 8.VIII.1978, 5 1st instars, leg. Koteja, slide N° 5125 (IAZP); same locality and data,

4 2nd-instar females, leg. Koteja, slide N° 5139 (IAZP); same locality and data, 3rd-instar females, leg. Koteja, slide N° 5147 (IAZP); same locality, 18.IX.1978, 9 3rd-instar females, leg. Koteja, slide N° 5215 (IAZP); same locality, 20.XII.1978 (in lab.), 2 2nd-instar males, leg. Koteja, slide N° 5356 (IAZP); same locality, 30.IV.1979, 5 3rd-instar females, leg. Koteja, slide N° 5441 (IAZP); J. Dtugie, Wtodawsie, Lubelskie, 7.VI.1978, 2 adult females, leg. Koteja, slide N° 4872 (IAZP).

DISTRIBUTION. Palearctic Region: Ireland (Green, 1934), Great Britain, Spain, France, Guernsey Islands, Switzerland, Italy, The Netherlands, Denmark, Sweden, Germany, Czech Republic, Poland, Hungary, Mongolia (Ben-Dov, 1993), Russia (Primorje Territory), Ukraine.

HOST PLANTS: Gramineae (*Agropyrum, Agrostis, Brachypodium, Briza, Bromus, Dactylis, Elymus, Festuca, Phloeum, Poa, Nardus, Polytrichum*).

BIOLOGY: the biology of this species was studied in details by Boratynski *et al.* (1982), who clarified for the first time the peculiar life cycle of a *Lecanopsis*.

COMMENTS. *L. formicarum* is the most common and widely distributed species of *Lecanopsis*. Thanks to the work of Boratynski *et al.* (1982) all the young stages and the adult female have been correctly described and its peculiar life-cycle has been elucidated for the first time.

In this paper *L. terrestris* Borchsenius is synonymized with *L. formicarum*. It is important to point out that, when describing *L. terrestris*, Borchsenius did not know the identity of *L. formicarum*. Besides, his description of *L. terrestris* is based solely on one female collected at Poltava in 1925, during last moult. This probably led to the interpretation that the new species had "small preopercular pores on the dorsum", a character that he assumes as distinctive. The other Borchsenius' slide of *L. terrestris* is a 3rd-instar female collected in 1935 (ten years later) at Orsk, far away from the type locality of the adult female of the same species. The morphological characters of this 3rd instar do not differ from the characters exhibited by the 3rd instars of *L. formicarum* and it is thereby attributed to the latter. The fact that the morphology of the nymphs of *L. formicarum* has been clearly described and illustrated only in 1982, probably led to their misidentification and therefore were attributed to other described species (i.e. *L. festucae* or *L. terrestris)* prior to 1982. On the other hand, before the description of the new species of *Lecanopsis* (Borchsenius 1952; Pellizzari, 1995) adult females of *Lecanopsis* were usually attributed to *L. formicarum*.

Lecanopsis myrmecophila Leonardi, 1908

Lecanopsis mirmecophila Leonardi, 1908: 181 (mis-spelling).
Lecanopsis myrmecophila, Leonardi, 1920: 327 (justified emendation); Borchsenius, 1957: 112; Kozár & Walter, 1985: 77; Ben-Dov, 1993: 158; Koteja, 1988: 96.
Lecaniopsis myrmecophila, Lindinger, 1935:139.

ADULT FEMALE (Fig. 7)

LIVING SPECIMENS: not seen.
MOUNTED SPECIMENS: oval, 3,61-3,8 mm long and 2,85-3,53 mm wide.
VENTER: derm membranous, with weak signs of segmentation on thorax and abdomen. Dermal spinules present on thorax, but difficult to detect. Antennae 7-segmented, apical segment with 8-9 setae. Legs: in the examined specimens only one anterior leg is present, this is weak and small in comparison with body size, with tarsus slightly curved. The other legs are broken at coxa-trochanter articulation level. Spiracles opening in a peritreme cavity. Peritreme small. Spiracular pores with 10 loculi with a diameter of 4,8 μm, forming an elongate and loose band of 7-12 disc pores, from each anterior spiracle to body margin and a group of 2-9 disc pores near each posterior spiracle. About 8-9 spiracular disc-pores detectable in the anterior peritreme cavity and 9-14 in the posterior peritreme cavity. Pregenital disc-pores with 7 loculi and a diameter of 7,2 μm, detectable only on the last abdominal segment. Tubular ducts more numerous along body margin from metathorax to anal lobes (difficult to detect).
MARGIN: marginal setae hair-like, short.
DORSUM: anal plates subtriangular, small (length 130 μm, width 72 μm). Preopercular pores small, with a diameter of 4,3-4,8 μm, forming a narrow (2-4 pores wide) longitudinal band extending from head to anal region. Tubular ducts of two sizes, more numerous along body margin from metathorax to anal lobes (difficult to detect). Minute hair-like setae scattered.

FIRST INSTAR: not known.
SECOND-INSTAR FEMALE: not known.
THIRD-INSTAR FEMALE: not known.
SECOND-INSTAR MALE: not known.
ADULT MALE: not known.

TYPE MATERIAL EXAMINED. Syntypes of *L. myrmecophila*: 2 adult females, **Italy**, Sardinia, Tempio (SS), in a nest of *Tetramorium coespitum* (DBPI).

DISTRIBUTION. Palearctic Region: Italy (Sardinia).

HOST PLANTS: not known.

BIOLOGY: the type was collected in a nest of the ant *Tetramorium caespitum* L..

COMMENTS. This species is known only from the original description. The present redescription is based on the type material consisting of 2 females in very poor condition.

Lecanopsis aphenogastrorum Gómez-Menor Ortega, 1928

Lecanopsis aphenogastrorum Gómez-Menor Ortega, 1928: 350; Martin Mateo, 1984: 71; Kozár & Walter, 1985: 77; Ben-Dov, 1993: 156; Koteja, 1998: 94.

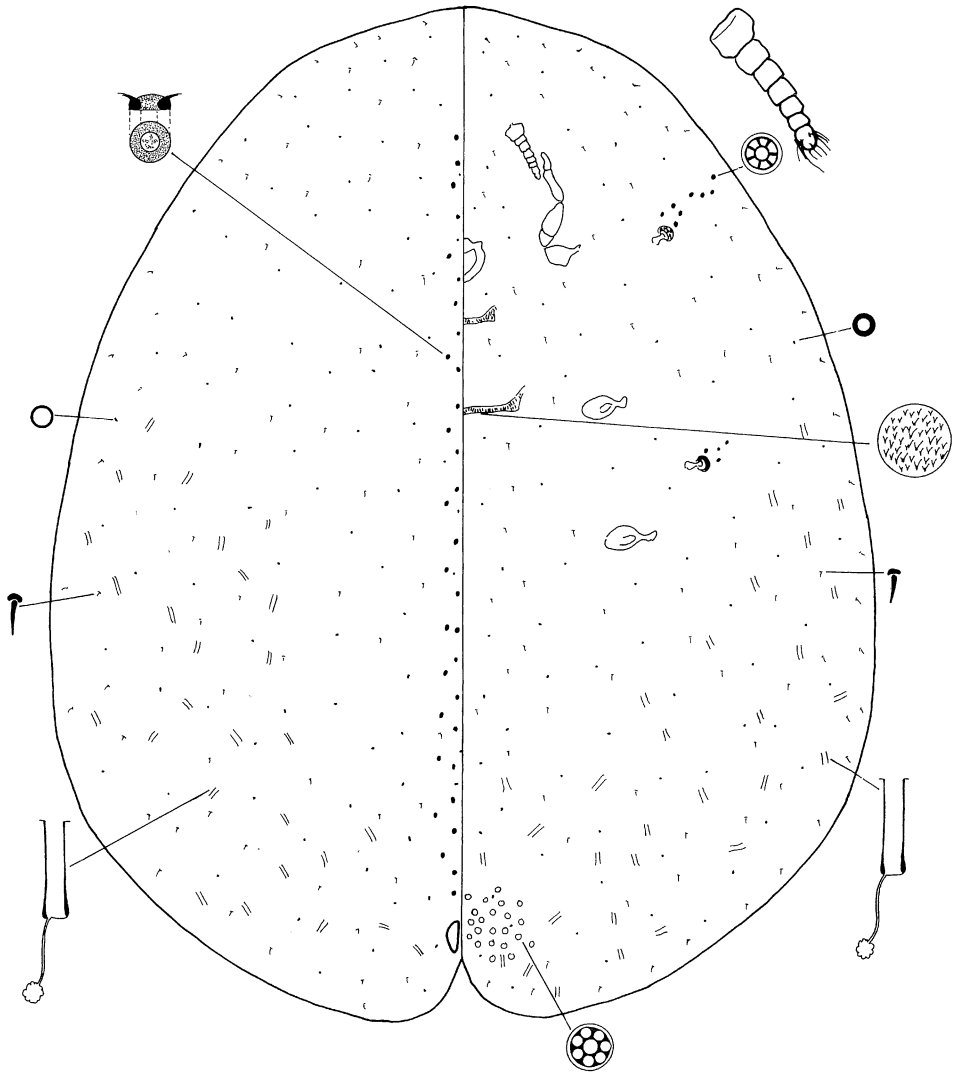

Fig. 7 *Lecanopsis myrmecophila*, adult female.

ADULT FEMALE (Fig. 8)

LIVING SPECIMEN: not seen.
MOUNTED SPECIMENS: elongate elliptic, 6 mm long and 3,5 mm wide (according Gómez-Menor Ortega, 1928). The adult female type is divided into several overlapping parts.
VENTER: derm membranous, with clear signs of segmentation. Dermal spinules present on head, thorax and abdomen. Antennae 6-segmented, with 1st segment wider. Legs stout, tibia almost straight, tarsus subconical and weakly curved. Tarsal digitules as long as claw, claw digitules longer than claw. Spiracles each opening in a peritreme cavity. Spiracular pores with 5-8 loculi and a diameter of 7,5 µm, forming an elongate group of 33 disc pores, extending from each anterior spiracle to body margin, and a group of 18-19 disc pores near each posterior spiracle. Pregenital disc-pores with 6 or 7 loculi and a diameter of 9,6 µm, numerous near genital opening and forming transversal rows on last 4 abdominal segments. Small simple pores, each with sclerotized rim, numerous and scattered all over venter. Tubular ducts of two sizes (difficult to detect because of sclerotization of derm), present from thorax to anal lobes, more numerous near margin. Minute hair-like setae numerous, scattered.
MARGIN: marginal setae short, hair-like. Setae on margin of anal lobes longer than other marginal setae.
DORSUM: derm membranous, strongly sclerotized, with marked signs of segmentation on thorax and abdomen. Anal plates subtriangular with widely rounded angles, 139 µm long and 110 µm wide. Preopercular pores with a diameter of 8,5 µm, forming a longitudinal band (about 8-10 pores wide) extending from head to level of genital region. Small simple pores scattered. Tubular ducts present from thorax to anal lobes, more numerous on margin. Minute hair-like setae scattered.

FIRST INSTAR: not known.
SECOND-INSTAR FEMALE: not known.
THIRD-INSTAR FEMALE: not known.
SECOND-INSTAR MALE: not known.
ADULT MALE: not known.

TYPE MATERIAL EXAMINED. Lectotype of *L. aphenogastrorum*: 1 adult female, **Spain,** Colldejou, Tarragona, in a nest of *Aphenogaster*, leg. C. Bolivar, no date (MNCN).

DISTRIBUTION. Palearctic Region: Spain.

HOST PLANTS: not known.

BIOLOGY: the adult female was found in the nest of ants of the genus *Aphenogaster*.

COMMENTS. This species is based on one mature female, with the derm deeply sclerotized, collected from a nest of *Aphenogaster* sp. (Formicidae) and has not been recorded since. It shares some characters with *L. formicarum* (i.e. a narrow longitudinal band of preopercular pores), but differs in possessing a large group of spiracular pores near the posterior spiracular openings and 6-segmented antennae.

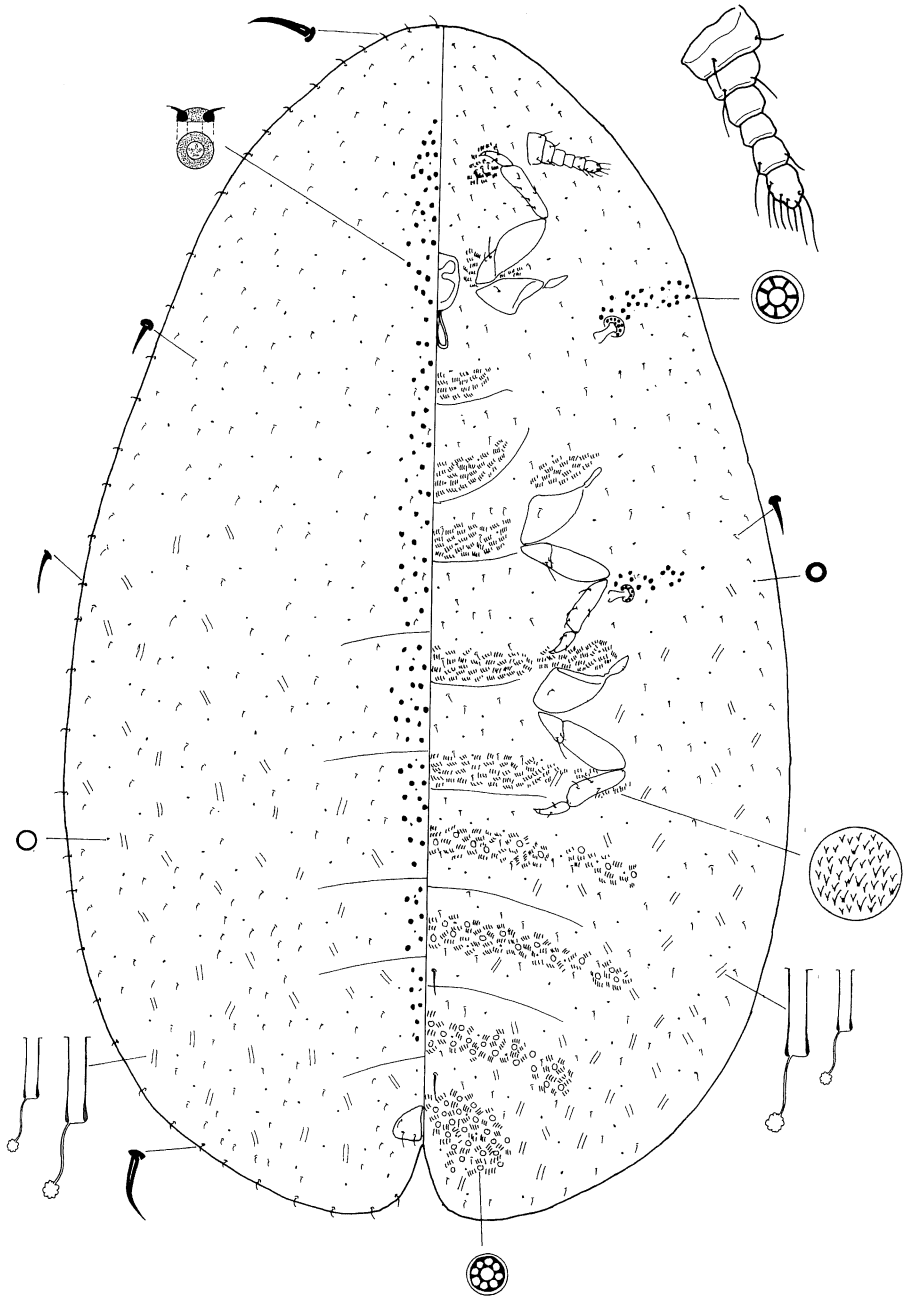

Fig. 8 - *Lecanopsis aphenogastrorum,* adult female.

Lecanopsis subterranea (Gómez-Menor Ortega, 1948) **n. comb.**

Filippia subterranea Gómez-Menor Ortega, 1948: 94; Kozár & Walter, 1985: 77.
Lecanopsis festucae Borchsenius, 1952 **n. syn..** Borchsenius, 1957: 103; Tereznikova, 1981: 110; Kozár and Walter, 1985: 77; Kosztarab & Kozár, 1988: 193; Tang, 1991: 23; Ben-Dov, 1993:157; Koteja, 1998: 94.
Lecanopsis formicarum Newstead, Ben-Dov, 1993:157 (in part, misidentification).
Paralecanopsis festucae (Borchsenius, 1952), Pellizzari, 1995: 40.

ADULT FEMALE (Fig. 9)

LIVING SPECIMENS: orange, elongate, moderately convex with short anal cleft.
MOUNTED SPECIMENS: elongate elliptic, 3,56-5 (4,05) mm long and 2,16-2,7 (2,53) mm wide.
VENTER: derm membranous, with signs of segmentation only on thorax and abdomen. Dermal spinules present medially from head to last abdominal segment. Antennae usually 7-8-segmented, seldom 6-segmented. Legs stout, tarsus subconical and weekly curved. Spiracles opening in a peritreme cavity. Spiracular disc-pores usually absent or rare near anterior and posterior spiracles; when present, with 5-8 (7) loculi and a diameter of 5,8-7,2 μm, numbering 0-9 (2,66) near anterior, and 0-4 (0,7) near posterior spiracle. Pregenital disc-pores with 6-8 (7) loculi and a diameter of 8,4-10,1 μm, present on the last five abdominal segments, numerous near genital opening. Minute simple pores with sclerotized rim rare, scattered all over venter. Tubular ducts of two sizes, numerous on abdomen, present also on thorax, rare on head. Minute hair like-setae numerous, scattered. One pair of interantennal setae, one (rarely two) pairs of pregenital setae.
MARGIN: marginal setae longer and thicker than the other setae scattered on venter.
DORSUM: derm membranous, with signs of segmentation. Anal plates subtriangular with widely rounded angles. Preopercular pores with a diameter of 7,4-9,6 μm, forming a narrow longitudinal band extending from head to anal region. Band of preopercular pores wider on thorax and on first two abdominal segments, where it appears as wide as space between legs. Small simple pores scattered. Tubular ducts of two sizes, numerous on abdomen and thorax, few on head. Minute hair-like setae scattered.

FIRST INSTAR (Fig. 10)

LIVING SPECIMENS: body orange, elongate, flattened. Legs and antennae well developed.
MOUNTED SPECIMENS: body elongate, oval, 0,59-0,66 (0,61) mm long and 0,19-0,24 (0,25) mm wide. Eyes large, situated dorso-marginally.
VENTER: antennae 6-segmented, 118-199 (129) μm long. Legs subequal. Tarsal digitules longer than claw digitules. Loop of mouth stylets 241-295 (275) μm long, reaching abdominal segment IV. Spiracular disc-pores, with 5-8 loculi forming 5 groups along ventral margin. First group, near anterior spiracle, with 4-8 (4,7) disc pores, second, near posterior spiracle, with 3-6 (4,3) disc pores, third group, close to second, consisting of one disc pore. Fourth and fifth groups each have 2-4 (2,6) disc pores. There are 2 spiracular disc-pores in each peritreme cavity. One pair of interantennal

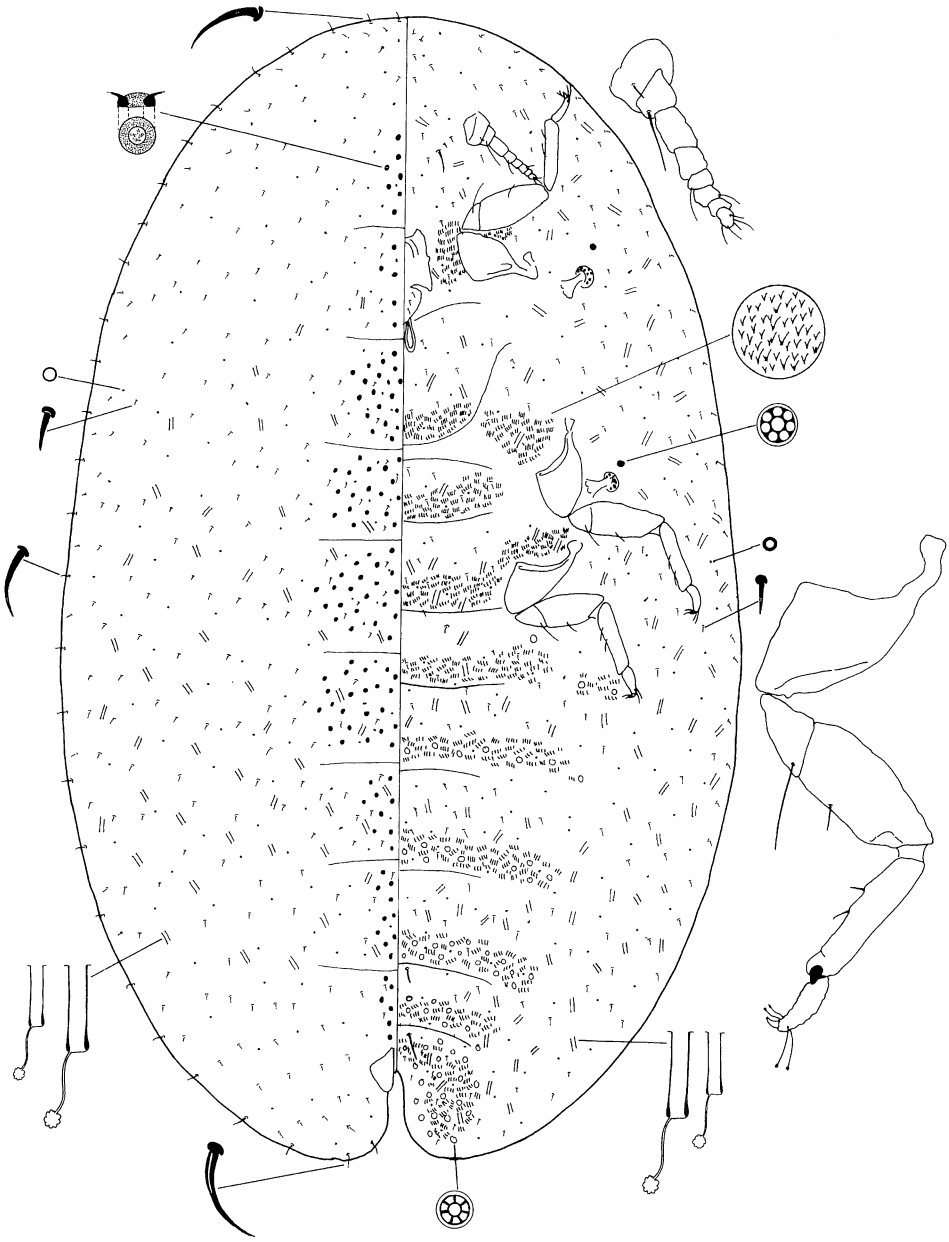

Fig. 9 - *Lecanopsis subterranea*, adult female.

setae. Minute ventral setae forming a submarginal row around body and two submedial longitudinal rows on abdomen.
MARGIN: anal lobes well developed with apical seta 170-210 (190) µm long. Marginal minaret-like setae, present on margin of head and abdomen, absent on thorax. There are (on either side) 5 (seldom 4) minaret-like setae on head and 5 (seldom 6) on last abdominal segments: two on ventral margin of last two abdominal segments, with other 3 on dorsal margin of remaining segments (see fig.).
DORSUM: anal ring with 6 setae. Normal anal plates absent. One pair of dorsal setae present medially on each thoracic segments.

SECOND-INSTAR FEMALE: not known.

THIRD-INSTAR FEMALE (Fig. 11)

LIVING SPECIMENS: not seen
MOUNTED SPECIMENS: body elongate, oval, 2,64-2,76 (2,7) mm long and 1,2-1,32 (1,26) mm wide. Eyes very small, marginal.
VENTER: dermal spinules not detectable, according to Borchsenius (1957) present on thorax and on fist abdominal sternites. Antennae 7-segmented, short, wide at base. Legs reduced, stout, with all segments well developed, tibia and tarsus sub-conical. Tarsal and claw digitules well developed, longer than claw. Loop of mouth stylets reaching mesosternum. Spiracular disc-pores with 6-10 loculi, forming a submarginal band, 2-6 pores wide, from head to last abdominal segments. Spiracular pore band extending medially anterior to posterior spiracles. Spiracles with peritreme cavity covered with disc pores. Ventral setae small, scattered. One pair of interantennal setae. Small simple pores not detectable.
MARGIN: marginal spine-like setae short and conical on anal lobes; longer on head, thorax and abdomen.
Dorsum: anal plates well developed, subtriangular. Anal ring with 6 setae. Dorsal setae small, scattered. Ventral setae small, scattered. Small simple pores not detectable.

SECOND-INSTAR MALE: described by Borchsenius (1957) as 2nd-instar female (not seen).

ADULT MALE: not known.

TYPE MATERIAL. Lectotype of *Filippia subterranea*: 1 adult female, **Spain**, Monte Araca, de Vitoria, leg. Pérez de San Romàn, slide N° H.C. 56, (MNCN).
Types of *L. festucae*: 1 adult female, **Ukraine**, Odessa, Mezhlimanski Massiv, 26.IV.1935; 1 adult female and 2 3rd-instar females, Maikop District, Kodzhoh Village, 29.IX.1932, slide N° 93=51, (ZIAS).
OTHER MATERIAL EXAMINED - **France**: M. Ventouse, Vaucluse, 1400 m, 29.V.1936, 3 adult females, leg. Balachowsky (as *L. formicarum*), slides N° 5055/3-4-6 (MNHN); **Italy**: Castello di Graines (AO), 7.VI.65, 1 adult female, leg. Sampò (DAAPE); Val Fondillo (AQ), 1000m, 11.V.96, 2 adult females and crawlers, leg. Fontana, slides N°

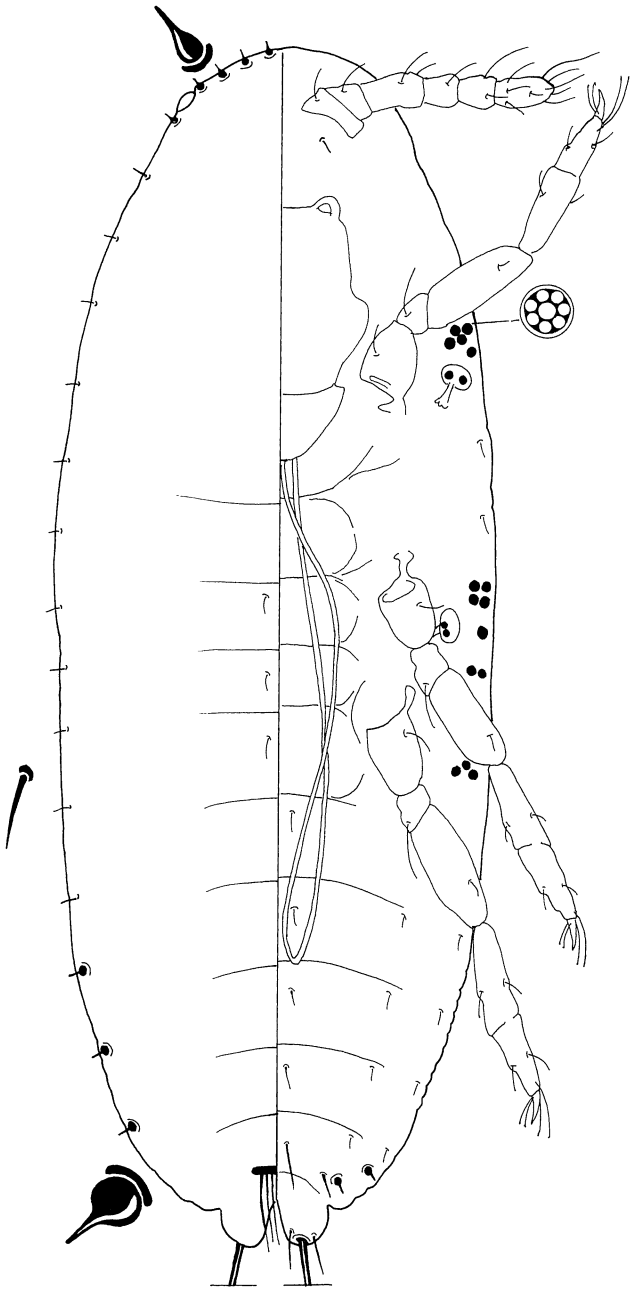

Fig. 10 - *Lecanopsis subterranea*, first instar.

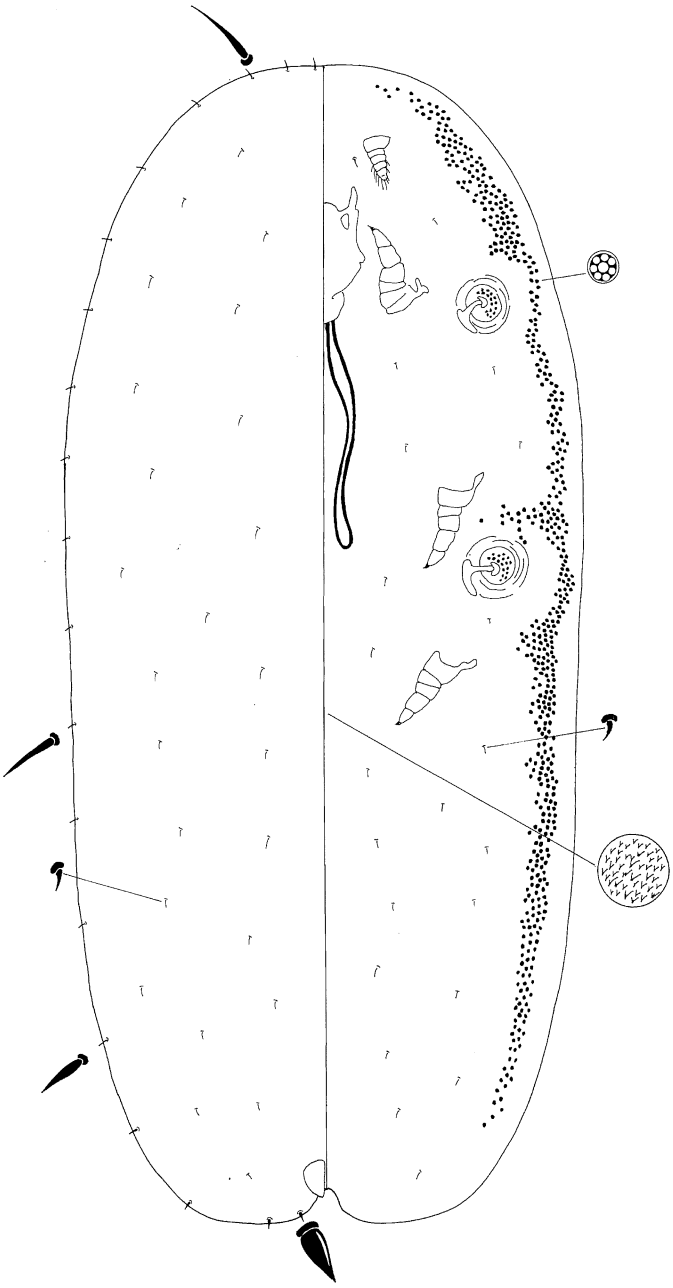

Fig. 11 - *Lecanopsis subterranea,* 3rd-instar female.

1053/1-2 and 1054/1-4 (DAAPE); Val di Rose (AQ), 1250m, 12.V.1996, 1 adult female and crawlers, leg. Fontana, slides N° 1055 and 1056/1-5 (DAAPE); Opi (AQ), 1190m, 11.V.1999, 7 adult females and crawlers, leg. Malagnini & Fontana, slides N° 884/1-7, 884/3/1-10, 884/4/1-4 (DAAPE); Monte Pollino, Piani di Ruggio (PZ), 1550m, 26.VI.1998, 6 adult females, leg. Fontana, slides N° 856/1-6 (DAAPE); Passo di Godi (AQ), 11.V.1999, 1 adult female, leg. Malagnini & Fontana, slide N° 880; same locality, crawlers of N° 880, 25.V.1999, slides N° 896/1-13; Villetta Barrea (AQ), 7.VI.2001, 1 adult female and crawlers, leg. Fontana, slides N°1014/1-2, (DAAPE).

DISTRIBUTION, Palearctic Region: Spain, Hungary, Bulgaria, Romania, Ukraine, Moldavia, Russia (Caucasus), Mongolia (Ben-Dov, 1993), Switzerland (Kozár *et al.*, 1994), France, Italy.

HOST PLANTS: Gramineae (*Agrostis, Dactylis, Elytrigia, Festuca, Poa*).

BIOLOGY: living on crown roots of Gramineae; adult females often found under stones. One generation per year (Kosztarab & Kozár, 1988).

COMMENTS. The study of the type of *Filippia subterranea*, listed as a synonym of *L. formicarum* (Ben-Dov, 1993; Koteja, 1998), proved it belongs to the genus *Lecanopsis*. The type of *Filippia subterranea* is in no way different from the type of *L. festucae*, nor from the subsequent redescriptions of the this species (Tereznikova, 1981; Kosztarab and Kozár, 1988), thereby *L. festucae* becomes an objective junior synonym of *F. subterranea.*

The main distinctive character of the adult female of this species is the absence of spiracular pores near the spiracular openings (sometimes 1-5 pores may be present, mainly in populations from Italy) and this character proved to be constant in all the specimens examined.

The 1st instar has been briefly described and illustrated by Tereznikova (1981: 112). Unfortunately, in the same book, three pages onward, the same illustration is presented as 1st instar of *L. porifera* (= *L. turcica*). Since the 1st instar of *L. turcica* is well known and differs from the illustration at page 115, we assume that the drawing on page 112 refers in fact to *L. festucae*. A comparison between the drawing of Tereznikova at p. 112 and the morphology of 1st instars obtained from adult females of *L. subterranea* collected in Italy, proved that they are very similar.

Whereas the 1st instar can be identified on the basis of its morphology, the 3rd female nymph could be identified on the basis of the great number of spiracular disc-pores arranged in a wide marginal band, in comparison with the lower number of other species, but we do not know if this character is stable. The drawing of the 3rd-instar female by Tereznikova (1981) does not correspond to the types of the 3rd-instar female of Borchsenius (the two known specimens, in poor condition, were collected by Borchsenius together with the adult female, so that their identity is sure) but appears to be similar to the same instar of *L. formicarum.* In our opinion, an identification of *L. subterranea* based solely on 3rd instar could lead to a misidentification.

Lecanopsis turcica (Bodenheimer, 1951)

Paralecanopsis turcica Bodenheimer, 1951: 329; Bodenheimer, 1953:109; Borchsenius, 1957: 113; Hodgson, 1994: 432; Pellizzari, 1995: 40.
Lecanopsis porifera Borchsenius, 1952: 282, syn. by Hodgson, 1994: 432. Borchsenius, 1957: 91; Kozár & Walter, 1985: 77; Kosztarab & Kozár, 1988: 194; Ben-Dov, 1993:159; Koteja, 1998: 96;
Lecanopsis formicarum Newstead, 1893; Rehacek, 1960: 22 (misidentification).
Lecanopsis turcica (Bodenheimer, 1951); Ben-Dov, 1980: 263; Kozár & Walter, 1985: 77; Ben-Dov, 1993: 160; Koteja, 1998: 97.

ADULT FEMALE (Fig. 12)

LIVING SPECIMENS: not seen.
MOUNTED SPECIMENS: elongate elliptic, 2,08-4,84 (3,26) mm long and 1.11-3,56 (2,23) mm wide.
VENTER: derm membranous, with signs of segmentation. Dermal spinules present medially from head (very few spinules) to last abdominal segment. Antennae 6-segmented, with subequal segments, as long as wide; last segments with numerous setae. Legs stout, tibio-tarsal sclerosis present, tarsus subconical and weakly curved. Spiracles each opening in a peritreme cavity. Spiracular disc-pores with 6-8 loculi and a diameter of 6,4-7,4 μm forming an elongate group of 17-31 (22,6) pores, near each anterior spiracle and a group of 10-24 (18) pores near each posterior spiracle; 9-24 spiracular disc-pores are also present in the anterior and posterior peritreme cavity. Pregenital disc-pores usually with 7-10 loculi and a diameter of 8,5-10 μm, numerous near genital opening and on last abdominal segments, present on first two abdominal segments. Small simple pores with sclerotized rim numerous and scattered all over venter. Tubular ducts of two sizes, numerous on abdomen, present also on thorax. Minute hair-like setae numerous, scattered. Three pairs of interantennal setae and one pair of pregenital setae.
MARGIN: marginal setae hair like, short. Setae on margin of anal lobes longer than other marginal setae.
DORSUM: derm membranous, with signs of segmentation on thorax and abdomen. Anal plates subtriangular with widely rounded angles. Preopercular pores of different sizes, with a diameter of 7,4-10,7 μm, forming a wide longitudinal band, as wide as extending from head to anal region. Small simple pores scattered. Tubular ducts of two sizes present in lower number than on venter. Minute hair-like setae scattered.

FIRST INSTAR (Fig. 13)

LIVING SPECIMENS: not seen.
MOUNTED SPECIMENS: body elliptic, elongate, 0,65-0,816 (0,74) mm long. Eyes large, situated dorso-marginally.
VENTER: antennae 6-segmented. A pair of interantennal setae. Legs subequal, stout. Tibia and tarsus without articulatory sclerosis. Tarsal digitules longer than the claws

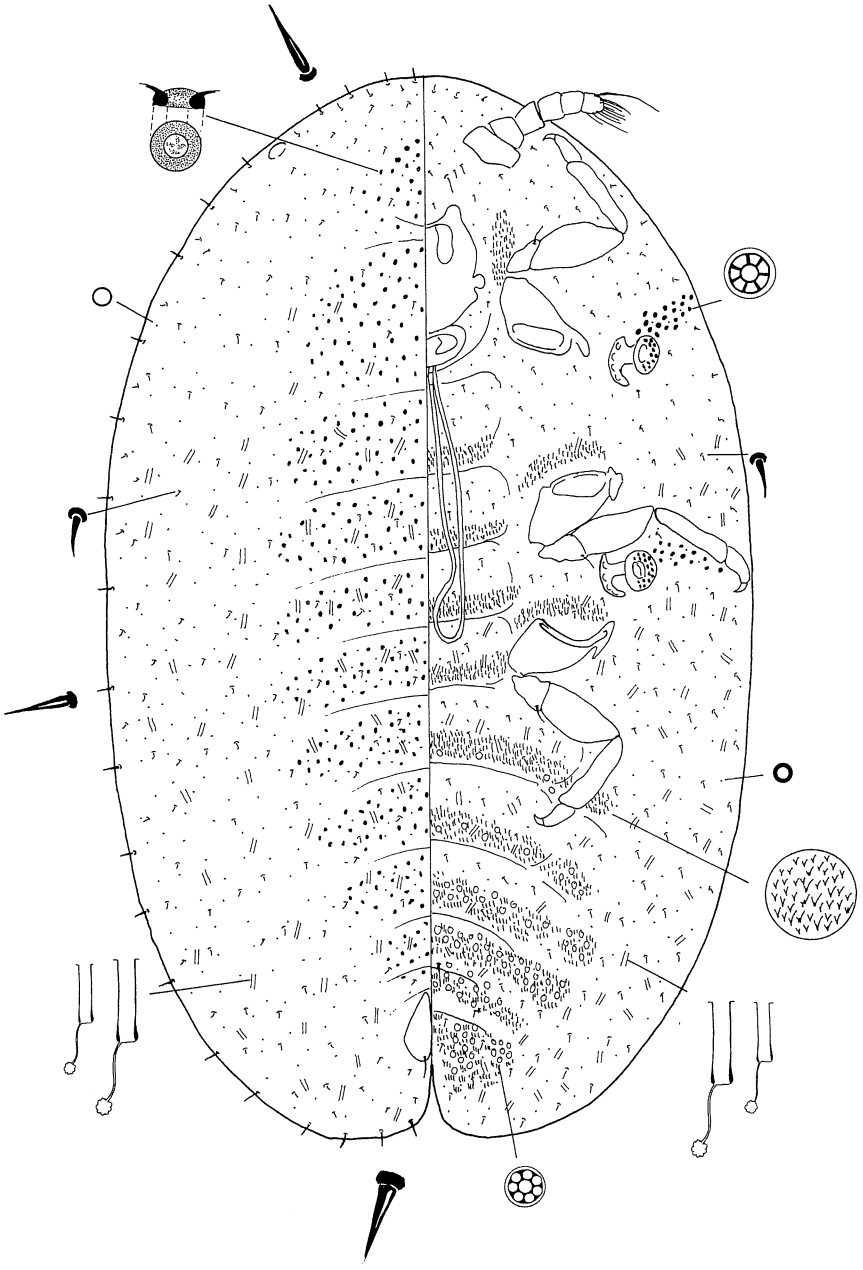

Fig. 12 - *Lecanopsis turcica*, adult female.

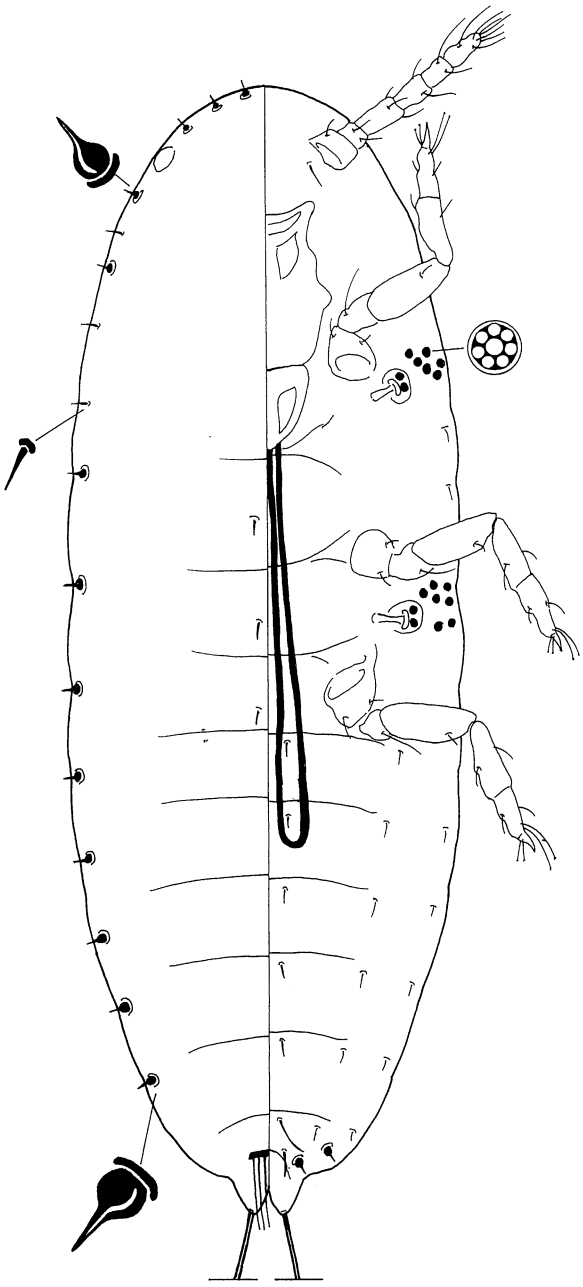

Fig. 13 - *Lecanopsis turcica* - first instar.

digitules. Spiracular disc-pores with 5-9 loculi, forming groups of 7-10 (8) disc pores between each anterior spiracle and body margin, and a group of 5-9 (7,5) disc pores between the posterior spiracle and the body margin, 1 or 2 disc pores located in each peritreme cavity. Minute ventral setae forming one marginal, one submarginal and one submedial longitudinal row on abdomen.
MARGIN: anal lobes well developed with the apical setae 0,3 mm long. Minaret-like setae present on margin of dorsum except for the last two that are on margin of venter. There are (on each side) 5 minaret-like setae on head, 3 on thorax and 7 on abdomen.
DORSUM: anal ring with 6 setae. Anal plates absent. One pair of setae present medially on each thoracic segments.

SECOND-INSTAR FEMALE: not known.

THIRD-INSTAR FEMALE (Fig. 14)

LIVING SPECIMENS: not seen. According to Bodenheimer (1953) living specimens are entirely enclosed in a wax glassy test.
MOUNTED SPECIMENS: body elliptic elongate, 1,2-2,06 (1,64) mm long and 0,5-1,22 (0,83) mm wide.
VENTER: dermal spinules present medially from head to last abdominal segment. Antennae very short, conical, 5-segmented (seldom 6). Labium short. Legs reduced, stout, with all segments well developed, tibia and tarsus sub-conical. Claw sub-conical, short. Tarsal digitules short. Spiracles with several disc pores in the peritreme cavity (the precise number difficult to determine). Spiracular disc-pores with 6-11 loculi, forming two group of 20-55 (40,2) disc-pores near each spiracle. Ventral setae small and short. Three pairs of interantennal setae, one pair of setae on last ventral segment. Small simple pores scattered all over venter.
MARGIN: marginal setae small, sub-conical or spine-like.
DORSUM: anal plates well developed, subtriangular. Anal ring with 6 setae. Small simple pores scattered all over dorsum.

SECOND-INSTAR MALE (Fig. 15)

LIVING SPECIMENS: not seen.
MOUNTED SPECIMENS: body elliptic elongate, 1,1-1,4 mm long. Eyes small, marginal.
VENTER: antennae 7-segmented. Loop of mouth stylets reaching the prosternum. Legs well developed, long. Claw long, subconical. Tarsal digitules longer than claw digituled. Spiracular disc-pores with 7-10 loculi forming a group of 3-12 disc pores near anterior spiracle and a group of 0-2 near posterior spiracle. Spiracles with 4-6 spiracular disc pores in each peritreme cavity. Small simple pores scattered. Two pair of interantennal setae and pairs of large, median setae, on four posterior abdominal sternites.
MARGIN: marginal setae thick and long (15-20 μm) on head and abdomen, smaller on thorax.
DORSUM: anal plates well developed, subtriangular. Small simple pores scattered.

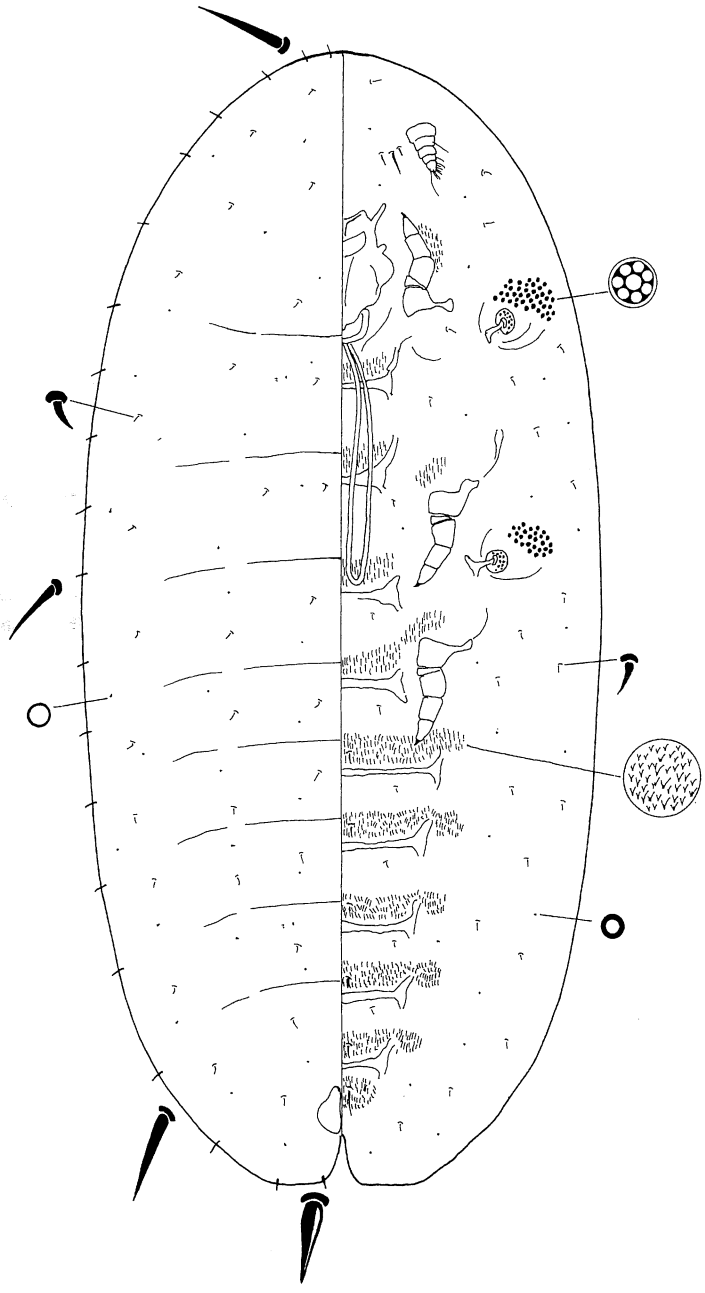

Fig. 14 - *Lecanopsis turcica*, 3rd-instar female.

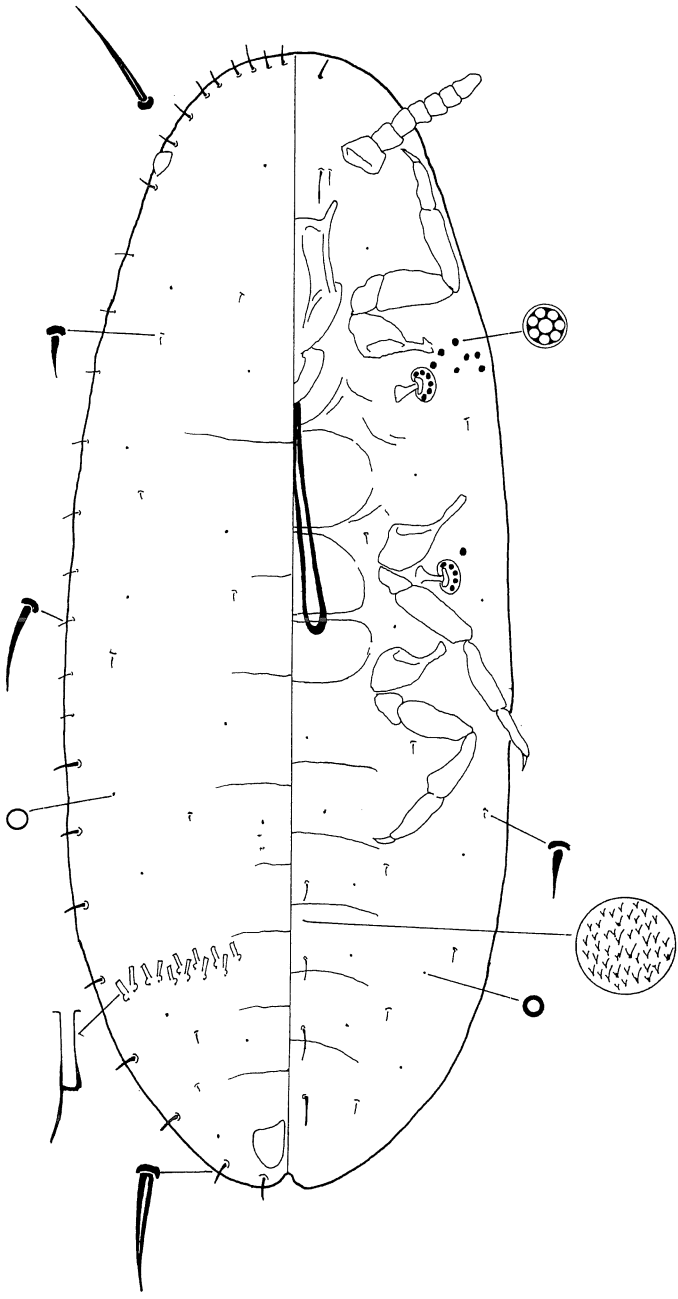

Fig. 15 - *Lecanopsis turcica*, 2nd-instar male.

Dorsal setae small, scattered. Tubular ducts present in a medially interrupted row across abdominal segment IV, with 11-12 ducts on each side.

PUPARIUM
Not seen. According to the drawing of Rehacek (1960) (as *L. formicarum*) it appears very similar to those of *L. formicarum* and *L. clodiensis*.

ADULT MALE: not known.

TYPE MATERIAL EXAMINED. Syntypes of *L. turcica*: 7 crawlers, 2 2nd-instar males, 2 3rd-instar females, **Turkey**, Kayaardi, 11.VII.1939, slide N° 228 (DERI) (type series designated by Ben-Dov, 1980).
Types of *L. porifera*: 2 adult females, **Ukraine**, Odessa, Mezhlimansky Massiv, under stones and on roots of *Festuca,* 26.IV.1935, slide N° 338=50, (ZIAS); 1 adult female and 1 3rd-instar female, Odessa, right side river Kuyal'n-liman, 1.X.1928, leg. Kirichenko, slide N° 72=51/E (ZIAS); 2 2nd instar males, 1 1st instar, Odessa, 1.X.1928, slide N° 72=51/D; (ZIAS).
OTHER MATERIAL EXAMINED. **Hungary**: Izvafo, 2 crawlers, 29.VII.1987, leg. Kozár, slide N° 3075a (PPIB); Zsambek, 2 3rd-instar females, 27.IX.1981, slide N° 1686, (PPIB); Velence, Benechegy, 2 adult females, 24.V.1980, leg. Kozár, slide N° 1187 (PPIB); Budapest, Budaors, 3 adult females, 23.V.1981, leg. Kozár, slide N° 1495a (PPIB).

DISTRIBUTION. Palearctic Region: Slovenia, Hungary, Romania, Ukraine, Georgia, Armenia, Turkey (Ben-Dov, 1993), Slovakia (Rehacek, 1960, as *L. formicarum*).

HOST PLANTS: *Agropyron, Bromus, Dactylis, Elytrigia, Festuca, Lolium, Secale.*

BIOLOGY: living on the root-crowns of Gramineae. One generation/year. Adult females in May (Kosztarab & Kozár, 1988).

COMMENTS. This species is easily identifiable as the adult female and 1st -instar nymph as well as 3rd-instar female. The adult female has 6-segmented antennae and a large longitudinal band of preopercular pores on dorsum. The 3rd-instar female, erroneously redescribed as 2nd instar by Hodgson (1994), presents a large group of spiracular disc-pores near the stigmatic openings and this character proved to be unique among the *Lecanopsis* so far as is known. It is likely that the 2nd-instar female, not known until now, will exhibit the same character.

L. formicarum, recorded and illustrated by Rehacek (1960) for Slovakia, has been assigned to *L. turcica* on the basis of his drawings, that clearly represent an adult female and a 1st-instar nymph of this species.

Lecanopsis iridis Borchsenius, 1952

Lecanopsis iridis Borchsenius, 1952: 291; Borchsenius, 1957: 106; Danzig, 1980: 303; Kozár & Walter, 1985: 77; Tang, 1991: 24; Ben-Dov, 1993: 158; Koteja, 1988: 96.

ADULT FEMALE: not known.

FIRST INSTAR (Fig. 16)

LIVING SPECIMENS: not seen.
MOUNTED SPECIMENS: body oval, elongate, 1,2 mm long. Eyes large, situated dorso-marginally.
VENTER: antennae 6-segmented. One pair of interantennal setae. Legs well developed, subequal. Tarsal digitules longer than claw digitules. Loop of mouth stylets not detectable. Spiracular disc pores with 5-9 loculi, forming 5 groups. First group, near the anterior spiracle, with 8-11 disc pores, second group, near posterior spiracle, with 4-8 disc pores, third, near second group, always with 1 disc pore, fourth and fifth groups each with 2-7 disc pores. Spiracles with 2-5 disc-pores in each peritreme cavity. Minute ventral setae not detectable.
MARGIN: anal lobes well developed each with a long apical seta. Marginal minaret-like setae, present on top of head (2 setae on each side) and on last three segments of abdomen, two on ventral margin and one on dorsal margin. Other four marginal setae of abdomen also minaret-like, but very small in comparison with others. Other marginal setae on thorax and head hair-like.
DORSUM: anal ring with 6 short setae. Normal anal plates absent. Dorsal setae not detectable.

SECOND INSTAR FEMALE (Fig. 17)

LIVING SPECIMENS: not seen. According to Borchsenius (1957) living specimens are oval, and bright red.
MOUNTED SPECIMENS: body oval, elongate, 1,3-1,9 mm long.
VENTER: dermal spinules not detectable, present, according to Borchsenius (1957) on head, thorax and abdomen. Antennae reduced, conical, 6-segmented. Legs reduced, conical, with tibia and tarsus partially fused. Tarsal digitules not detectable. Spiracular disc-pores with 6-8 loculi, forming a submarginal band, 1-4 pores wide, usually extending from head, at level of antennae, to fifth or sixth abdominal segments. Spiracular pore band extending anteriorly to each first spiracle and anteriorly and posteriorly to second spiracles. Spiracles with 22-28 disc pores within peritreme cavity. Ventral setae not detectable. One pair of interantennal setae. Small simple pores not detectable.
MARGIN: marginal setae similar to minaret-like setae of first instar, but smaller, present on head (2 on each side) and 4 or 5 on last abdominal segments; other marginal setae short, hair-like.
DORSUM: anal plates small, subtriangular. Anal ring with 6 setae. Small simple pores not detectable.

THIRD-INSTAR FEMALE (Fig. 18)

LIVING SPECIMENS: not seen.
MOUNTED SPECIMENS: body oval, 2,2 mm long.
VENTER: dermal spinules present medially on head, thorax and abdomen. Antennae

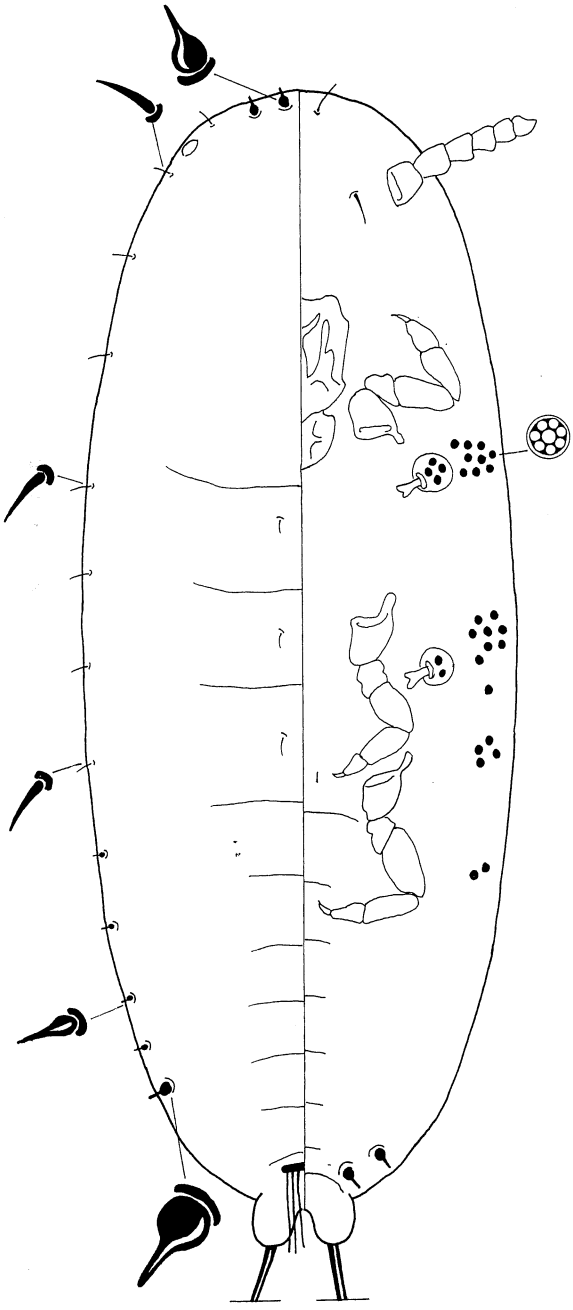

Fig. 16 - *Lecanopsis iridis,* first instar.

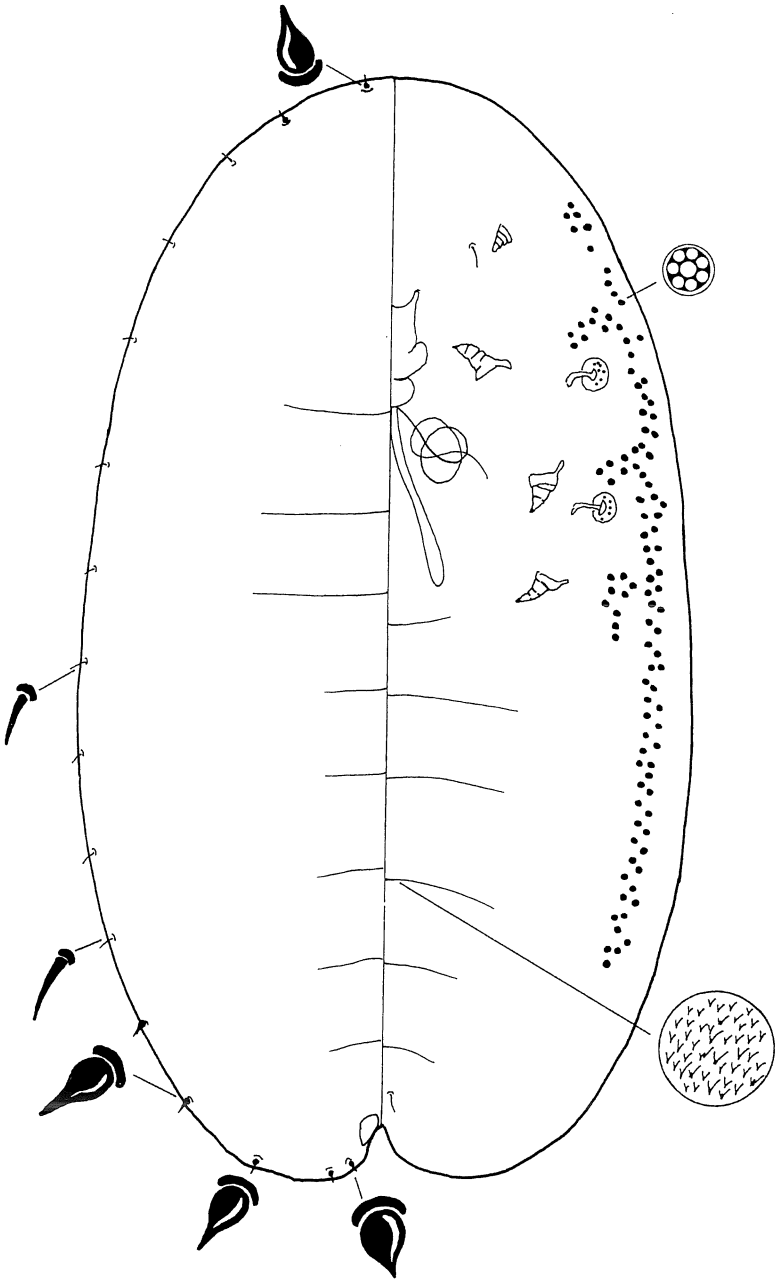

Fig. 17 - *Lecanopsis iridis,* 2nd-instar female.

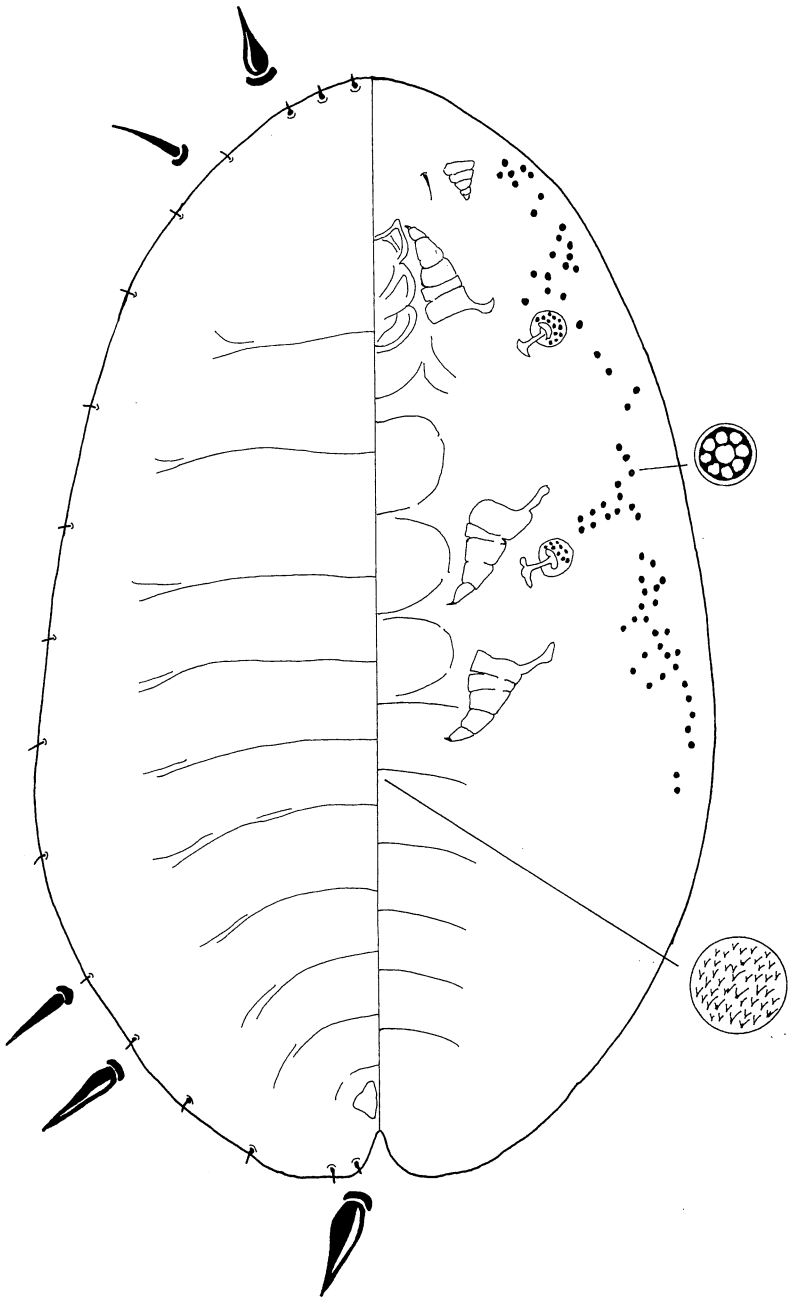

Fig. 18 - *Lecanopsis iridis,* 3rd-instar female.

reduced, conical, 7-segmented. Legs reduced, conical. Spiracular disc-pores with 8 or 9 loculi, forming a sparse submarginal band, usually 1-2 pores wide, extending from head, at level of antennae, to second abdominal segment. Spiracular pore band extending from margin to above each spiracle and behind each second spiracle. Spiracles with peritreme cavity covered by disc pores. Ventral setae not detectable. One pair of interantennal setae. Small simple pores not detectable.
MARGIN: marginal setae small and conical, numbering 6 on head and 5, longer, on each margin of the last abdominal segments; other marginal setae short, hair-like.
DORSUM: anal plates present, subtriangular. Anal ring with 6 setae. Dorsal setae not detectable. Small simple pores not detectable.

SECOND-INSTAR MALE: not known.

ADULT MALE: not known.

TYPE MATERIAL EXAMINED. Syntypes of *L. iridis*: 2 crawlers, **Russia**, Primorje Territory, Ussurisk Region, Grigor'ievka Village, 12.VIII.1947, leg. Borchsenius, on *Iris* (slide N° 196=49/G); 2 2nd-instar female and 1 3rd-instar female, same data and locality, leg. Borchsenius, on *Iris uniflora*, slide N° 196=49/H (ZIAS).

DISTRIBUTION - Palearctic Region : Russia (Primorje Territory).

HOST PLANTS: *Iris uniflora* (Iridaceae).

BIOLOGY: according Borchsenius (1957) it lives under the dry leaves on the rhizome of *Iris uniflora*.

COMMENTS. This is the only species of *Lecanopsis* collected on a plant that is not a grass. It was described from immature stages only. The type series of this species comprises two 1st instars, two 2nd-instar females and one 3rd-instar female collected in the village of Grigor'evka (Primorje) on 12.VIII.1949. The specimens are rather poor, so that several morphological characters are undetectable. The 1st instar clearly differs from other 1st instars of *Lecanopsis* so far known in possessing fewer minaret-like setae on the body margin. The 2nd-instar female and the 3rd-instar female differ slightly from the same instars of other *Lecanopsis* species (with the exception of *L. turcica*) in the distribution and shape of part of the marginal setae and in having a small group of spiracular pores just below the posterior spiracles. We cannot ascertain whether these characters are stable within the species or not, for the species is known only from the type series. For further comments see *L. shutovae*.

Lecanopsis shutovae Borchsenius, 1952

Lecanopsis shutovae Borchsenius, 1952: 293; Borchsenius, 1957: 108; Danzig, 1980: 257; Kozár & Walter, 1985: 77; Tang, 1991: 25; Ben-Dov, 1993: 160; Koteja, 1988: 97.

ADULT FEMALE (Fig. 19)

LIVING SPECIMENS: not seen.

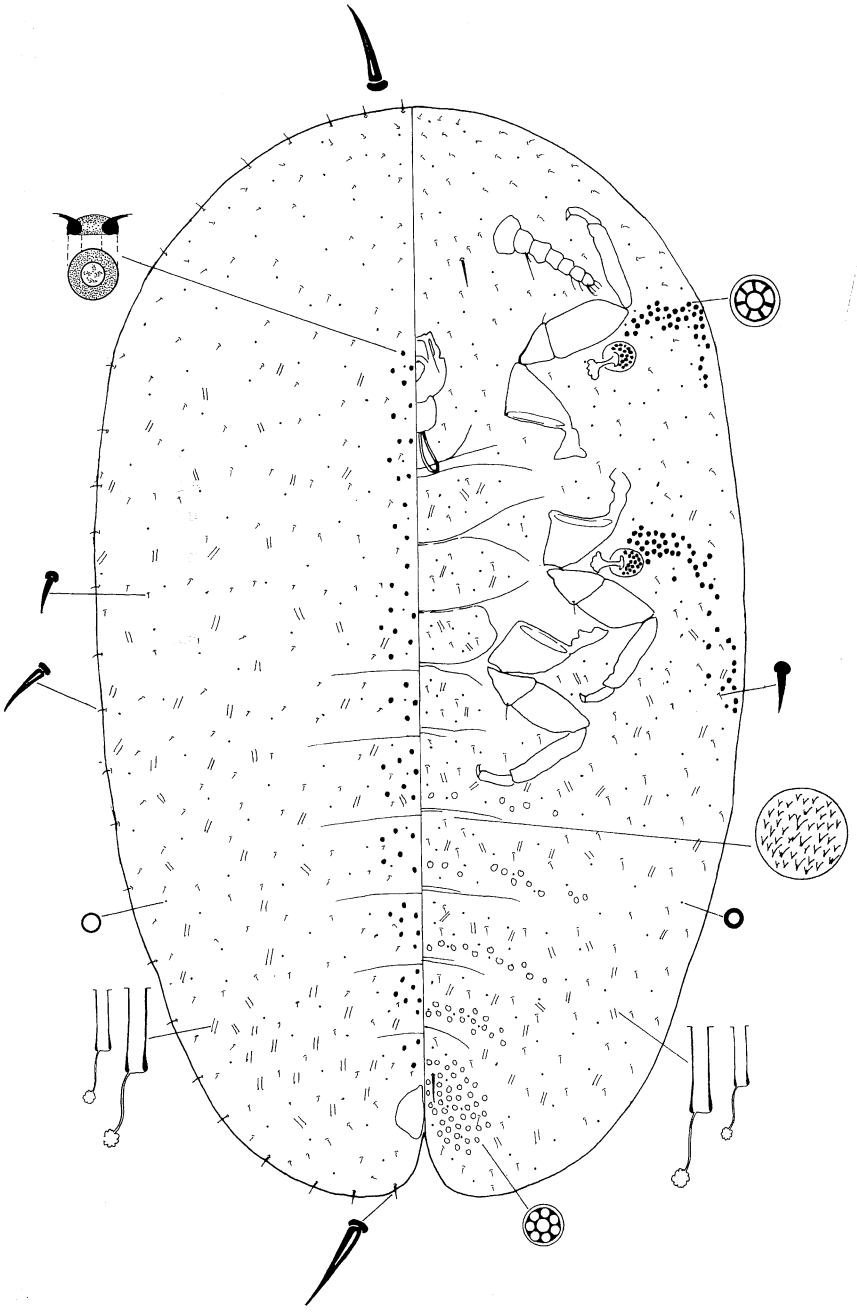

Fig. 19 - *Lecanopsis shutovae*, adult female.

MOUNTED SPECIMENS: elongate, broadly oval, 3,2-5 mm long and 2-3 mm wide.
VENTER: derm membranous, with signs of segmentation on thorax and abdomen. Antennae 7-segmented (7-8 according to Borchsenius (1957). Legs stout, femur stout, tibia straight, tarsus curved. Spiracles opening in a peritreme cavity. Spiracular pores with 5-9 loculi and a diameter of 6 μm, forming an elongate, irregular group of 53-65 disc pores, from each anterior spiracle to body margin and with a few pores extending posteriorly along body margin. A group of 42-46 disc-pores is in front of each posterior spiracle and extends below, with about 18 22 disc-pores, along the body margin. Several spiracular disc-pores are within the peritreme cavities. Pregenital disc-pores with 6-8 loculi and a diameter of 12 μm, numerous near the genital opening and on last abdominal segments. Small simple pores with sclerotized rim, numerous and scattered all over venter. Tubular ducts of two sizes, numerous on abdomen, present also on thorax. Minute hair-like setae scattered. One pair of interantennal setae and one pair of pregenital setae present.
MARGIN: marginal setae hair-like, short. Setae on margin of the anal lobes longer than the other marginal setae.
DORSUM: derm membranous, with signs of segmentation on thorax and abdomen. Anal plates subtriangular with widely rounded angles. Preopercular pores each with a diameter of 9,6 μm, forming a narrow longitudinal band (maximum width 5 pores) extending from head (few pores) to anal region. Small simple pores scattered. Tubular ducts of two sizes, numerous on abdomen, present also on thorax. Minute hair-like setae scattered.

FIRST INSTAR: not known.
SECOND-INSTAR FEMALE: not known.
THIRD-INSTAR FEMALE: not known.
SECOND-INSTAR MALE: not known.
ADULT MALE: not known.

TYPE MATERIAL EXAMINED. Lectotype of *L. shutovae*: 1 female, **Russia**, Primorje Territory, Ussurisk Region, Grigor'ievka Village, 17.VI.1937, leg. Stipanov & Schutova, on grass roots, slide N° 94 (ZIAS).

DISTRIBUTION. Palearctic Region : Russia, Primorje Territory.

HOST PLANTS: *Festuca* and other Gramineae.

BIOLOGY: lives on the crown of Gramineae. Adult females collected in June and July (Borchsenius, 1957).

COMMENTS. The type series is on three slides. Of these, the first has one adult female (lectotype), collected in the village of Grigor'evka (Primorje) at 17.VI.1937 on the roots of Gramineae. The other two slides have respectively two 3rd -instar females, and three 1st instars mixed with one 2nd -instar female. These specimens were collected in the same locality, but twelve years later (13.VIII.1949). The adult female was described as *L. shutovae* and all young instars were attributed to the same species.

The 1st instars have the same morphological characters as *L. formicarum*. The 2nd and 3rd-instar females differ from the same instar of *L. formicarum* only by having the marginal spines on the head and on the last abdominal segments more conical than in specimens of *L. formicarum* from Central Europe. It appears questionable to assign these nymphs to the same species of a female collected twelve years before. Moreover, in the same locality, almost at the same date (12.VIII.1949), three young stages of a *Lecanopsis*, described as *L. iridis*, were collected. It is clear that young stages of two different species, but only one adult female, the type of *L. shutovae*, were collected at Grigor'evka (Primorje) in different periods. As previously stated, the young stages described as *shutovae*, are very similar to *formicarum* and therefore have been attributed to the latter species.

The adult female of *L. shutovae* differs from other species mostly by having, in addition to the group near posterior spiracle, a row of spiracular pores extending posteriorly along the body margin. In the opinion of the original author (Borchsenius, 1957), this character has a diagnostic value. For the 2nd and 3rd -instar females of *L. iridis* both possess a small group of spiracular pores just behind the posterior spiracles (see above), we suspect that the adult female of *L. shutovae* could be the adult female of *L. iridis*. Both these species are known only from the type series and have not been recorded since. The systematic solution to this case cannot be resolved from such a paucity of available specimens and further material from the original locality is needed.

Lecanopsis taurica Borchsenius, 1952.

Lecanopsis taurica Borchsenius, 1952: 285; Borchsenius, 1957: 99; Kozár & Walter, 1985: 77; Ben-Dov, 1993: 160; Koteja, 1998: 97.
Paralecanopsis taurica (Borchsenius); Pellizzari, 1995: 40.

ADULT FEMALE (Fig. 20)

LIVING SPECIMENS: not seen.
MOUNTED SPECIMENS: body oval, 3,8 mm long and 2,2 mm wide.
VENTER: derm membranous, with signs of segmentation on thorax and abdomen. Antennae 8-segmented. Legs stout (the type has not well moulted legs). Spiracles opening in a peritreme cavity. Spiracular pores with 7-8 loculi and a diameter of 7,2 µm, forming a elongate group of 18-27 disc pores, near each anterior spiracle and a group of 10-19 disc pores near each posterior spiracle. 8-13 spiracular disc-pores are also present in walls of the anterior and posterior peritreme cavities. Pregenital disc-pores with 7-10 loculi and a diameter of 10 µm, numerous near genital opening and on last abdominal segments, with a few on first two abdominal segments. Small simple pores with sclerotized rim numerous and scattered all over venter. Tubular ducts of two sizes, numerous on abdomen, present also on thorax. Minute spine-like setae numerous, scattered. One pair of interantennal setae and one pair of pregenital setae.

MARGIN: marginal setae thorn-like, long. Setae on margin of anal lobes longer than the other marginal setae.
DORSUM: derm membranous, with signs of segmentation on thorax and abdomen. Anal plates subtriangular with widely rounded angles. Preopercular pores of different sizes with a diameter of 10-12 μm, forming a large longitudinal band from mesothorax to level of genital region. Longitudinal band appearing as a series of transversal bands present on each tergite (Fig. 20). Small simple pores scattered. Tubular ducts of two sizes, fewer than on venter. Minute hair-like setae scattered.

FIRST INSTAR: not known.
SECOND-INSTAR FEMALE: not known.

THIRD-INSTAR FEMALE (Fig. 21)

LIVING SPECIMENS: not seen.
MOUNTED SPECIMENS: body oval, 3,5 mm long.
VENTER: dermal spinules detectable on thorax and first abdominal segment. Antennae reduced, conical, 7-segmented. Loop of mouth stylets reaching the mesosternum. Legs reduced, markedly conical. Tarsal and claw digitules longer than claw. Spiracular disc-pores with 6-11 loculi, forming a submarginal band, 1-4 pores wide, with numerous pores, extending from head (at level of antennae) to the 4^{th} or 5^{th} abdominal segment. It extends medially anterior to each spiracle and posterior to second spiracle. Spiracles with peritreme cavity covered by disc pores. Ventral setae small, scattered. Small simple pores scattered.
MARGIN: marginal setae conical on anal lobes and head, spine-like, short and stout the others.
DORSUM: anal plates well developed, subtriangular. Anal ring with 6 setae. Dorsal setae small, scattered. Small simple pores scattered.

SECOND-INSTAR MALE (Fig. 22)

LIVING SPECIMENS: not seen.
MOUNTED SPECIMENS: body elongate oval, 1,2 mm long.
VENTER: antennae 7-segmented. Loop of mouth stylets reaching prosternum. Legs well developed, long. Claw long, subconical. Tarsal digitules longer than claw digitules. Spiracular disc-pores, each with 5-8 loculi, forming a group of 6 or 7 pores near anterior spiracle and a group of 1 or 2 pores near posterior spiracle. Peritreme cavity with 3-6 pores. Small simple pores scattered. Microducts present on median part of head and thorax and forming a group under anterior spiracles. A pair of interantennal setae and pairs of large, medial setae, on each of 3 posterior abdominal sternites, longer on last.
MARGIN: marginal setae thick and long (20-30 μm) on head and abdomen, shorter on thorax.
DORSUM: anal plates well developed, subtriangular. Small simple pores scattered.

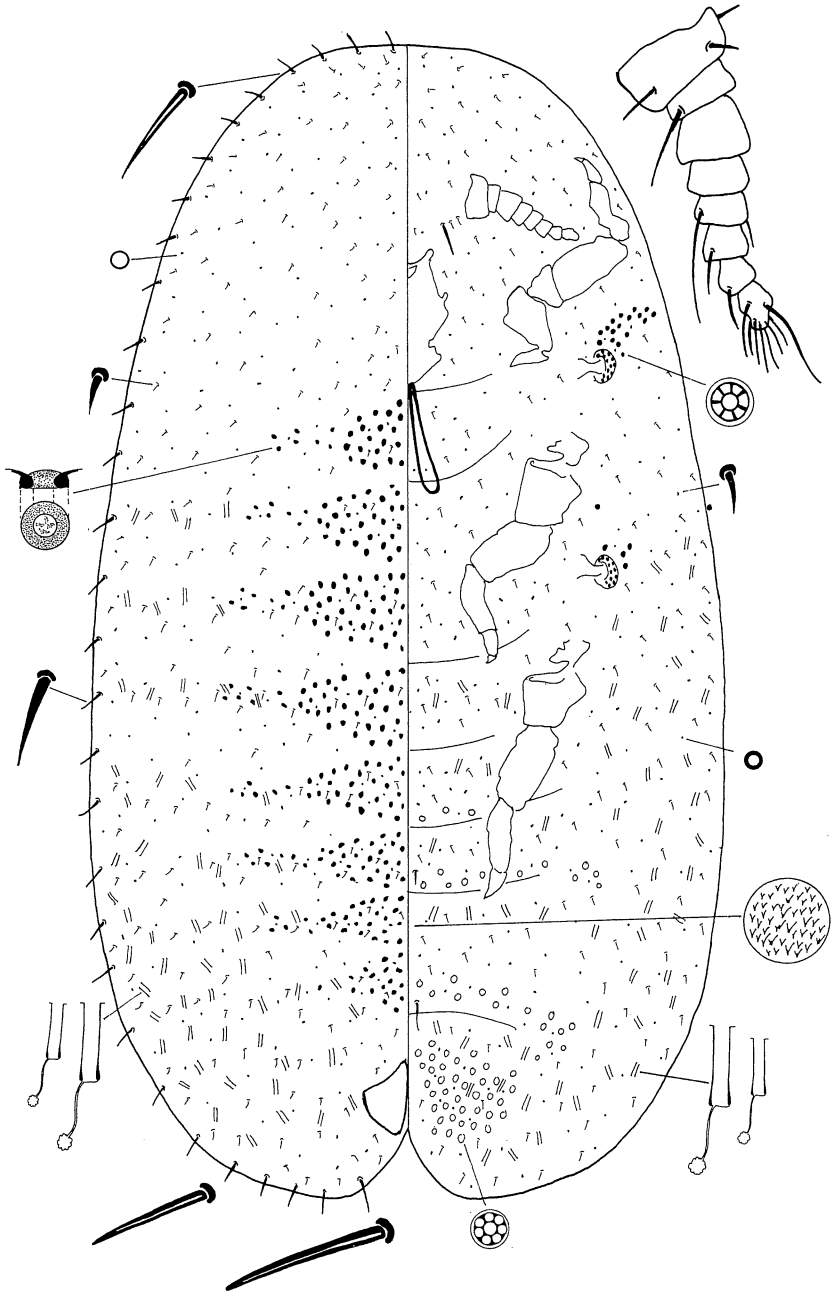

Fig. 20 - *Lecanopsis taurica,* adult female

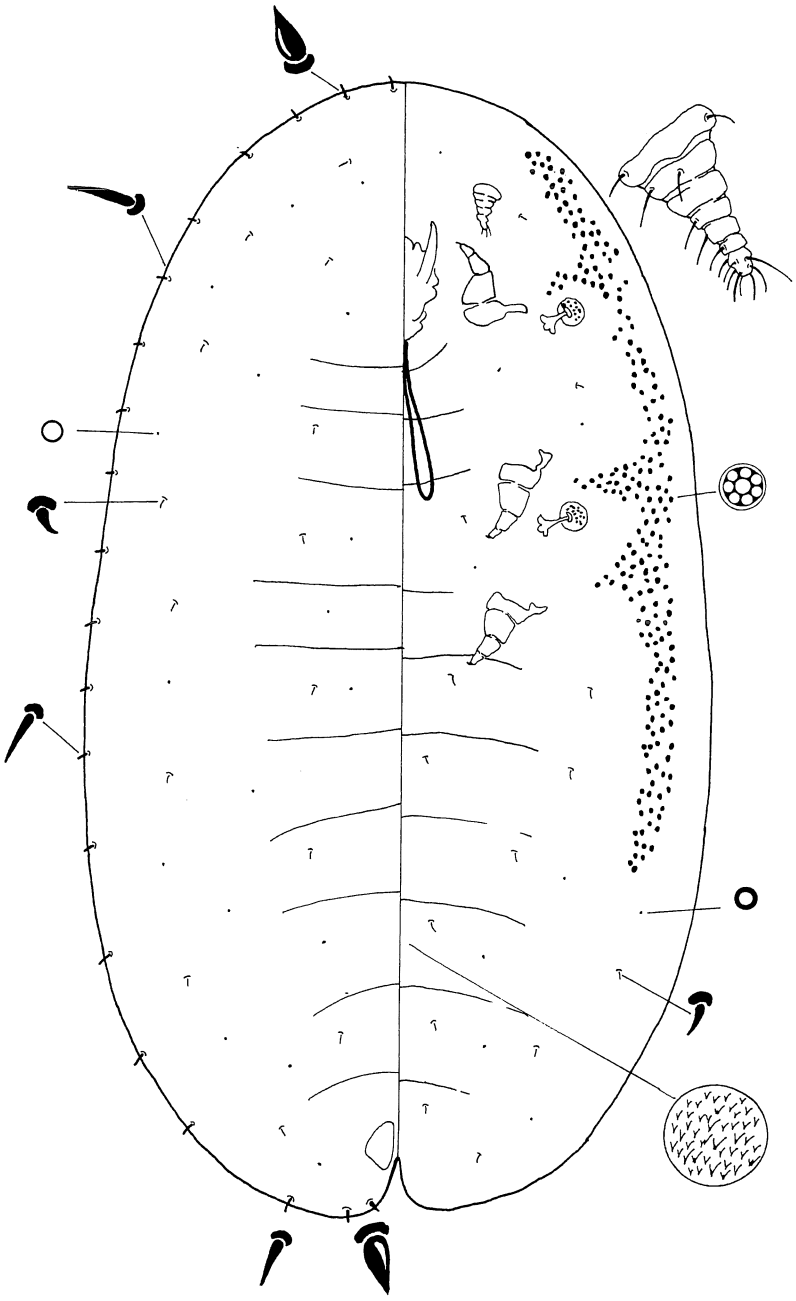

Fig. 21 - *Lecanopsis taurica,* 3rd-instar female.

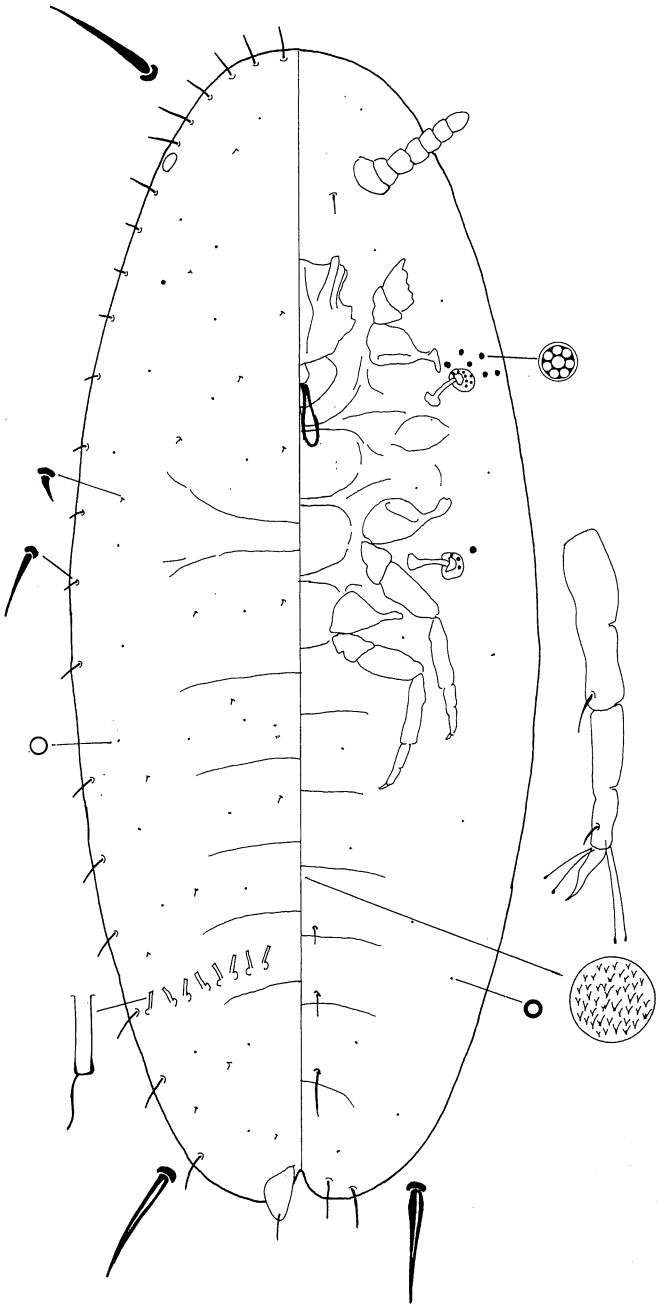

Fig. 22 - *Lecanopsis taurica,* 2nd-instar male.

Tubular ducts present in a medially interrupted row across the fourth abdominal segment, with about 8 ducts on each side.

ADULT MALE: not known.

TYPE MATERIAL EXAMINED. Syntypes of *L. taurica*: 1 adult female, 1 2nd-instar male, 1 3rd-instar female, **Ukraine,** Crimea, North slope, near Marievka Village, about 2,5 Km from Sinferopoli on *Bromus erectus*, 18.X.1929, slide N° 272=51 (ZIAS).

DISTRIBUTION. Palearctic Region: Ukraine.

HOST PLANTS: *Bromus erectus.*

BIOLOGY: on root crown and under leaf sheaths of *Bromus erectus* (Borchsenius, 1957).

COMMENTS. This species has not been recorded since its description and is known only from the type series, collected in October, comprising one adult female, one 3rd -instar female and one 2nd-instar male. The only known adult female has been cut transversally (as usually in Borchsenius slides), moreover, it appears to be a newly moulted specimen, not yet sclerotized. It is characterised by having a large band of preopercular pores on the dorsum, 8-segmented antennae and stout setae along the body margin. The 3rd -instar female is characterised by its large and short band of marginal spiracular pores. The presence in October of an adult female, together with a 3rd-instar female and one 2nd-instar male, is also remarkable. In fact, adult females of *Lecanopsis* are usually present during spring.

Lecanopsis clodiensis (Pellizzari, 1995)

Paralecanopsis clodiensis Pellizzari, 1995: 36.
Lecanopsis brevicornis Newstead, 1896, Leonardi, 1920: 326 (misidentification).
Lecanopsis clodiensis (Pellizzari), Pellizzari & Fontana, 2001: 323.

ADULT FEMALE (Fig. 23)

LIVING SPECIMENS: orange in colour, oval, elongate, dorsum convex with short anal cleft. Reproductive females partially enclosed in a white, loose egg sac.
MOUNTED SPECIMENS: elongate elliptic, 3,8-8,5 (6,12) mm long and 1,95-5,56 (3,83) mm wide.
VENTER: derm membranous, with signs of segmentation on thorax and abdomen. Dermal spinules present medially from antennae to genital opening. Antennae 6-8-segmented (usually 7). Legs stout. Femur stout, tibia straight, tarsus subconical and weakly curved. Spiracles opening in a peritreme cavity. Spiracular disc-pores with 6-11 loculi and a diameter of 7,2 µm, forming an elongate group of 20-204 (86,5) pores near each anterior spiracle and a group of 0-51 (11) pores near each posterior spiracle. Number of spiracular disc-pores highly variable among different populations (see comments and tab. 1). Also 30-68 (48) spiracular disc-pores present in anterior peri-

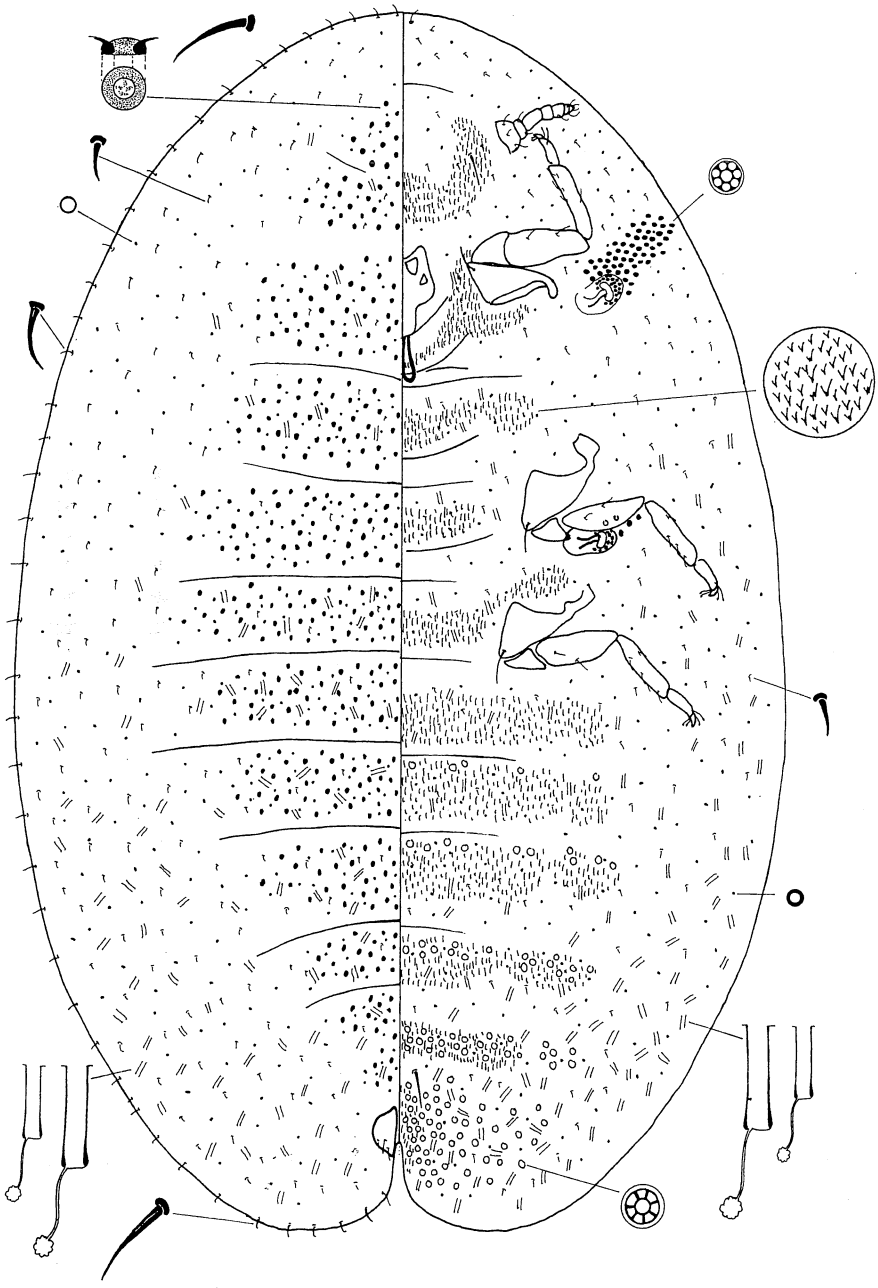

Fig. 23 - *Lecanopsis clodiensis*, adult female.

Table 1 - Number of spiracular disc-pores in 10 specimens from different localities.

	anterior spiracle			posterior spiracle		
Locality	**min.**	**max.**	**aver.**	**min.**	**max.**	**aver.**
Isola Verde (VE) (Veneto region: Venice lagoon)	20	83	**51**	0	7	**3**
Isola Vicentina (VI) (Veneto region: prealps)	31	120	**82**	4	23	**11**
Apulia region (several localities)	48	136	**84**	0	15	**6**
Popoli (AQ) (Abruzzo region: Apennine)	76	204	**133**	4	40	**24**

treme cavity and 26-77 (50) in posterior peritreme cavity. Pregenital disc-pores with 7-8 loculi and a diameter of 9-10 μm, numerous near the genital opening and on last abdominal segments with a few in first two abdominal segments. Small simple pores with sclerotized rim numerous and scattered all over venter. Tubular ducts of two sizes, numerous on abdomen, present also on thorax. Minute spine-like setae numerous, scattered. One pair of interantennal setae and one pair of pregenital setae present.
Margin: marginal setae hair like, short. Setae on margin of anal lobes longer than other marginal setae.
DORSUM: derm membranous, with signs of segmentation on thorax and abdomen. Preopercular pores numerous, of different sizes, with a diameter of 4-9,6 μm, forming a large longitudinal band occupying medial one-half of body width and extending from head to anal region. Small simple pores scattered. Tubular ducts present, fewer than on venter and distributed on thorax and abdomen, rare on head. Minute hair-like setae scattered. Anal plates subtriangular with rounded angles. Anal ring with an irregular row of circular pores and 8 setae.

FIRST INSTAR (Fig. 24)

LIVING SPECIMENS: body yellowish, elongate oval and flattened. Legs and antennae well developed.
MOUNTED SPECIMENS: body elliptic, elongate, 0,680-0,725 (0,7) mm long and 0,207-0,266 (0,243) wide. Eyes large, situated dorso-marginally.
VENTER: antennae 6-segmented, 128-160 (146) μm long. One pair of interantennal setae. Legs subequal, well developed. Tarsal digitules clearly longer than claw digitules. Loop of mouth stylets 240-280 (258) μm long, reaching fourth abdominal segment. Spiracular disc-pores with 5-9 loculi, forming a group of 6-12 (8) pores between each anterior spiracle and body margin and a group of 7-12 (9) pores between each posterior spiracle and body margin. Two (seldom 3) disc pores in each peritreme cavity Minute hair-like setae distributed in longitudinal rows around body and two submedial longitudinal rows on abdomen.

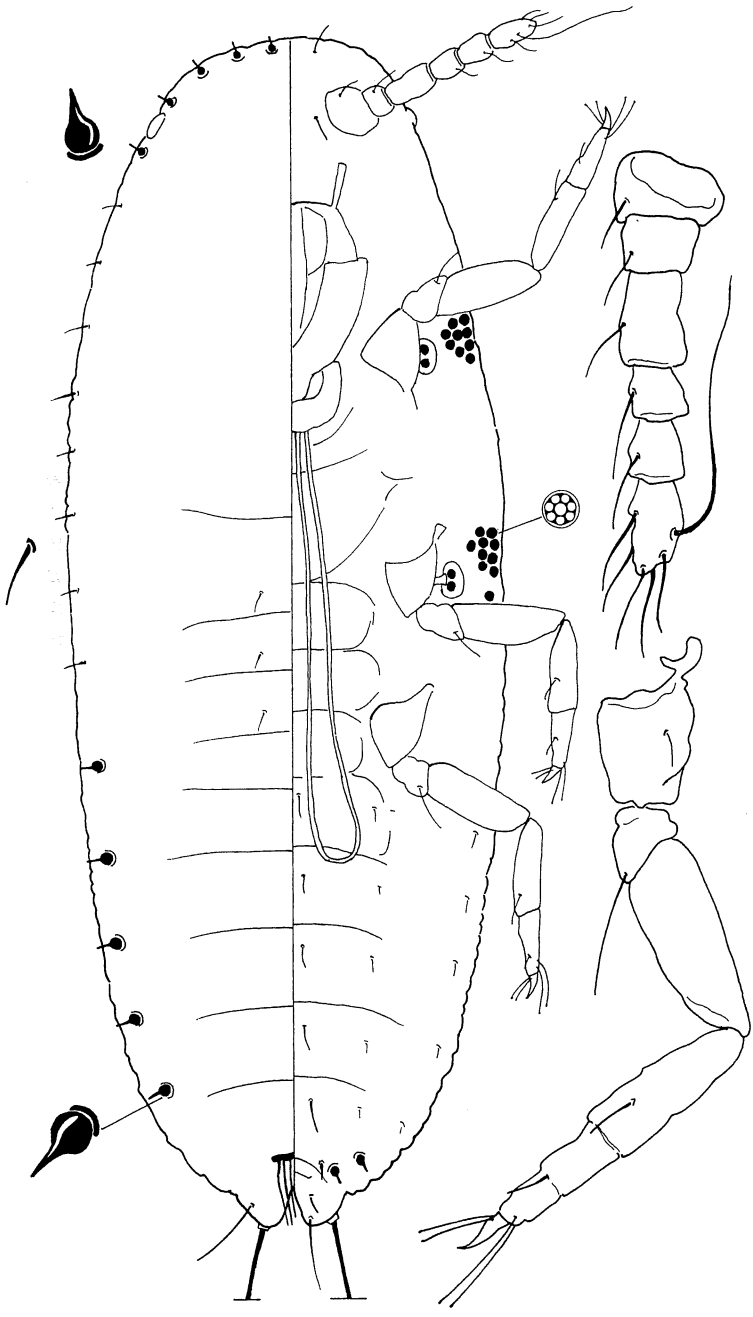

Fig. 24 - *Lecanopsis clodiensis*, first instar.

MARGIN: anal lobes well developed each with 3 setae (2 dorsal and 1 ventral) and a long apical seta 224-300 (253) μm long. Marginal minaret-like setae present on margin of head and abdomen. There are 5 minaret-like setae on either side of head (4 anterior to the eye spot and 1 posterior to the eye spot) and 7, seldom 8, on either side of abdomen. On margin of thorax there are 8 or 9 marginal hair-like setae.
DORSUM: anal ring with 6 setae. Normal anal plates absent. One pair of short dorsal setae on each thoracic segments.

SECOND-INSTAR FEMALE (Fig. 25)

LIVING SPECIMENS: living specimens orange, moderately convex, oval, sometimes with irregular shape, entirely enclosed in a wax glassy test.
MOUNTED SPECIMENS: body oval, 1,29-1,49 (1,39) mm long and 0,62-0,74 (0,68) mm wide.
VENTER: dermal spinules present medially on head, thorax and abdomen. Antennae reduced, conical, 5-6-segmented. Labium short. Legs reduced, sub-conical, stout, with tibia and tarsus partially fused. Tarsal and claw digitules short, same length of claw. Spiracles with 13-24 (17,4) spiracular disc-pores in anterior peritreme cavity and 16-29 (21,6) in posterior peritreme cavity. Spiracular disc pores with 6-8 loculi, forming a loose group or band above each spiracle and extending in a narrow submarginal band, 1 pore wide (rarely 2 pores wide), from the top of head to the 3rd-6th abdominal segments. Ventral setae small and short, submarginal setae on head longer. One pair of interantennal setae. One pair of median setae on last abdominal segments. Small simple pores scattered.
MARGIN: marginal setae small, conical, slightly longer on the head and anal lobes.
DORSUM: anal plates well developed, subtriangular. Anal ring with 6 setae. Small simple pores scattered all over dorsum.

THIRD-INSTAR FEMALE (Figs. 26, 27)

LIVING SPECIMENS: living specimens orange, oval (often irregularly) elongate, convex and entirely enclosed in a wax glassy test.
MOUNTED SPECIMENS: body elongate, oval. Body size highly variable, depending on the age of the individuals (figs. 26, 27). Body size greatly increasing from late summer to following spring, when maximum size is attained. Here are reported the average length and width of specimens collected respectively in September and December. September: 2,58 mm long and 1,33 mm wide; December: 5,08 mm long and 3,08 mm wide.
VENTER: dermal spinules present medially on head, thorax and abdomen. Antennae reduced, conical, 6-segmented. Loop of mouth stylets reaching mesosternum. Legs reduced, conical with all segments well developed. Tarsal and claw digitules longer than claw. Peritreme cavity covered by spiracular disc-pores set very close to each other. Spiracular disc pores with 6-8 loculi forming a loose band above each spiracle and extending in a narrow submarginal band, 1-2 pores wide, from top of head to 3rd-

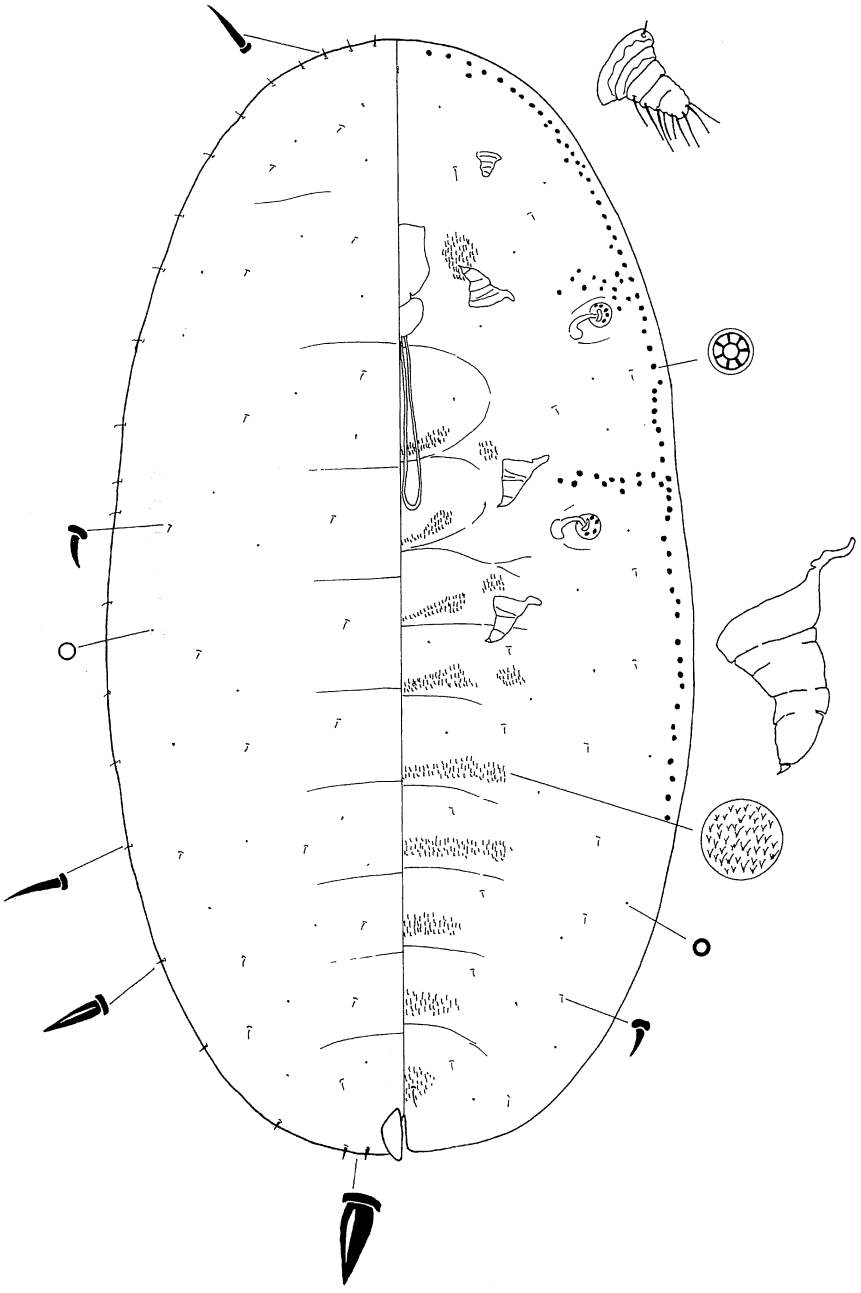

Fig. 25 - *Lecanopsis clodiensis*, 2nd-instar female.

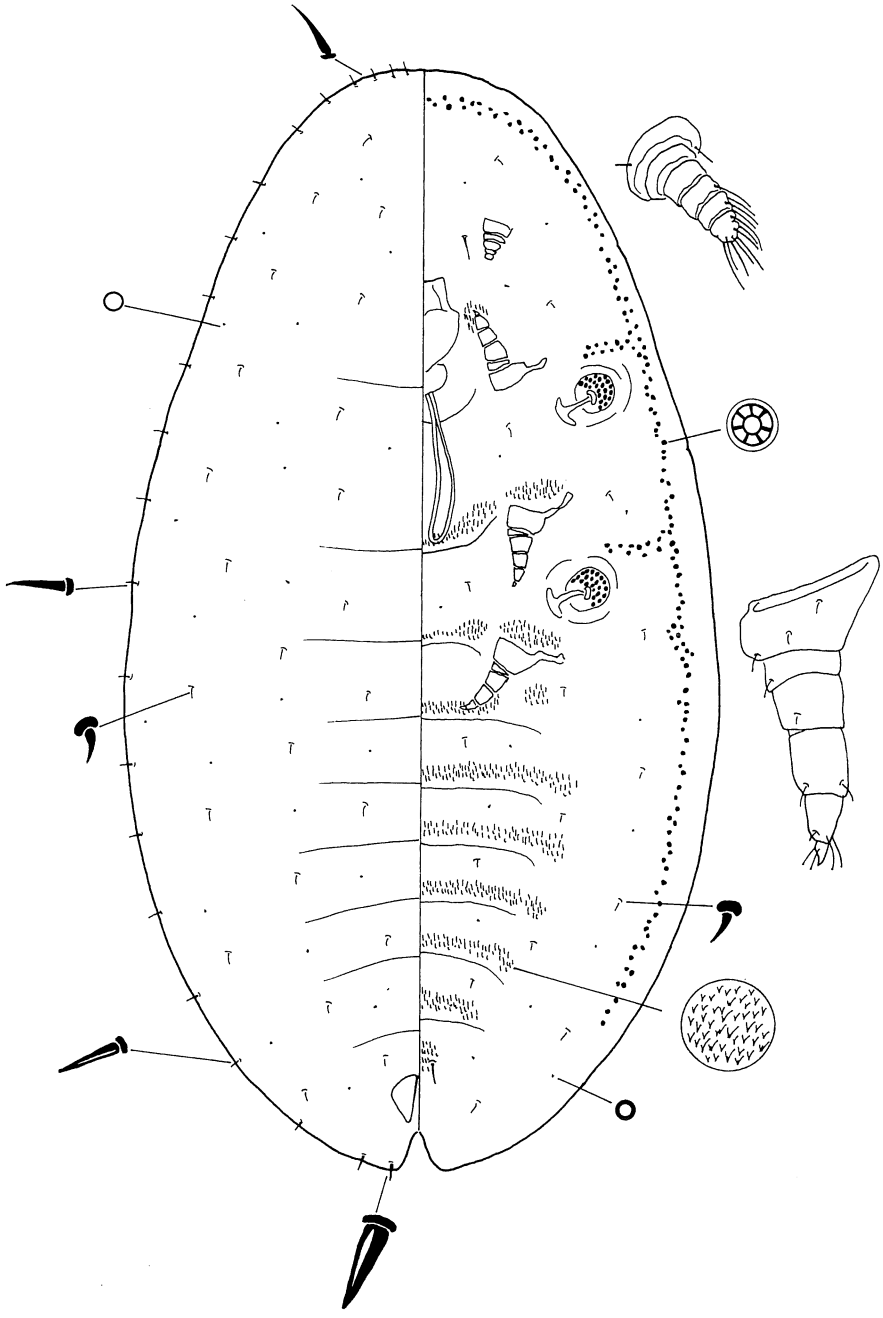

Fig. 26 - *Lecanopsis clodiensis*, 3rd-instar female: body aspect in September, just after the moult.

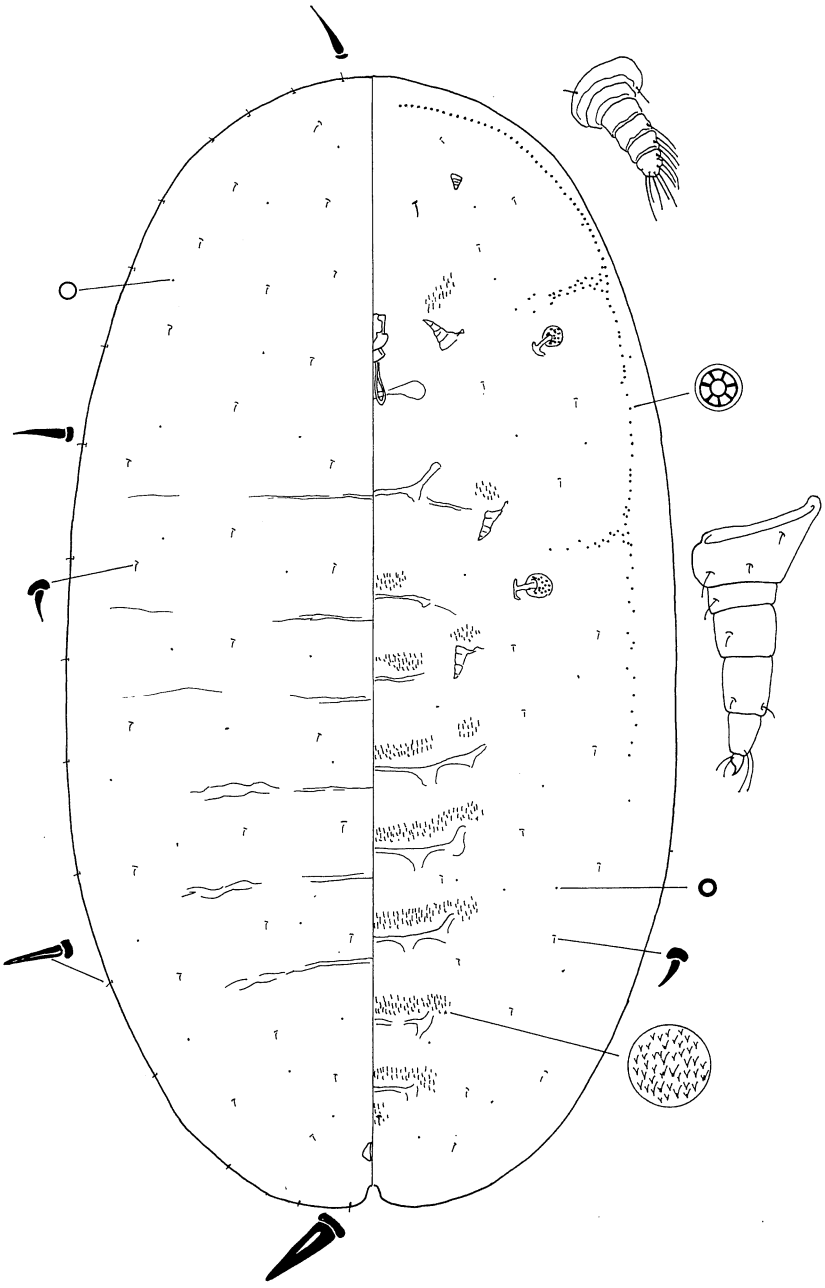

Fig. 27 - *Lecanopsis clodiensis*, 3rd-instar female: fully grown individual.

7th abdominal segments. Small simple pores scattered. One pair of interantennal setae. Minute hair like setae scattered.
MARGIN: marginal setae very short, slightly longer and conical on head and on anal lobes, others hair-like.
DORSUM: anal plates well developed, subtriangular. Anal ring with 6 setae. Dorsal setae small, scattered. Small simple pores scattered.

SECOND-INSTAR MALE (Fig. 28)

LIVING SPECIMENS: living specimens orange, body elongate and flattened, entirely enclosed in a wax glassy test. Legs and antennae well developed.
MOUNTED SPECIMENS: Body elliptic, elongate, 1,29-1,6 (1,5) mm long and 0,5-0,72 (0,62) mm wide. Eyes small, marginal.
VENTER: dermal spinules present on head, thorax and abdomen. Antennae 7-segmented. Loop of the mouth stylets reaching the prosternum. Legs well developed, long. Claw long, subconical. Tarsal digituli longer than claw digituli. Spiracular disc pores with 6-8 loculi, forming a group of 25-40 disc-pores near each anterior spiracle and a group of 1-5 disc pores near each posterior spiracle. Peritreme cavity covered by 14-20 disc pores. Small simple pores scattered. One pair of interantennal setae; one pair of large, median setae, on each of last five abdominal segments.
MARGIN: marginal setae thick, and long on head (with 20-24 setae between eyes) and abdomen, shorter on thorax.
DORSUM: anal plates well developed, subtriangular. Small simple pores scattered. Dorsal setae small, scattered. Tubular ducts present in a medially interrupted row across fourth abdominal segment, with 15-16 ducts on each side.

MALE PUPARIUM
Glassy, thin and wrinkled, enveloping entirely 2nd-instar male; dorsum with only one transversal suture, separating posterior operculum. Ventral and dorsal surface following closely body segmentation of second instar male. Long and twisted wax filaments present on head margin and on abdominal margin.

MALE PREPUPA (Fig. 29)
Bright orange in colour, eyes black and small. Antennae and legs reduced, with indistinct segmentation. Dermal spinules present ventrally. Wing rudiments well appressed to body, extending dorsally to metanotum. Anal lobes conical, as long as penial sheath rudiment. Spiracles small, with 0-1 spiracular pores near each anterior spiracle. Small setae both on dorsum and venter, arranged in longitudinal rows on abdomen and in small groups on thorax and head. Measurements of male prepupa in table 2.

MALE PUPA (Fig. 30)
Bright orange in color, eyes black and little. Antennae 10-segmented. Legs long, with distinct segmentation. Dermal spinules present ventrally. Wing rudiments well appressed to body, extending dorsally to first abdominal segment. Anal lobes conical,

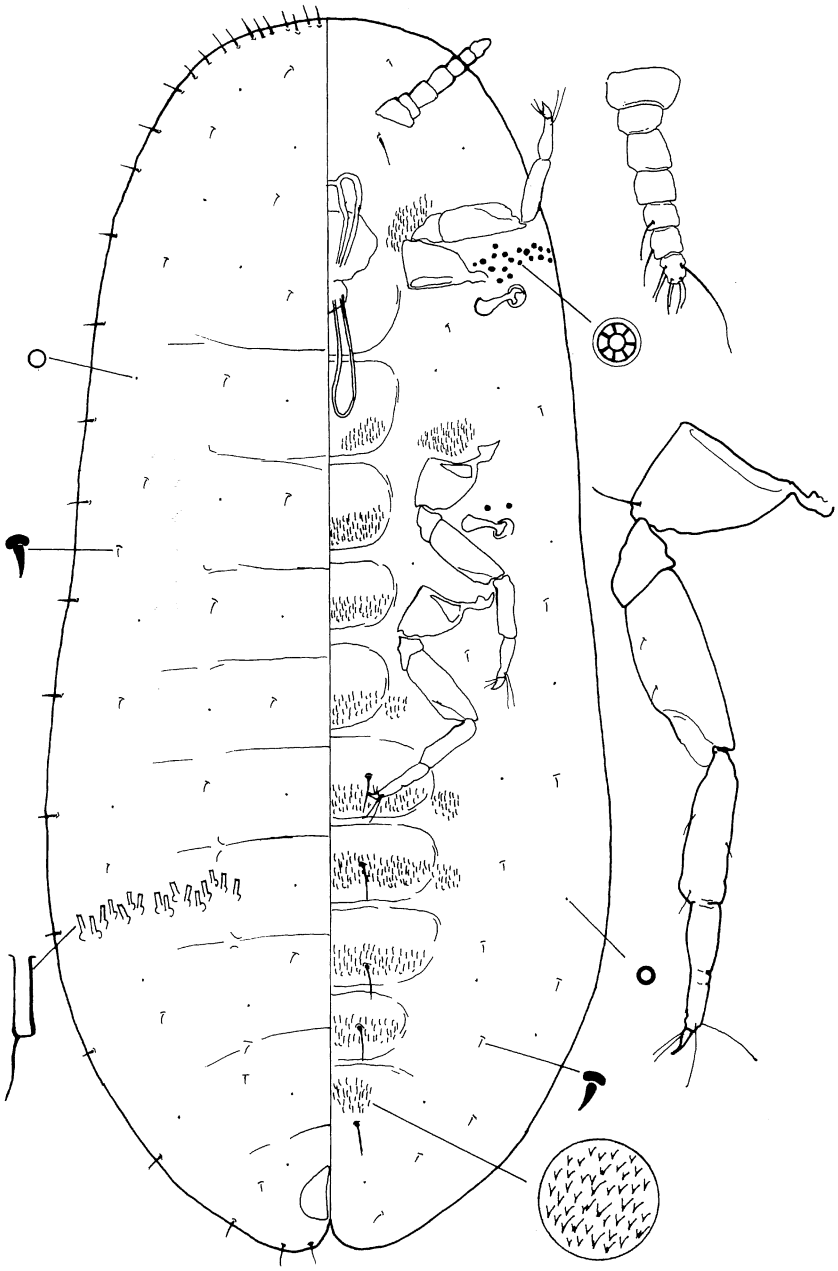

Fig. 28 - *Lecanopsis clodiensis*, 2nd-instar male.

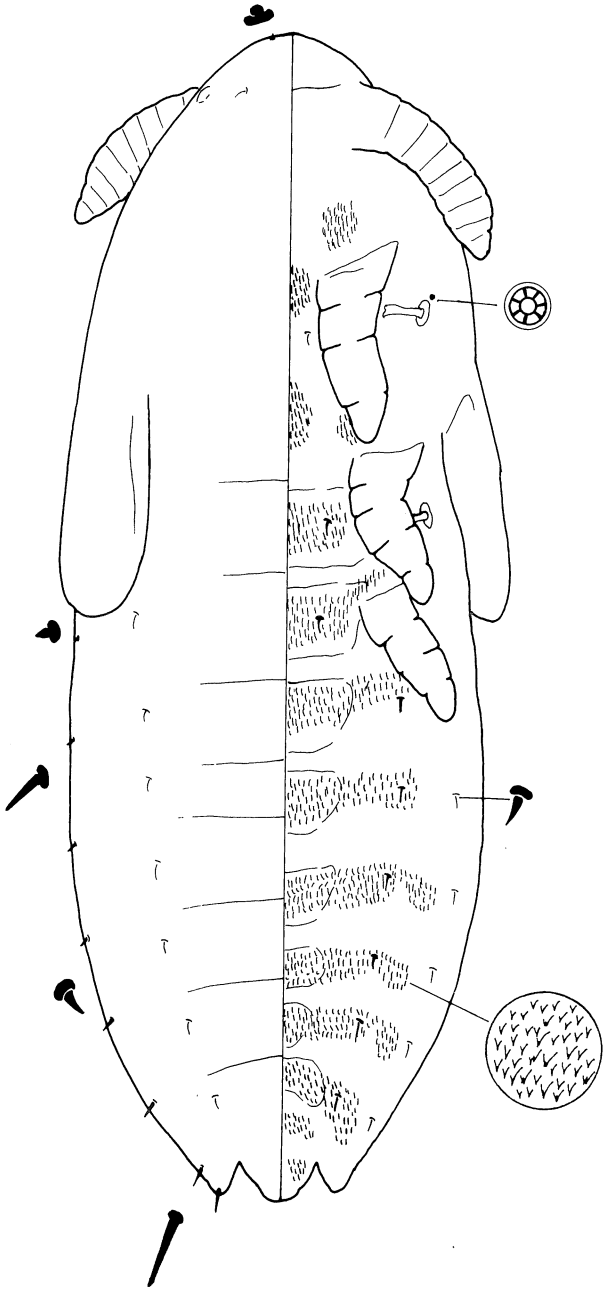

Fig. 29 - *Lecanopsis clodiensis*, prepupa.

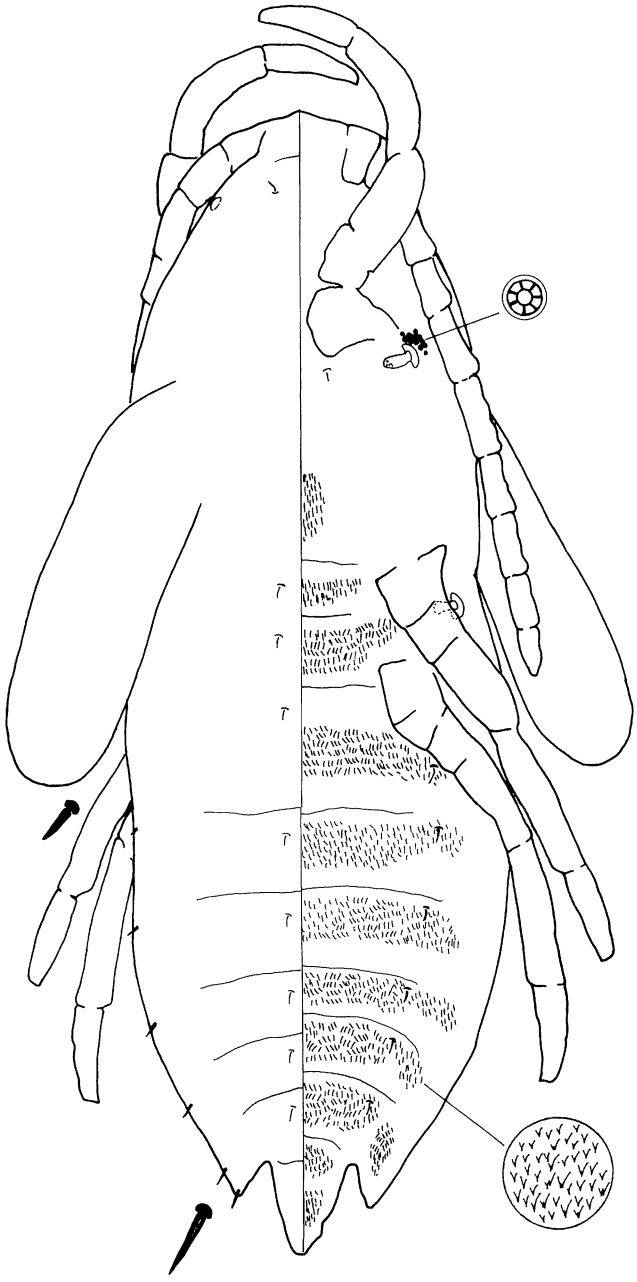

Fig. 30 - *Lecanopsis clodiensis*, pupa.

Table 2 - Principal measurements of male prepupa.

	mm
total length	1,87
wing rudiment length	0,37
antennae length	0,34
penial sheath rudiment length	0,092
penial sheath rudiment width (base)	0,136
hind leg length	0,24

as long as half of penial sheath rudiment. Spiracles small; 12-16 spiracular pores near each anterior spiracle. Small setae both on dorsum and venter arranged in longitudinal rows on abdomen and in little groups on thorax and head. Measurements of male pupa in table 3.

ADULT MALE (Fig. 31)

The terminology follows that of Giliomee (1967). Main measurements of male in Table 4.

LIVING SPECIMENS: winged, body orange with brown and black thoracic sclerites; globular head, well sclerotized, brown in colour. Legs and antennae long and thin, clear brown in colour. Antennae longer than wings. Wings translucent. Apex of abdomen with two white, long, stiff wax filaments, 2,4-3 mm long.

MOUNTED SPECIMENS: head well sclerotized, with distinct polygonal reticulation, both on ventral and dorsal surfaces. Vertex convex with few dorsal setae, two of which clearly longer. Six eyes present: one pair on ventral surface and two pairs on dorsal surface behind the antennae. Antennae long, 10-segmented (seldom 9-segmented). All antennal segments with short setae, not longer than twice antennal segment width. Apical segment weakly widened, with many long setae. Number of setae for each antennal segment increasing from base to apex. Prothorax membranous, without notable structures. Mesothorax large, well sclerotized. Prescutum transverse, subrec-

Table 3 - Principal measurements of male pupa.

	mm
total length	1,98
wing rudiment length	0,73
antennae length	0,98
penial sheath rudiment length	0,177
penial sheath rudiment width (base)	0,135
hind leg length	0,804

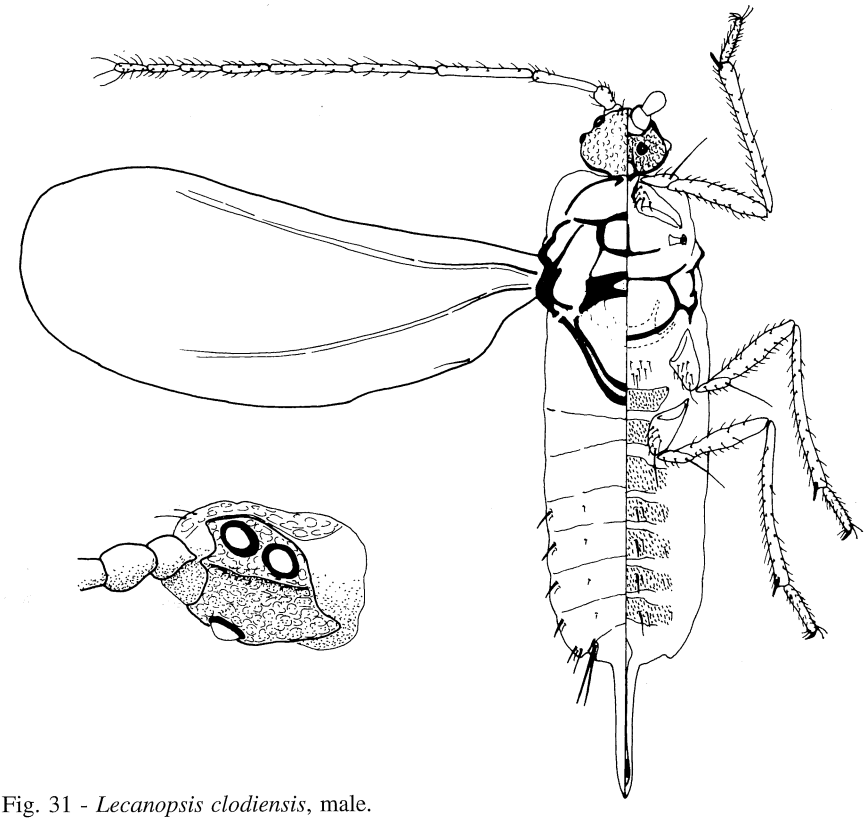

Fig. 31 - *Lecanopsis clodiensis*, male.

tangular, with widely rounded corners. Scutellum wide and stout, well sclerotized, with a membranous (transparent) elliptic, transverse area in middle. Mesopostnotum well sclerotized, subconical, with widely rounded posterior margin. Metathorax membranous, without notable structures. Wings large, thick, with anterior margin weakly concave, posterior margin convex and with apex semicircular. Radius and media thick, 2/3 as long as wing length. Legs long and thin, covered with short thin setae. Femur stout, weakly convex. Tibia long and thin; median and hind tibia weakly curved laterally. Tarsi straight. Claw subconical, sharply pointed. Tarsal digitules lightly longer than claw and widened at apex, claw digitules thin and hair-like. Abdomen cylindrical, with ventral sclerites well sclerotized bearing a few spine-like setae. Dorsal sclerites medially almost without setae and with a stout spine on margin of each last 5 segments. Caudal extensions evident. Glandular pouch with 2 (seldom 3) long, straight spine-like setae. Penial sheath subcylindrical, weakly narrow in middle and with pointed apex.

Table 4 - Main measurements of male.

	mm
total length (head-penial sheath apex)	2,011
wing length	1,549
wing maximum width	0,64
antennal length	1,639
mesothorax width	0,560
scutellum-mesopostnotum	0,303
head width at gena	0,265
fore leg: coxa	0,177
fore leg: trochanter -femur	0,413
fore leg: tibia	0,460
fore leg: tarsus	0,153
median leg: coxa	0,171
median leg: trochanter -femur	0,365
median leg: tibia	0,483
median leg: tarsus	0,159
hind leg: coxa	0,177
hind leg: trochanter -femur	0,359
hind leg: tibia	0,483
hind leg: tarsus	0,159
penial sheath length	0,430
penial sheath medial width	0,037
setae of glandular pouch length	0,206

TYPE MATERIAL EXAMINED. Holotype of *P. clodiensis*: 1 adult female, **Italy**, Isola Verde, Chioggia (VE), 2.V.1990, leg. Pellizzari, slide N° 283, (DAAPE). Paratypes: 7 adult females, Italy, Isola Verde, Chioggia (VE), 30.V.1984, leg. Pellizzari, slides N° 120/1-8 (DAAPE); 1 adult female, same locality, 10.III.1995, leg. Pellizzari, slide N° 612/3 (DAAPE); 1 adult female, same locality, 22.III.1995, leg. Pellizzari, slide N° 612 (PPIB). 1 crawlers, same locality, 25.V.1988, slide N°122a/1.
Allotype: 1 male, **Italy**, Isola Verde, Chioggia (VE), 20.I.1998, leg. Fontana, slide N° 840/27 (DAAPE).
OTHER MATERIAL EXAMINED. **Italy:** Isola Vicentina (VI), 29.IV.1994, 4 adult females, 7 crawlers, leg. Pellizzari & Fontana, slides N° 540/1-6; same locality, 13.X.1995, 1 3rd-instar female, leg. Fontana & Pellizzari, slide N° 760/1 (DAAPE); M. Calbarina (PD), 8.V.1991, 2 adult females, 1 2nd-instar female, 3 3rd-instar female, leg. Pellizzari, slides N°352, 353; same locality, 22.II.1995, 4 3rd-instar females, leg. Pellizzari & Fontana, slides N° 615/1-4; same locality, 12.IV.1995, 3 adult females, slides

N°615/5-7 (DAAPE); Isola Verde, Chioggia (VE), 30.V.1984, 6 adult females, leg. Pellizzari, slides N°120/1-6; same locality, 13.V.1985, 2 adult females, leg. Pellizzari, slides N° 121/1-2; 6.V.1988, 6 adult females, leg. Pellizzari, slides N°122/1-6; 30.V.1984, 13 crawlers, leg. Pellizzari, slides N°122a/1-2; VI.1985, 71 crawlers, leg. Pellizzari, slides N°121a/1-10; 25.V.1988, 125 crawlers, leg. Pellizzari, slides N°122a/2-6; 26.I.1995, 5 3rd-instar females, leg. Fontana, slides N°612/5-9; 26.I.1995, 6 2nd-instar males, leg. Fontana, slides N°612/10-15; 10.III.1995, 4 adult females, leg. Pellizzari & Fontana, slides N°612/1-4; 2.IV.1995, 2 adult females, leg. Fontana, slides N°612/5-6; 19.VII.95, leg. Fontana, 2 1st instars, 4 2nd-instar females, slides N° 745/1-6; 25.VI.97, leg. Fontana, many 1st-instars, 36 2nd-instar females, 1 3rd-instar female, slides N°/826/1-18; 4.IX.1997, leg. Fontana, 4 1st instars, 3 2nd-instar females, 12 3rd-instar females, leg. Fontana, slides N° 842b/1-19; 12.XII.1997, 16 3rd-instar females, 27 2nd-instar males, leg. Fontana, slides N°840/1-20; 20.I.1998, (in laboratory), 1 prepupa, 1 pupa, 4 males, leg. Fontana, slides N° 840/21-26 (DAAPE). Mossano (VI), 24.IV.98, 4 adult females, leg. Pellizzari, slides N° 844/1-4. Foligno (PG), 1930, 1 adult female, 1 3rd-instar female, leg. Menozzi, slide N° 5056/1 (MNHN). Vasto (CH), 22.VIII.1991, 4 crawlers, 12 2nd-instar females, 1 3rd-instar female, leg. Pellizzari, slides N° 383/1-15; same locality, 2.V.1995, 7 adult females, leg. Fontana, slides N° 629/1-7 (DAAPE). Popoli, Sorgenti del Pescara, (AQ) 250 m, 7-10.V.1996, 18 adult females, 21 crawlers, leg. Fontana; same locality, 25.VIII.97, 1 1st instar, 9 2nd-instar females, 16 3rd-instar females, leg. Fontana, (DAAPE); Casoli (CH), 22.VIII.1993, 1 3rd-instar female, leg. Pellizzari, slide N° 509/1, (DAAPE). Trivigno (PZ), II.1993, 11 adult females, leg. A. Romano; same locality, VI.1993, 1 adult female, leg. Marotta, (DBPI). Potenza, 12.IV.1989, 2 adult females, leg. Racana, slide N°1989:134. Brindisi di Montagna (PZ), 1988, leg. De Marzo, 13 crawlers, 5 3rd-instar females, slide N°1988/27; same locality, 2.XI.1988, leg. De Marzo, 6 3rd-instar females; same locality, 1989, leg. De Marzo, 2 3rd-instar females; (DBPI). Rifreddo (PZ), 24.III.1988, 2 2nd-instar males, slide N° 1988:21 (DBPI). Ailano (CE), 17.III.92, 2 adult females, 4 3rd-instar females, 1 2nd-instar females, leg. Marotta; (DBPI); Maddaloni (CE), 1906, 3 3rd-instar females, leg. Leonardi, slide N° 1 (DEAP); Marina di Lesina, (FG), 11.V.1997, 2 adult females, leg. Fontana, slide N° 813a/4-5 (DAAPE). Bosco Spina Pulci (FG), 12.V.1997, 1 adult female, leg. Fontana, slide N° 813a (DAAPE); Rodi Garganico, (FG)12.V.1997, leg. Fontana, 3 adult females, 2 crawlers slide N° 813a/1-3 (DAAPE). Gravina di Puglia (BA), IV.1988, 8 adult females, leg. De Marzo, (DBPI); Pulo di Altamura (BA), IV.1983, 11 adult females, leg. De Marzo, (DBPI); Rutigliano (BA), 1.IV.89, 3 adult females, leg. De Marzo, slide N° 1989:118 (DBPI); Monopoli (BA), 29.III.1981, 3 young adult females, slide N° 1981:56 (DBPI); Casamassima (BA), 1988, 3 3rd-instar females, slide N° 1988:101 (DBPI); Monte Sirino, (PZ), 24.VI.98. 5 adult females, leg Fontana, slides N° 854/1-5. **Croatia**: Barbariga, 17.VI.2000, 2 adult females, leg. Fontana, slide N° 944 (DAAPE); Sv. Lourenc, 17.VI.2000, 1 adult female, leg. Fontana, slide N° 943 (DAAPE); Dugi Otok island, 11.VIII.2000, leg. Malagnini, 1 1st instar; 18 3rd-instar females; 7 2nd-instar males, slides N° 993/1-26 (DAAPE).

DISTRIBUTION - Palearctic Region: Italy, Croatia.

HOST PLANTS: *Agropyron, Avena, Brachypodium, Bromus, Festuca* and other undetermined Gramineae.

BIOLOGY: the life cycle, the biology and the ethology of this species have been studied in detail by Pellizzari & Fontana (2001).

COMMENTS. This species was recorded as *L. brevicornis* Newstead (= *formicarum* Green) by Leonardi, but Leonardi's material, labelled *brevicornis* and preserved in the DEAP and in the MNHN, proved to be *L. clodiensis*. *L clodiensis* is very common and largely distributed through the Italian peninsula. The adult female is clearly different from other *Lecanopsis* species because of the large band of preopercular pores of different diameters extending from the head to the anal plates and the presence of numerous spiracular pores near the anterior spiracles. The 1st instar also differs from that of other species by the number and distribution of spiracular disc-pores and minaret-like setae. Second and third instar females are characterised by a narrow marginal band of spiracular pores usually extending from the top of the head to the third-sixth abdominal segments, but this character does not appear to be stable among different populations and, in some cases, also within a population. For instance, in a population from Croatia most of the 3rd -instar females possess a marginal band of spiracular pores extending from the head (antennae level) to the thorax only. This variability makes it difficult to identify 2nd and 3rd instars at species level.

Lecanopsis marottai n. sp.

ADULT FEMALE (Fig. 32)

LIVING SPECIMENS: living specimens dark orange, oval, elongate, moderately convex with short anal cleft. Reproductive females partially enclosed in a white, loose egg sac.

MOUNTED SPECIMENS: elongate elliptic, 3,2-4,15 (3,68) mm long and 2,2-2,6 (2,44) mm wide.

VENTER: derm membranous, with signs of segmentation on thorax and abdomen. Dermal spinules present medially from head to the last abdominal segment. Antennae 8-segmented (seldom 7). Legs stout. Tarsal and claw digituli longer than claw. Spiracles opening in a peritreme cavity. Spiracular disc-pores with 6-10 loculi and a diameter of 4,8-7,2 μm, forming an elongate band of 25-53 (38,5) pores, from each anterior spiracle to body margin, usually absent (rarely 1-3 pore may be present) near each posterior spiracle. With 16-30 (22) spiracular disc-pores are present in the anterior and posterior peritreme cavity. Pregenital disc-pores with 6-8 loculi and a diameter of 8 μm, numerous near the genital opening and present on the last 4-5 abdominal segments. Small simple pores with sclerotized rim numerous and scattered all over the venter. Tubular ducts numerous on abdomen and present also on thorax, of two sizes: the largest 35,2 μm long, and 6 μm wide with inner filament 16 μm long; the

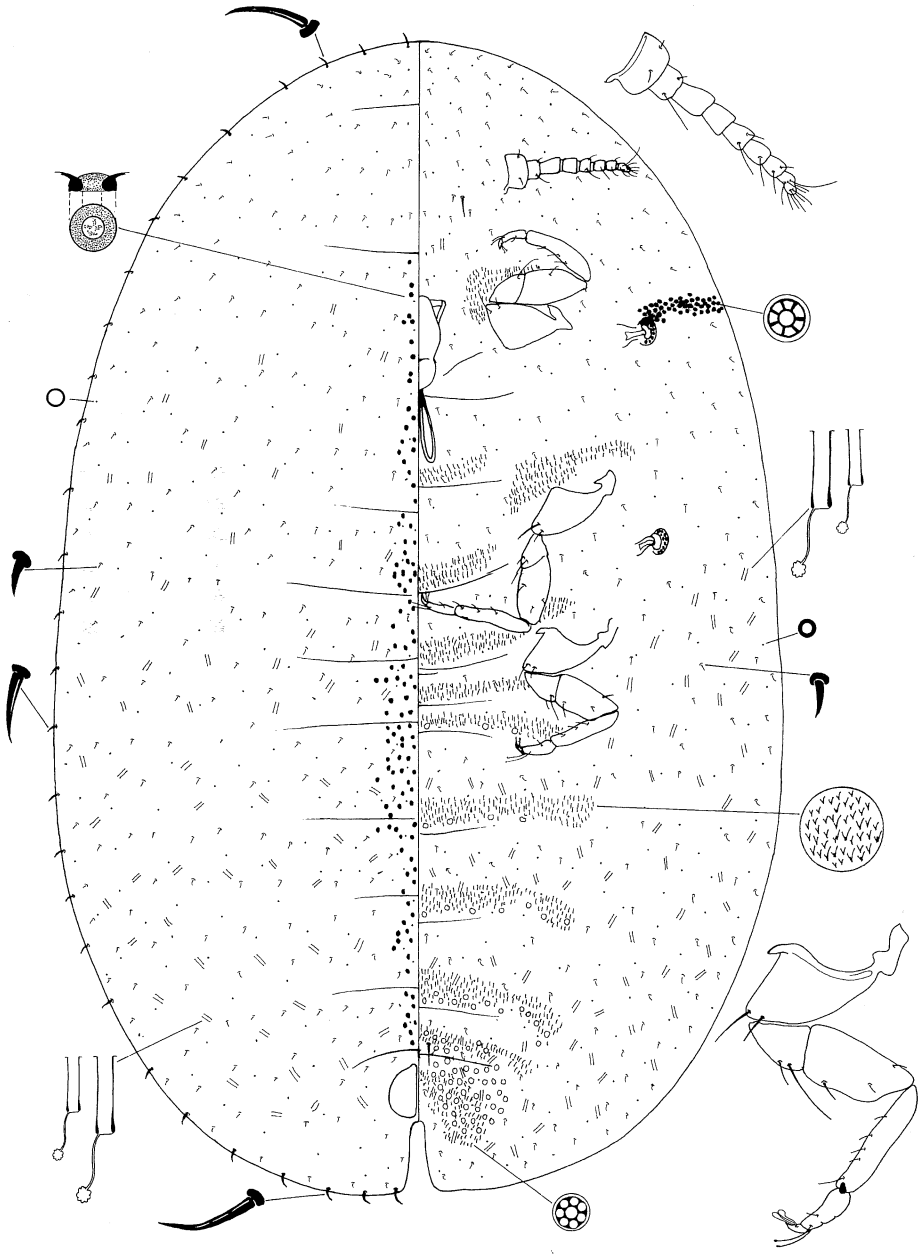

Fig. 32 - *Lecanopsis marottai* sp. n., adult female.

smallest 25,6 μm long, 3,2 μm wide with inner filament 17,6 μm long. Minute spine-like setae numerous, scattered. One pair of interantennal setae and one pair of pregenital setae.
MARGIN: marginal setae hair like, short. Setae on margin of the anal lobes longer than other marginal setae.
DORSUM: derm membranous, with signs of segmentation on thorax and abdomen. Preopercular pores of different sizes with a diameter of 6-9,6 μm, forming a narrow longitudinal band extending from head (20 % of specimens), or prothorax (40% of specimens) or mesothorax (40% of specimens), to anal region. Small simple pores scattered. Tubular ducts present, not so numerous as on venter. Minute hair-like setae scattered. Anal plates subtriangular with widely rounded angles.

FIRST INSTAR (Fig. 33)

LIVING SPECIMENS: body orange, elongate and flattened. Legs and antennae well developed. MOUNTED SPECIMENS: body elliptic, elongate, 0,619-0,678 (0,643) mm long and 0,218-0,236 (0,224) mm wide. Eyes large, situated dorso-marginally.
VENTER: antennae 6-segmented, 118-123 (121) μm long. A pair of interantennal setae. Legs subequal, well developed. Tibia and tarsus not articulated. Tarsal digitules longer than claw digitules. Loop of mouth stylets 295-306 (298) μm long, reaching fourth abdominal segment. Spiracles with 2 disc pores (rarely 3) in each peritreme cavity. Spiracular disc-pores with 5-9 loculi, forming 5 groups along ventral margin of thorax. First group, near the anterior spiracle, with 2-5 disc pores, second group, near posterior spiracle, with 2 or 3 disc-pores, third, near second group, always with 1 disc pore. Fourth and fifth groups each have 1 disc pore. Minute ventral setae forming a submarginal row around body and two submedial longitudinal rows on abdomen.
MARGIN: anal lobes well developed with apical seta 177-218 (191) μm long. Marginal minaret-like setae, present on head and abdomen, absent on thorax. There are (on either side) 5 (seldom 4), minaret-like setae on head and 7, seldom 6, on abdomen. These are located on dorsal margin except for last two that are on ventral margin.
DORSUM: anal ring with 6 setae. Anal plates absent. Dorsal setae minute, a pair each on thoracic segments.

SECOND INSTAR FEMALE: not known.

THIRD-INSTAR FEMALE (Fig. 34)

LIVING SPECIMENS: orange, oval, moderately convex, enclosed in a glassy wax test.
MOUNTED SPECIMENS: body elongate oval, 2,2-2,92 (2,42) mm long and 1,15 - 1,48 (1,32) mm wide,. Eyes very small, marginal.
VENTER: dermal spinules present medially from head to last abdominal segment. Antennae short, conical, 7-segmented. One pair of interantennal setae Loop of mouth stylets reaching mesosternum. Legs with all segments well developed but reduced, more developed in anterior legs, in comparison with those of other *Lecanopsis* species. Tarsal and claw digitules longer than claw. Spiracles with peritreme cavity covered by

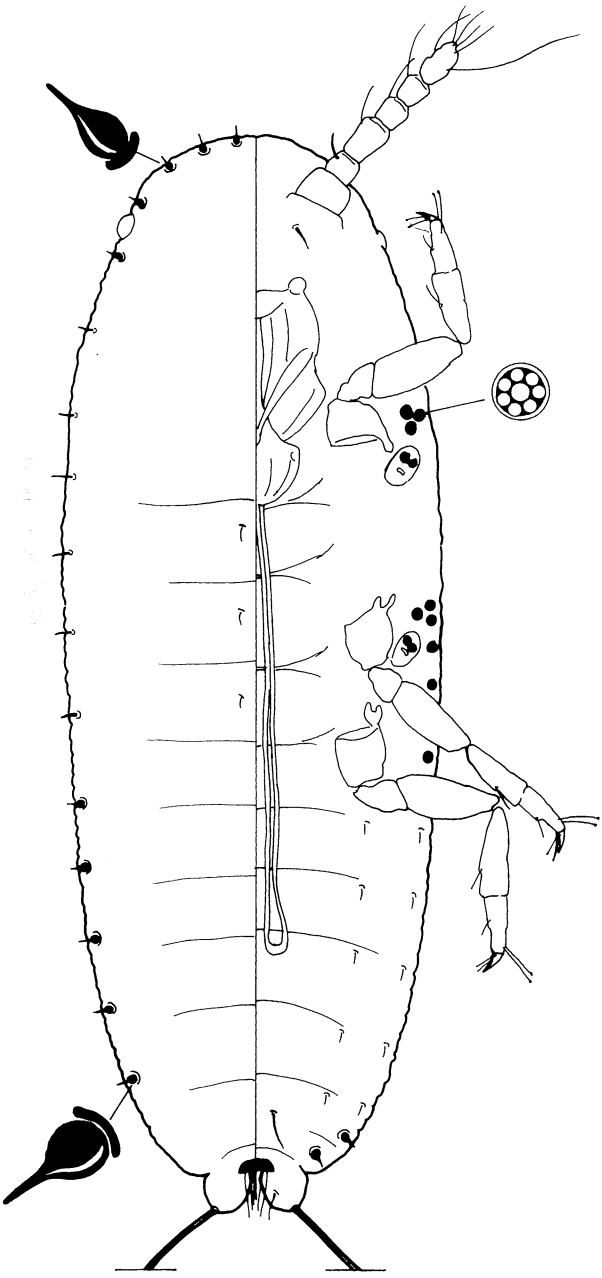

Fig. 33 - *Lecanopsis marottai* sp. n., first instar.

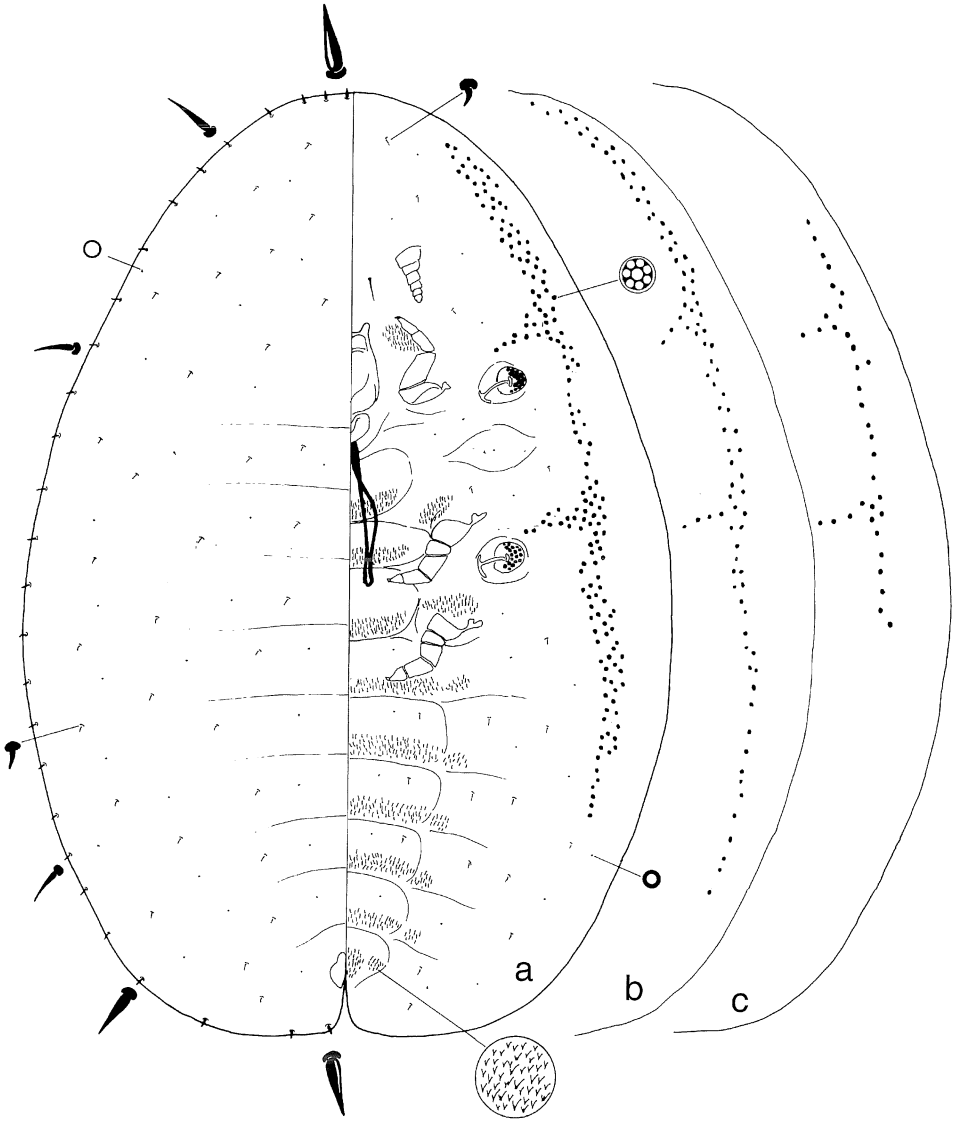

Fig. 34 - *Lecanopsis marottai* sp. n., 3rd-instar female; a, b, c intraspecific variability in the distribution of the spiracular pores.

disc-pores set very close to each other. Spiracular disc-pores with 8 loculi, forming a submarginal band, from head to first or to fourth abdominal segment. Spiracular pore band extending medially anterior to each spiracle. Number of pores in marginal band of disc pores and its extension may vary considerably: either 3-4 pores wide or only 1 pore wide, reaching first or fourth abdominal segment. Ventral setae small, scattered. Small simple pores scattered.
MARGIN: marginal setae conical and stout, longer on head and on anal lobes.
DORSUM: anal plates well developed, subtriangular. Anal ring with 6 setae. Dorsal setae small, scattered.

SECOND-INSTAR MALE: not known.

ADULT MALE: not known.

TYPE MATERIAL EXAMINED. Holotype: 1 adult female, **Italy**, Popoli, Sorgenti del Pescara, (AQ), 7. V. 1996, leg. Fontana, slide N° 1046/1 (DAAPE). Paratypes: 6 adult females, 3 3rd-instar females, **Italy**, Popoli, Sorgenti del Pescara, (AQ), 7.V.1996, leg. Fontana, slides N° 1046/2-10 (DAAPE); 3 crawlers (in laboratory), same locality, 7.V.1996, slides N°1047/1; 1 adult female, same locality, 25.IV.1993, leg. Osella, slide. N° 1045 (DAAPE); 1 adult female, same locality, 3.V.1995, leg. Fontana, slide. N° 636 (DAAPE); 3 adult females, Popoli, (AQ), 800m, 9.V.1996, leg. Fontana, slides N° 1048/1-3 (DAAPE); crawlers of N° 1048 (in laboratory), same locality, 9.V.1996, slides N° 1049/1-4;
OTHER MATERIAL EXAMINED. **Italy:** Popoli, Sorgenti del Pescara, (AQ), 9.V.1996, 1 adult female, leg. Fontana, slide N° 1050 (DAAPE); same locality, 22.IV.1997, 1 adult female, leg. Fontana, slide N° 1051 (DAAPE); same locality, 22.IV.1997, 10 crawlers of N° 1051 (in laboratory), slides N° 1052/1-10; same locality, 7.V.1996, many crawlers (in laboratory), slides N°1047/2-14; Lauria, M. Sirino, (PZ), 1300m, 24.VI.1998, 1 adult female and crawlers, leg. Fontana, slides N° 854/1-4 (DAAPE).

DERIVATIO NOMINIS: this species is dedicated to the memory of Salvatore Marotta, eminent Italian coccidologist.

DISTRIBUTION. Palearctic Region: Italy.

HOST PLANTS: undetermined Gramineae.

BIOLOGY: adult females and 3rd-instar females recorded from April to June.

COMMENTS. This is a difficult species to identify, if the 1st instar is absent. The 1st instar clearly differs from other known species in the number and distribution of spiracular pores. The adult female is very close to *L. formicarum* but has spiracular pores near the anterior spiracles forming a band extending to the body margin and not in a group as in *L. formicarum*. Besides, it usually has no spiracular disc-pores at the posterior spiracles (rarely 1-2 pores), while *L. formicarum* has a higher number (from 3 to 37 (9,5) depending on the population). Unfortunately, in the 16 females examined, one has 3 pores near each posterior spiracle and is the minimum observed in *L. formi-*

carum. The three 3rd-instar females, collected on the same plant, each have a different pattern in distribution and number of spiracular pores in the marginal band (see 34).

Lecanopsis mirabilis n. sp.

ADULT FEMALE (Fig. 35)

LIVING SPECIMEN: dark orange, elliptic, convex with short anal cleft. Reproductive females partially enclosed in a white, loose egg sac consisting of shining wax filaments.
MOUNTED SPECIMEN: elongate elliptic, 3,84 mm long and 2,17 mm wide.
VENTER: derm membranous, with signs of segmentation on thorax and abdomen. Dermal spinules present medially on head, thorax and abdomen. Antennae 8-segmented, elongate, first segment wider and third segment longer than others. Legs well developed, stout. Tarsal and claw digituli longer than claw. Spiracles opening in a peritreme cavity. Spiracular disc-pores with 6-8 loculi and diameter of 9,6 μm numbering 40-50 in anterior peritreme cavity and 30-40 in posterior peritreme cavity. Spiracular disc-pores absent near anterior and posterior spiracular openings. Pregenital disc-pores with 7 loculi and a diameter of 9,6 μm, numerous near genital opening, present also in all abdominal segment. Small simple pores with sclerotized rim numerous and scattered all over venter. Tubular ducts of two sizes, numerous on abdomen, present also on thorax, rare on head Minute hair-like setae scattered. One pair of interantennal setae and pairs of large, median setae, on five posterior abdominal sternites.
MARGIN: marginal setae hair-like, short. Setae on margin of anal lobes longer than other marginal setae.
DORSUM: derm membranous, with signs of segmentation on thorax and abdomen. Anal ring with 6 setae. Anal plates subtriangular. Preopercular pores of different sizes with a diameter of 6,4-11,2 (7,3) μm, forming a dense median longitudinal band extending from mesothorax to anal region. Longitudinal band narrower than space between legs, reaching a maximum width of 15 pores. Multilocular disc-pores with 8 loculi and sclerotized rim, single or forming groups of 2-4 pores, distributed along margin and submargin of dorsum, absent in median part. Small simple pores scattered. Tubular ducts of one size present on abdomen and submargin of thorax, rare on head. Hair-like setae scattered.

FIRST INSTAR (Fig. 36)

LIVING SPECIMENS: orange in colour, elongate and flattened. Legs and antennae well developed. MOUNTED SPECIMENS: body elliptic, elongate, 0,548-0,662 (0,592) mm long and 0,200-0,247 (0,215) wide. Eyes large, situated dorso-marginally.
VENTER: antennae 6-segmented, 118-123 (121) μm long. One pair of interantennal setae. Legs subequal, well developed. Tarsal digitules longer than claw digitules. Loop

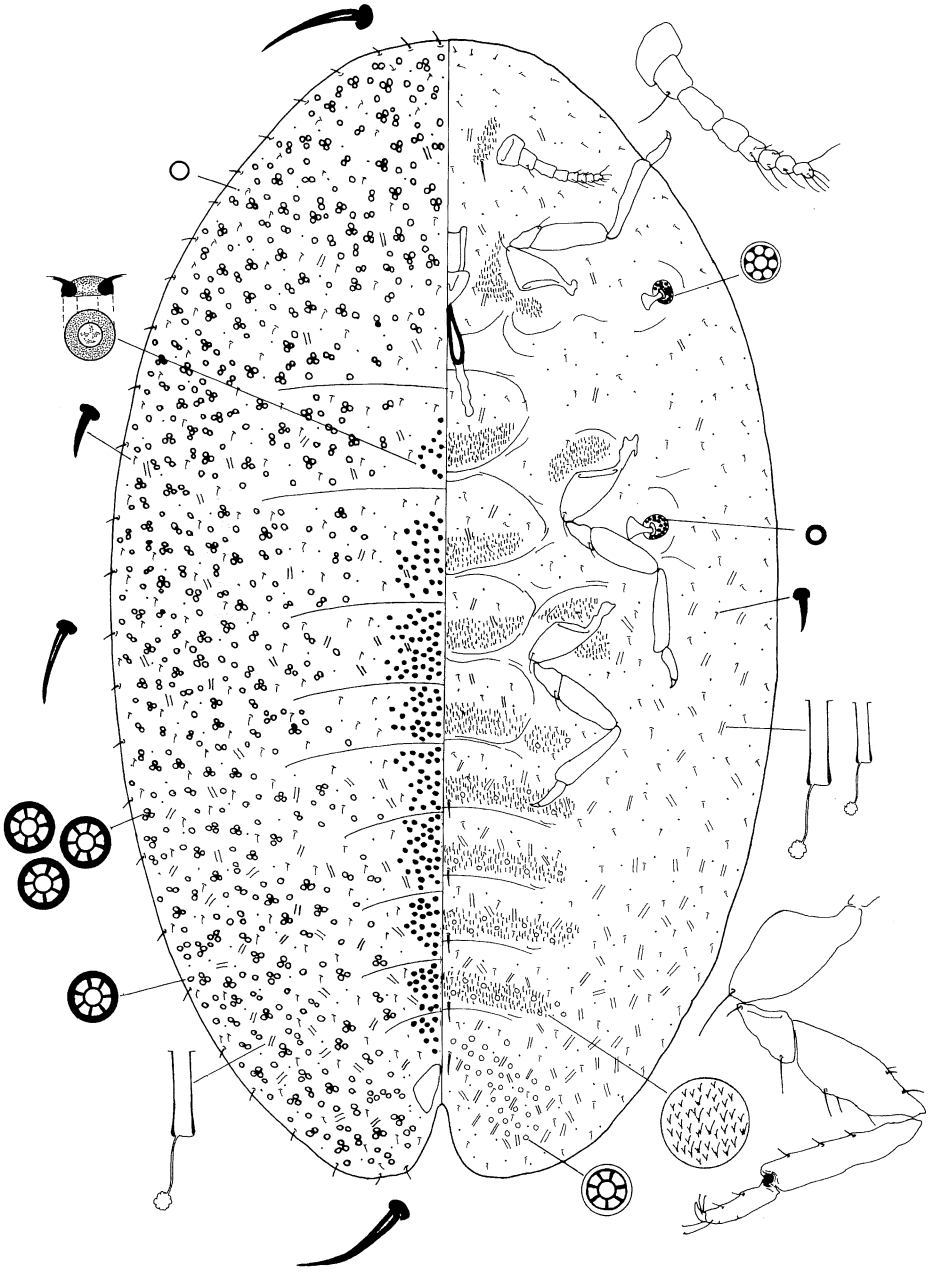

Fig. 35 - *Lecanopsis mirabilis* sp. n., adult female.

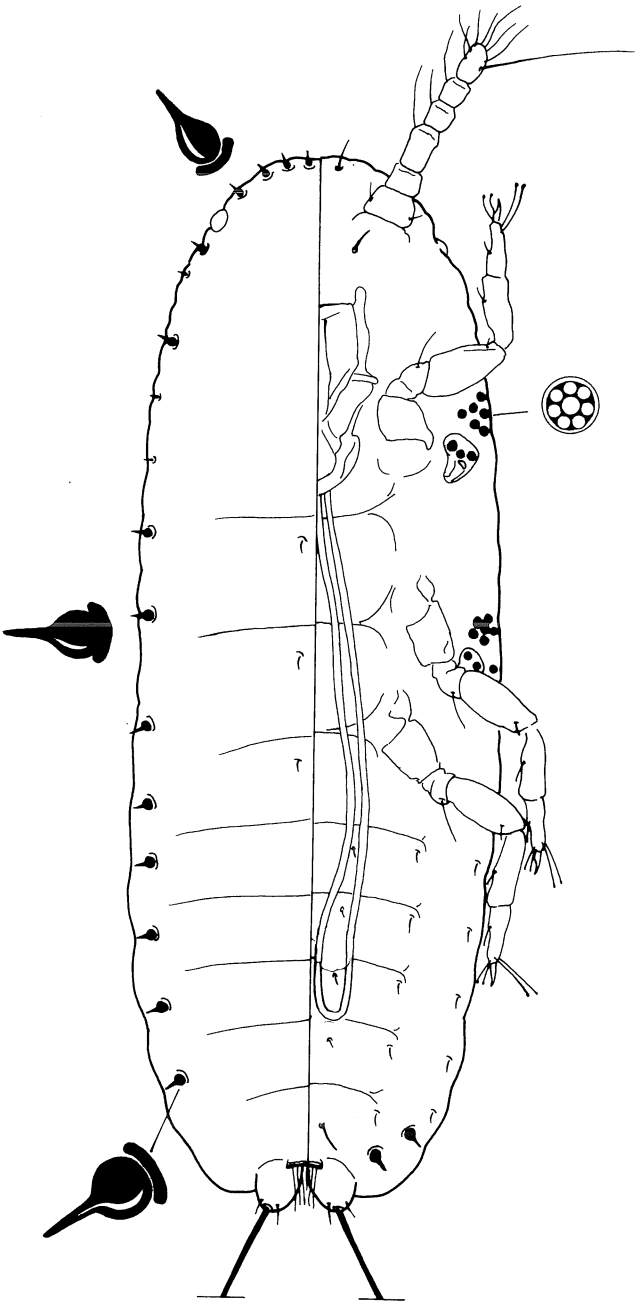

Fig. 36 - *Lecanopsis mirabilis* sp. n., first instar.

of mouth stylets 295-318 (307) μm long, reaching sixth abdominal segment. Spiracles with 2-3 disc pores in each peritreme cavity. Spiracular disc-pores usually with 7 loculi forming a group of 4-8 (5,8) between anterior spiracle and body margin, and a group of 2-8 (5,1) between posterior spiracle and body margin. Occasionally a single pore may be present behind each second group of spiracular disc-pores. Minute ventral setae forming a submarginal row around body and two submedial longitudinal rows on abdomen.
MARGIN: anal lobes well developed with apical seta 177-200 (174) μm long. Marginal minaret-like setae present on margin of dorsum. There are 16 minaret-like setae on each side: 6 on head, 3 on thorax and 7 on abdomen. Setae on head and thorax smaller than those on abdomen.
DORSUM: anal ring with 6 setae. Normal anal plates absent. Dorsal setae minute, one pair on each thoracic segment.

SECOND-INSTAR FEMALE: not known.
THIRD-INSTAR FEMALE: not known.
SECOND-INSTAR MALE: not known.
ADULT MALE: not known.

TYPE MATERIAL. Holotype: 1 adult female, **Italy**, Sicily, Carlentini (SR), near *Avena fatua*, 30.IV.1997, leg. Russo & Pellizzari, slide N° 805 (DAAPE); 23 crawlers, 19.V.1997, slides N° 805/1-23 (DAAPE).

DERIVATIO NOMINIS - The new species name is the Latin adjective "*mirabilis*" meaning "wonderful, surprising", because of the peculiar presence of multilocular pores, single or grouped, on dorsum.

DISTRIBUTION: Palearctic Region: Italy (Sicily).

HOST PLANTS: not known.

BIOLOGY: Adult female with egg sac collected at the end of April near a plant of *Avena fatua*.
COMMENTS. The most relevant morphological character of this species is the presence of multilocular pores with sclerotized rim, single or grouped in 2-4 elements on the dorsum. This character proved to be unique in the *Lecanopsis* so far known. The fact that this species is described from only one specimen leads us to be cautious in proposing any new systematic solution.

DISCUSSION

Destiny played unkind tricks on the genus *Lecanopsis* and on its species. In fact the revision of the world-wide bibliography on this topic highlighted misinterpretations or trivial mistakes that have entangled an already difficult situation.

The difficulties we met with during this revision allowed us to state the following considerations.

The identification of the *Lecanopsis* at specific level can be sometimes problematic especially when we refer to species whose original description is based only on one or very few specimens. We noticed that, in some cases, the identification of a species based solely on numerical characters of the adult female can lead to errors due to intraspecific variability. The intraspecific variability can be highlighted when many specimens of the same population and of different populations are available. That is the case of *Lecanopsis formicarum* and *L. clodiensis*: hundreds of specimens of different instars of these two species have been be studied during this revision, so highlighting the intraspecific variability of several characters (for example: number of spiracular pores, length of the specimens, number of antennal segments). The number of stigmatic pores may vary in individuals of the same population or of different populations of the same species and appear correlated to the size of the specimen. The number of segments in the antenna of adult females can vary from 6 to 8 in some species (i.e. *L . clodiensis*) while in other species (i.e. *L. turcica*) it appears stable and can be assumed to be a distinctive character. The size of adult females should never be considered as an important character and it depends on the feeding site, more or less favourable for growth, of the previous 3rd instar, so that it is possible to observe adult females whose length varies from 2 to 5,4mm in *L. formicarum* (Boratynski et al., 1982) and from 3,8 to 8,5 mm in *L. clodiensis*. Besides, some morphological characters may appear different in young females with respect to gravid females. The study of a population of *L. formicarum* from Denmark demonstrates that the diameter of the preopercular pores appears smaller in young females (just after the moult) with respect to gravid females (in which they have a well sclerotized rim) and has no specific value, as assumed by Borchsenius to separate *L. formicarum* from *L. terrestris*.

In our experience, the width and length of the longitudinal band of preopercular pores constitutes a rather reliable character and, when associated with the presence, number and distribution of stigmatic pores near the spiracular openings, greatly contributes to identification at species level.

A reliable identification of 2nd and 3rd-instar females at species level can also be problematic (with the exception of *L. turcica* because of its particular morphology and of *L. clodiensis* and *L. formicarum*, whose intraspecific variability is known). Besides the 2nd-instar females of several species are not yet known or are known only from descriptions based on one or two specimens. In any case it should be taken into account that the individuals just after a moult look different from the fully grown individuals of the same instar, moreover, intraspecific variability has been observed also in these stages (Pellizzari & Fontana, 2001a). A sure identification of 2nd and 3rd-instar females of a *Lecanopsis* is achieved when breeding in the laboratory (starting from ovipositing females or growing infested plants) is performed in order to obtain the whole descent of a species or visiting the biotope where a species lives several times in the year in order to collect all the stages. It is also possible to collect on infested plants different stages (dead or alive) of *Lecanopsis* that can be attributed for a certainty to

the same species or 3rd instars that moult to adult females in the laboratory in a short time allowing for a sure identification of both instars.

The morphology of the 2nd-instar males appears rather similar among the species so far studied.

The morphological characters of the 1st instar nymph are rather stable, even when specimens from different populations are compared. The availability of 1st instars of a *Lecanopsis* species highly contributes to reliable identification and can solve dubious cases. If adult females with egg sacs are collected, it is convenient to wait for egg hatching in order to obtain the 1st instars.

With regard to the biology of this genus, we known in details the life history of *L. formicarum* and *L. clodiensis* (Boratynski *et al.*, 1982; Pellizzari & Fontana, 2001). In these species the overwintering is carried out by 3rd-instar females and 2nd-instar males. At the end of its growth (in April) the 3rd-instar female attains the size of the future adult female. Adult emergence takes place in April-May. The adult female does not feed and has no relation with the host plant. After fertilisation the female lays eggs starting from late April to June. Eggs hatch in May-June. The collecting data on labels of several species seem to confirm this biology.

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