

## Notes on Pupillarial Species of Armored Scale Insects from Korea (Hemiptera: Diaspididae)

Soo-Jung Suh\*

Animal, Plant and Fisheries Quarantine and Inspection Agency, 30 beongil 8, Jungangdaero, Busan, Korea

### 한국산 깍지벌레과 Pupillarial종에 대한 보고 (노린재목, 깍지벌레과)

서수정\*

농림수산검역검사본부 영남검역검사소

**ABSTRACT:** Two pupillarial species, *Cryptoparlatoarea leucaspis* Lindinger and *Fiorinia japonica* Kuwana, are recorded for the first time in Korea. Both species were found on coniferous trees, *Cryptomeria japonica* and *Torreya nucifera*. Also an identification key, brief diagnoses, and photographs of Korean pupillarial species are provided to assist in their identification.

**Key words:** Pupillarial, *Cryptoparlatoarea leucaspis*, *Fiorinia japonica*, Korea

**초록:** 깍지벌레과 중 pupillarial류의 2종, *Cryptoparlatoarea leucaspis* Lindinger(신칭: 검은점깍지벌레) 및 *Fiorinia japonica* Kuwana(신칭: 잎깍지벌레)를 삼나무와 비자나무에서 처음으로 국내분포 종으로 보고하고, 한국산 깍지벌레과의 pupillarial류의 종 동정에 필요한 검색표, 종 특징 및 사진자료를 함께 기재하였다.

**검색어:** Pupillarial, *Cryptoparlatoarea leucaspis*, *Fiorinia japonica*, 한국

Adult females of pupillarial species of armored scales (Hemiptera: Coccoidea: Diaspididae) do not produce a typical waxy cover for protection. Instead they remain completely or partially enclosed in the shed skin of the enlarged, second instar nymph. Worldwide, there are 62 genera of armored scales that have pupillarial species. They occur in several diaspid tribes; all species in the tribes Fioriniini and Leucaspini, and the subtribes Xerophilaspina of the Diaspidini, Gymnaspina of the Parlatorini, and Aonidiina of the Aspidiotini (Howell and Tippins, 1990). The first record of a pupillarial form of armored scale insect in Korea is that of the Japanese maple scale, *Lopholeucaspis japonica* (Cockerell) which Paik (1978) accredited to Machida and Aoyama (1930) firstly documented. Until now,

additional species of pupillarial genera of armored scale insects have not been reported in Korea, although surveys have been conducted in Korea.

Two pupillarial forms collected during the survey of armored scale insects occurring on coniferous trees that was conducted in Jeollanamdo (Southern area of Korea) from 2006 through 2010 were identified as *Cryptoparlatoarea leucaspis* Lindinger and *Fiorinia japonica* Kuwana. These represent the first records of the occurrence of these species in Korea.

Currently, the genus *Cryptoparlatoarea* contains only two species *C. pini* Takahashi that occurs on pines in India and *C. leucaspis* Lindinger, found during this survey, which was previously known only from Japan on several evergreen species. The other genus *Fiorinia* contains 67 species worldwide and among them, the coniferous fiorinia scale, *Fiorinia japonica* Kuwana newly added to the catalogue of Korean scale insects,

\*Corresponding author: suhsj97@korea.kr

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has been already known from neighboring countries, China and Japan (Kuwana, 1925a; Tao, 1999).

When it comes to the economic importance of pupillarial forms, *F. japonica* is considered to be a serious pest of pine trees in Beijing, China and an occasional pest in USA (Tang, 1984; Miller and Davidson, 1990), however, during the recent survey, I did not observe this scale to be causing serious damage to the Korean pine trees. According to literatures (Kuwana, 1926; Kawai, 1980), *C. leucaspis* is not a major pest in Japan and it did not seem to be causing damage to Japanese cedars (*Cryptomeria japonica*) growing in Korea.

A key, brief account and photographs of the pupillarial species of armored scales in Korea including two species newly documented in this paper, are provided to assist in their identification. Terminology for morphological structures used in this paper is that of Miller and Davidson (2005). An asterisk (\*) is used to indicate a new distribution record. Photographs were taken using AxioCam MRc camera through ZEISS Axio Imager M2 Microscope and a LEICA M165C microscope with Delta pix camera. All specimens for accurate identification were mounted on slide and are deposited in the Collection of Yeongnam Regional Office, Animal, Plant and Fisheries Quarantine and Inspection Agency (QIA) in Busan, Korea.

#### Genus *Cryptoparlatoarea* Lindinger, 1905 검은점각지벌레속(신칭)

*Cryptoparlatoarea* Lindinger, 1905. Type species: *Cryptoparlatoarea leucaspis* Lindinger.

**Characters.** This genus is placed between *Leucaspis* and *Parlatoria* and the general characters of the female scale and pygidium of female body are similar to those of the former, while the shape of the marginal gland orifices is similar to those of the latter. Female scale oval to elliptical with slightly lateral constriction on each side, convex, black. The adult female enclosed in the second larval shed skin. Pygidial lobes small and conical projections. Pygidial plates fimbriate and exceeding the lobes. The male scale elongate, white, not carinated (Kuwana, 1926; Takagi, 1960).

#### *Cryptoparlatoarea leucaspis* Lindinger, 1905 검은점각지벌레(신칭) (Figs. 4–6)

*Cryptoparlatoarea leucaspis* Lindinger, 1905: 132 [Japan, on

*Juniperus* sp.]. *Apterionidia leucaspis*; Lindinger, 1934.

**Field Characters.** Female scale shiny black with reddish margin, oval to elliptical in shape, composed of the first and second larval shed skin as well as wax mass. First exuviae present margin. 1-1.5 mm long and 0.4-0.5 mm wide. Male scale elongate, white, not carinated, about 1 mm long (Kuwana, 1926).

**Slide-mounted Characters.** Body shape of adult female oval and unsclerotized except for pygidium and medial area. Pygidium of adult female with 3 pairs of well-developed lobes, all similar in shape, small, conical; median lobes parallel, widely separated; 2<sup>nd</sup> lobes, about same size as median lobes; 3<sup>rd</sup> lobes, smaller than median lobes. Plates fimbriate; two between median lobes; two between median and 2<sup>nd</sup> lobes; three between 2<sup>nd</sup> and 3<sup>rd</sup> lobes; three laterad of 3<sup>rd</sup> lobes. Macroducts short and large; 1 marginal macroduct each between median lobes, median and 2<sup>nd</sup> lobes, 2<sup>nd</sup> and 3<sup>rd</sup> lobes; 1-2 macroducts laterad of 3<sup>rd</sup> lobes. Perivulvar pores in 4 groups, about 20 pores on each side of body. Cephalothorax and prepygidial area of abdomen with intermittent row of tubercular gland spines along the lateral margin. Anterior spiracles each with 2-3 pores, posterior spiracles without pores. Antennae set apart, each with 1 seta.

**Material examined.** Korea. Jeollanamdo (JN): 77 Yongbong-ro, Buk-gu, Gwangju, 26 adult females and 2 males, on *Cryptomeria japonica* (Taxodiaceae), 25-vii-2007 (S.J. Suh); same data, except for 3 adult females, 16-viii-2010.

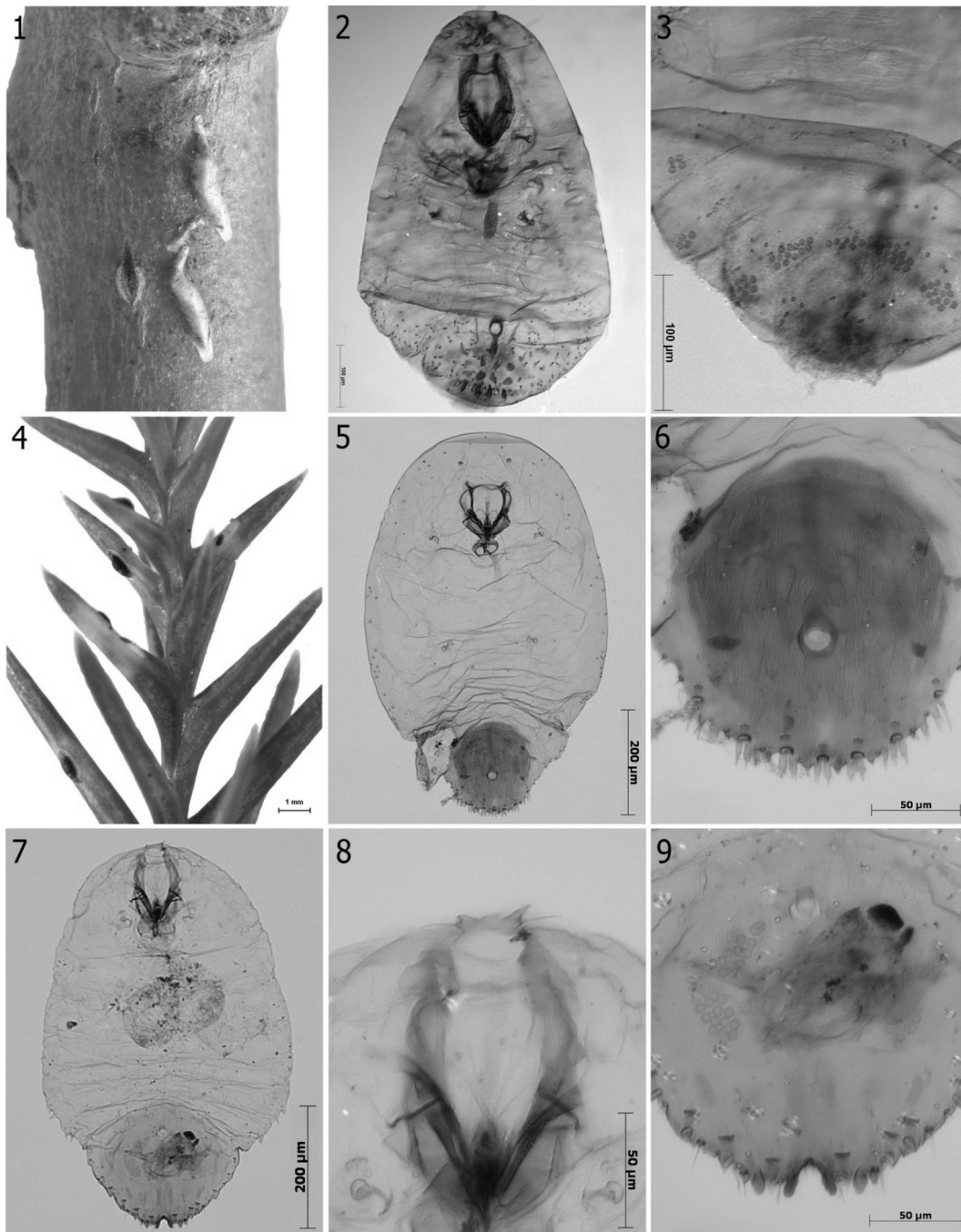
**Hosts.** Five coniferous genera (*Cryptomeria*, *Chamaecyparis*, *Cupressus*, *Juniperus*, and *Thujopsis*) (Miller *et al.*, 2011).

**Distribution.** \*Korea and Japan.

#### Genus *Fiorinia* Targioni-Tozzetti, 1868 앞각지벌레속(신칭)

*Fiorinia* Targioni-Tozzetti, 1868. Type species: *Fiorinia pellucida* Targioni-Tozzetti.

**Characters.** An usually elongate pupillarial form, often with parallel sides. Adult female with the median lobes forming a notch in the apex of pygidium and yoked together basally. Second lobes usually well developed. Gland spines present on pygidial margin; tubercular gland spines, if present, on ventral margins. Marginal ducts large or slender, 2-barred. Submarginal or medial ducts absent from pygidium. Perivulvar pores often present in 5 or fewer groups. Antennae tending to be elongate conical and usually close together at the apex of the head, at



**Figs. 1-9.** 1-2) *Lopholeucaspis japonica*, adult female; 3) *L. japonica*, perivulvar pores of abdominal segments 4 to 6; 4-5) *Cryptoparlatorea leucaspis*, adult female; 6) *C. leucaspis*, pygidium; 7) *Fiorinia japonica*, adult female; 8) *F. japonica*, antennae; 9) *F. japonica*, pygidium.

times with a membranous process between (Williams and Watson, 1988; Gill, 1997).

*Fiorinia japonica* Kuwana, 1902 앞각지벌레(신칭)  
(Figs. 7-9)

*Fiorinia fiorinae japonica* Kuwana, 1902 [Japan, on *Podocarpus*

*chinensis* and *Pinus* sp.]. *Fiorinia juniperi* Leonardi, 1906. *Fiorinia japonica*; Ferris, 1921.

**Field Characters.** Adult female elongate with nearly parallel sides, brownish yellow with dark median area, elliptical, with mediolongitudinal carina. First exuviae present margin. Male scale white, not carinated, exuvium yellow, about 1mm long

(Kuwana, 1925b).

**Slide-mounted Characters.** Body shape of adult female elongate and unsclerotized. Pygidium of adult female with 2 definite pairs of lobes, 2<sup>nd</sup> lobes well developed with division into 2 lobules. Median lobes contiguous basally, with a conspicuous yoke. Perivulvar pores in 5 groups, about 40 pores on each side of body. Mesothorax to third abdominal segment with tubercular gland spines along the lateral margin. Perispiracular pores with 3 loculi, anterior spiracles with 4-8 pores, posterior spiracles without pores. Antennae marginal, close together, and each with 1 long seta. Cicatrices present on abdominal segment 1.

**Material examined.** Korea. JN: 77 Yongbong-ro, Buk-gu, Gwangju, 4 adult females, on *Torreya nucifera* (Taxaceae), 26-vii-2007 (S.J. Suh).

**Hosts.** Fourteen coniferous genera, also *Aucuba*, *Chrysalidocarpus*, *Eurya*, *Ficus*, *Phoenix*, *Pittosporum*, and *Thea* (Miller *et al.*, 2011).

**Distribution.** \*Korea, Japan, China, Hong Kong, Taiwan, India, Philippines, Sri Lanka, France, Australia, Mauritius, USA.

## Key to the Korean Pupillarial Species

1. Adult female entirely enclosed within the shed skin of the second instar (Figs. 1, 4), without macroducts on medial and submedial areas of pygidium (**Pupillarial forms**) ..... 2
- 1b. Adult female not enclosed within the shed skin of the second instar, with or without macroducts on medial and submedial areas of pygidium ..... (**Nonpupillarial forms**)
2. Perivulvar pores in clusters on abdominal segments 4 to 6 (Fig. 3) [on many ornamental hosts, not on conifers; widely distributed in Korea] ..... *Lopholeucaspis japonica* (Cockerell) (Figs. 1-3)
- 2b. Perivulvar pores in clusters restricted to abdominal segment 6 (Figs. 6, 9) ..... 3
3. Median lobes yoked, fused together at their bases (Fig. 9) [on *Torreya*; Korea (South)] ..... *Fiorinia japonica* Kuwana (Figs. 7-9)
- 3b. Median lobes separated by space at least the width of a single lobe (Fig. 6); [on *Cryptomeria*; Korea (South)] ..... *Cryptoparlatoria leucaspis* Lindinger (Figs. 4-6)

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