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

ABSTRACT: Two pupillarial species, Cryptoparlatorea 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, Cryptoparlatorea leucaspis, Fiorinia japonica, Korea

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 Leucaspidini, and the subtribes Xerophilaspidina of the Diaspidini, Gymnaspidina 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 Cryptoparlatorea leucaspis Lindinger and Fiorinia japonica Kuwana. These represent the first records of the occurrence of these species in Korea.

Currently, the genus Cryptoparlatorea 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.
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 Cryptoparlatorea Lindinger, 1905** 검은점깍지벌레속(신칭)

*Cryptoparlatorea* Lindinger, 1905. Type species: *Cryptoparlatorea 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 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).

**Cryptoparlatorea leucaspis** Lindinger, 1905 검은점깍지벌레(신칭) (Figs. 4-6)


**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; 2nd lobes, about same size as median lobes; 3rd lobes, smaller than median lobes. Plates fimbriate; two between median lobes; two between median and 2nd lobes; three between 2nd and 3rd lobes; three laterad of 3rd lobes. Macroducts short and large; 1 marginal macroduct each between median lobes, median and 2nd lobes, 2nd and 3rd lobes; 1-2 macroducts laterad of 3rd 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.


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

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

**Genus Fiorinia Targioni-Tozzetti, 1868** 잎깍지벌레속(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
times with a membranous process between (Williams and Watson, 1988; Gill, 1997).

_Fiorinia japonica_ Kuwana, 1902 잎깍지벌레(신칭) (Figs. 7–9)
_Fiorinia fioriniae 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
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] ................................................................. 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)] ................................................................. 1

3b. Median lobes separated by space at least the width of a single lobe (Fig. 6); [on Cryptomeria; Korea (South)] ........................................ 2

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Literature Cited


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