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Key to the Korean species of armored scale insects (Hemiptera: Diaspididae)

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Abstract. A list of all 80 species of armored scale insects (Hemiptera: Diaspididae) in 30 genera that have been identified or documented in Korea, along with a dichotomous key to separate them, is provided.

Key words. Diaspidids, checklist, identification, indigenous species

Introduction

Armored scale insects (Hemiptera: Diaspididae) are the largest and most diverse family of scale insects, with 2,587 species known worldwide (García et al. 2016). They are highly evolved and specialized plant parasites, and generally have a cryptic way of life because of their small size and limited mobility. The female Diaspididae has two nymphal stages; first-instar nymphs (crawlers) have well-developed legs and are known as the dispersal stage; second-instar nymphs and adult females (third-instar) are legless, wingless, feed on sap, and are covered by a waxy shield incorporating the exuviae of previous instars; adult males (when present) have legs and one pair of wings and do not feed; many reproduce asexually and have no males (Rosen 1990).

Armored scale insects occur in every part of the world where plants grow. There is hardly any country in the world today where diaspidids do not cause serious pest problems, and their success invading new territories has made them a constant quarantine threat in many parts of the world (Rosen 1990). They are one of the most economically important groups of insects found on food crops and ornamental plants.

In the Republic of Korea, armored scale insects such as the Asiatic rose scale, *Aulacaspis rosarum* Borchsenius and the euonymus scale, *Unaspis euonymi* (Comstock), are considered major pests because they cause severe damage to trees and shrubs due to their high populations. In addition, more and more non-indigenous armored scale insects such as *Aulacaspis yasumatsui* Takagi (intercepted 29 times) and *Lepidosaphes laterochitinosa* Green (intercepted 65 times) are frequently intercepted on imported plants over the past 20 years and are considered to be potential invasive species (Suh 2016c).

Due to their importance, a survey was conducted between 2006 and 2015 to regularly update a list of armored scale insects found in the Republic of Korea. Recent articles (Paik 2000; Suh and Hodges 2007; Lee 2010; Suh 2011, 2012, 2013, 2014, 2015, 2016a, 2016b; Yu and Suh 2013; Suh and Evans 2016) in addition to information reported herein, have increased the number of armored scale species known to occur in the Republic of Korea to 80 species belonging to 30 genera.

The purpose of this paper is to provide an identification key to the genera and species of armored scale insects known to occur in Korea, based on characters of the adult female. This information will not only enable researchers to identify the species known to occur in Korea, but also aid in the recognition and early detection of newly introduced species.

Materials and Methods

This paper provides a dichotomous key and a list concerning 80 species of armored scale insects reported from Korea. But during the survey over the past ten years, nine species such as *Chionaspis salicis* (Linnaeus) and *Comstockaspis macroporana* (Takagi) were not collected (Table 1), although they have been documented in the Korean fauna of armored scale insects. While developing the key, the author was not able to examine specimens of these species from Korea. Terminology for the morphological structures used in the key follows that of Miller and Davidson (2005).

Results

Table 1 presents a list of the armored scale insects that were collected and reported from the Republic of Korea, along with their regional distribution in Korea. A dichotomous key to the Korean armored scale insects is provided.

Key to armored scale insects of Korea (slide-mounted adult females)

1. Dorsum of pygidium with areolate pattern **2**
— Dorsum of pygidium without areolate pattern **3**

2(1). With perispiracular pores near posterior spiracles; pygidial macroducts short, approximately 5 times longer than width of dermal orifice ..... ***Pseudaonidia paeoniae*** **(Cockerell)**
— Without perispiracular pores near posterior spiracles; pygidial macroducts long, approximately 10 times longer than width of dermal orifice ..... ***Pseudaonidia duplex*** **(Cockerell)**

3(1). Usually occurring on bamboos **4**
— Rarely occurring on bamboos **9**

4(3). Median lobes fused; lacking two-barred macroducts ..... ***Odonaspis secreta*** **(Cockerell)** (in part)
— Median lobes not fused; two-barred macroducts present **5**

5(4). Median lobes yoked basally, with small space between them; medial lobule of second lobe larger than lateral lobule ..... ***Pinnaspis buxi*** **(Bouch**é**)** (in part)
— Median lobes not basally yoked, separated by space at least a half width of lobe or far apart from each other; medial lobule of second lobe about same size as, or smaller than l lateral lobule **6**

6(5). Apically toothed marginal plates absent anterior to 2nd lobes; median to 3rd lobes very small and pointed ..... ***Unachionaspis tenuis*** **(Maskell)**
— Apically toothed marginal plates present anterior to 2nd lobes; median, second and third lobes without the above combination of features **7**

7(6). With less than 10 perivulvar pores on each side of body; occurring on the leaves ..... ***Kuwanaspis hikosani*** **(Kuwana)**
— With more than 20 perivulvar pores on each side of body; occurring on stems **8**

8(7). Abdominal segment 1 with transverse row of macroducts ... ***Kuwanaspis howardi*** **(Cooley)**
— Abdominal segment 1 without transverse row of macroducts ..... ***Kuwanaspis pseudoleucaspis*** **(Kuwana)**

9(3). With at least one pore near the posterior or anterior spiracles **10**
— Without pores near the spiracles **63**

10(9). Body elongate, oval, or turbinate; not as described below **16**
— Body elongate; head and/or anterior two thoracic segments rectangular in shape, wider than remainder of body **11**

11(10). With ducts on dorsum of abdominal segment 2 ..... **12**
— Without ducts on dorsum of abdominal segment 2 ..... **14**

12(11). Spines more than 10 on ventral margins of abdominal segments 2 and 3 .... **13**
— Spines less than 10 on ventral margins of abdominal segments 2 and 3 ....
.... ***Aulacaspis rosarum* Borchsenius**

13(12). Only known on *Elaeagnus* (Elaeagnaceae); median lobes broadly rounded, usually more than 2 times width of second lobes .... ***Aulacaspis difficilis* (Cockerell)**
— Only found on *Smilax* (Smilacaceae); median lobes round, usually less than 1.5 times width of second lobes .... ***Aulacaspis spinosa* (Maskell)**

14(11). With usually ducts on dorsum of abdominal segment 6 .... **15**
— Without ducts on dorsum of abdominal segment 6 .... ***Aulacaspis latissima* (Cockerell)**

15(14). Median lobes narrowly rounded; basal sclerosis or yoke between median lobes produced anteriorly .... ***Aulacaspis yabunikkei* Kuwana**
— Median lobes broadly rounded; basal sclerosis or yoke between median lobes, not produced anteriorly .... ***Aulacaspis rosae* (Bouché)**

16(10). Pygidium with at least one pair of marginal scleroses indicating the intersegmental junctures of the abdominal segments 6 to 8 .... ***Odonaspis secreta* (Cockerell)** (in part)
— Pygidium without intersegmental scleroses **17**

17(16). Pygidium with more than seven groups of perivulvar pores; dorsum with sclerotized areas and a row of gland spines present from the prothorax to abdominal segment 4 ....
.... ***Lopholeucaspis japonica* (Cockerell)**
— Pygidium and dorsum without the above combination of characters **18**

18(17). Median lobes present, yoked basally by an internal sclerosis **19**
— Median lobes present or absent; if present, not yoked basally by an internal sclerosis **36**

19(18). Median lobes very tightly appressed with a small space between them **20**
— Median lobes distinctly separate **25**

20(19). Only found on conifers .... ***Pinnaspis chamaecyparidis* Takagi**
— Not found on conifers **21**

21(20). Median lobes fused throughout their length, thus forming a single median lobe ....
.... ***Pinnaspis uniloba* (Kuwana)**
— Median lobes although usually very closely appressed together, separate for at least some distance from the apex, if not to the base **22**

22(21). Median lobes protrude less than or about the same distance as second lobes **23**
— Median lobes protrude beyond or about the same distance as second lobes **24**

23(22). With submarginal ducts on dorsum of abdominal segment 5 ....
.... ***Pinnaspis aspidistrae* (Signoret)**
— Without submarginal ducts on dorsum of abdominal segment 5 ....
.... ***Pinnaspis buxi* (Bouché)** (in part)

24(22). Basal sclerosis of median lobes slender, scarcely produced anteriorly beyond bases of the lobes .... ***Pinnaspis hikosana* Takagi**
— Basal sclerosis of median lobes robust, distinctly produced anteriorly beyond bases of the lobes .... ***Pinnaspis strachani* (Cooley)**

25(19). With at least a few macroducts on medial or submarginal areas of pygidium; not pupillarial (adult female developing with second-instar nymph exuvium) **26**
— Without macroducts on medial or submarginal areas of pygidium; pupillarial .... ***Fiorinia japonica* Kuwana**

26(25). Setae or gland spines absent between the median lobes **27**
— Setae or gland spines present between the median lobes **31**

27(26). With a series of small dorsal macroducts (wider than microducts in gland spines) on the submedial area of the abdomen **28**
— Without a series of small dorsal macroducts on the submedial area of the abdomen **30**

28(27). Median lobes strongly divergent, with a straight medial margin; with small dorsal macroducts on the submedial area of abdominal segments 1 to 5 .... **29**
— Median lobes only slightly divergent, with a rounded medial margin; with small dorsal macroducts on the submedial area of abdominal segments 1 to 4; on many hosts including *Salix* and *Populus* (Salicaceae) .... ***Chionaspis salicis* (Linnaeus)**

29(28). With small dorsal macroducts on the submedial area of the prothorax and mesothorax; primarily on *Alnus* (Betulaceae) .... ***Chionaspis alnus* Kuwana**
— Without small dorsal macroducts on the submedial area of the prothorax and mesothorax; on *Quercus* (Fagaceae) .... ***Chionaspis saitamaensis* Kuwana**

30(27). With dorsal macroducts on abdominal segment 6; primarily on *Wisteria* (Fagaceae) .... ***Chionaspis wistariae* Cooley**
— Without dorsal macroducts on abdominal segment 6; on *Acer* (Sapindaceae) .... ***Chionaspis acer* (Takagi and Kawai)**

31(26). Body oval or turbinate, length usually less than 1.5 times greatest width **32**
— Body elongate, length usually 1.5 times or more than greatest width **33**

32(31). Third space usually with 1 gland spine; at least 1 bifurcate or trifurcate gland spine in second, third, or fourth space; antennae with sclerotized projections apically; with 5–22 (10) small macroducts on each side of the metathorax and segment 1; on many hosts .... ***Pseudaulacaspis pentagona* (Targioni-Tozzetti)**
— Third space usually with 2 or more gland spines; simple gland spine in second, third, or fourth space; antennae rounded apically; with 0–15 (5) small macroducts on each side of the metathorax and segment 1; primarily on *Prunus* (Rosaceae) .... ***Pseudaulacaspis prunicola* (Maskell)**

33(31). With perispiracular pores near posterior spiracles **34**
— Without perispiracular pores near posterior spiracles **35**

34(33). With usually two rows of submarginal macroducts on abdominal segments 2 and 3; with 4–11 pores near anterior spiracles and 1–5 pores near posterior spiracles; found on *Zelkova* and *Ulmus* (Ulmaceae) .... ***Pseudaulacaspis ulmicola* Tang**
— With one row of submarginal macroducts on abdominal segments 2 and 3; with 13–27 pores near anterior spiracles and 6–10 pores near posterior spiracles; only found on *Carpinus* (Betulaceae) .... ***Pseudaulacaspis latiloba* (Takagi and Kawai)**

35(33). Without a duct on abdominal segment 6; antennae usually widely apart, width between antennae wider than distance between median lobes; only found on *Quercus* (Fagaceae) .... ***Pseudaulacaspis kiushiuensis* (Kuwana)**

— With duct on abdominal segment 6; antennae usually close together, width between antennae narrower than distance between median lobes; found on many hosts .... ***Pseudaulacaspis cockerelli* (Cooley)**

36(18). Median lobes round, with medial margin about the same length as lateral margin **39**
— Median lobes with lateral margin conspicuously longer than medial margin **37**

37(36). Pygidium with transverse sclerosis at the base of median lobe; bosses absent from abdomen **38**
— Pygidium without transverse sclerosis at the base of median lobe; bosses present on abdomen .... ***Andaspis recurrens* Takagi and Kawai**

38(37). Pygidial marginal macroducts numbering 5 on each side; without submedian dorsal ducts on the pygidium .... ***Andaspis crawii* Cockerell**
— Pygidial marginal macroducts numbering 6 on each side; with submedian dorsal ducts on the pygidium .... ***Andaspis kashicola* (Takahashi)**

39(36). Second lobes bilobate with two lobules **40**
— Second lobes simple with one lobule **59**

40(39). Body elongate, body length more than two times maximum width **41**
— Body turbinate, body length less than two times maximum width **56**

41(40). Pygidium with three pairs of lobes; third lobes distinct **42**
— Pygidium with two pairs of lobes; if third lobes present, then small and pointed **44**

42(41). Macroducts present in submarginal and medial areas of abdominal segment 7; third lobes bilobate; not found on grasses **43**
— Macroducts absent from submarginal and medial areas of abdominal segment 7; third lobes simple; only found on grasses .... ***Duplachionaspis divergens* (Green)**

43(42). Perivulvar pores absent; second lobes usually protruding beyond the median lobes; head, thorax and first abdominal segment sclerotized in mature females .... ***Unaspis yanonensis* (Kuwana)**
— Perivulvar pores present; second lobes not protruding beyond the median lobes; head, thorax and .... first abdominal segment not sclerotized .... ***Unaspis euonymi* (Comstock)**

44(41). Usually occurring on conifers **45**
— Rarely occurring on conifers **48**

45(44). Perivulvar pores in 8 groups, 3 auxiliary groups being present cephalad of usual 5 groups .... ***Lepidosaphes pini* (Maskell)**
— Perivulvar pores in 4-5 groups **46**

46(45). With minute spinules on head .... ***Lepidosaphes okitsuensis* Kuwana**
— Without minute spinules on head **47**

47(46). With lateral spurs between abdominal segments 1 and 2 .... ***Lepidosaphes japonica* (Kuwana)**
— Without lateral spurs between abdominal segments 1 and 2 .... ***Lepidosaphes pallida* (Maskell)**

48(44). With lateral spurs or tubercles on metathorax and/or on abdominal segments **49**
— Without lateral spurs or tubercles **54**

49(48). Eye spur like .... ***Lepidosaphes pinnaeformis* (Bouché)**
— Eye not spur like **50**

50(49). With bosses or cicatrices on dorsal submargin of one or more abdominal segments .... ***Lepidosaphes ulmi* (Linnaeus)**
— Without bosses or cicatrices **51**

51(50). With minute spinules on head **52**
— Without minute spinules on head **53**

52(51). Without lateral spurs on metathorax .... ***Lepidosaphes tubulorum* Ferris**
— With lateral spurs on metathorax ....***Lepidosaphes ussuriensis* (Borchsenius)**

53(51). Cephalothorax elongate, little narrowing anteriorly; thoracic region and first abdominal segment becoming heavily sclerotized dorsally at full maturity ..***Lepidosaphes gloverii* (Packard)**
— Cephalothorax gradually narrowing anteriorly; thoracic region remaining membranous, but abdominal segments becoming sclerotized dorsally at full maturity ....***Lepidosaphes yanagicola* Kuwana**

54(48). Dorsal macroducts present in a row across median area on abdominal segments 3 and 4; 40 or fewer perivulvar pores **55**
— Dorsal macroducts absent from median area on abdominal segments 3 and 4; 87-140 perivular pores ....***Lepidosaphes towadensis* Takagi and Kawai**

55(54). Pygidium broadly rounded; median lobes separated by a space narrower than width of one median lobe; on many hosts including *Malus*, *Prunus*, and *Pyrus* (Rosaceae) .... ***Lepidosaphes conchiformis* (Gmelin)**
— Pygidium more or less trapezoidal; median lobes separated by a space as wide as one median lobe; primarily on *Camellia* (Theaceae) ....***Lepidosaphes kamakurensis* (Kuwana)**

56(40). Submarginal areas of posterior pygidial segments with at least 2 barrel-shaped macroducts **57**
— Submarginal areas of posterior pygidial segments without macroducts ....***Carulaspis juniperi* (Bouché)**

57(56). Submedial macroducts present on abdominal segments 2 to 5; without notches on medial margin of the median lobes; primarily found on cactus ....***Diaspis echinocacti* (Bouché)**
— Submedial macroducts absent from abdominal segments 2 to 5; with notches on medial margin of the median lobes; rarely found on cactus **58**

58(57). Submarginal macroducts numbering only two on each side; anterior spiracles with approximately three associated perispiracular pores ....***Diaspis boisduvalii* Signoret**
— Submarginal macroducts numbering more than two on each side; anterior spiracles with approximately 14 associated perispiracular pores .... ***Diaspis bromeliae* (Kerner)**

59(39). Dermal pockets absent between posterior spiracle and body margin **60**
— Dermal pockets present between posterior spiracle and body margin **61**

60(59). Pygidial lobes conical projections (v-shape); pygidial plates exceeding the lobes; pupillarial ... . ***Cryptoparlatorea leucaspis* Lindinger**

— Pygidial lobes U-shape; pygidial plates not exceeding the lobes; not pupillarial .... ***Parlatoria pergandii*** **Comstock**

61(59). Eye spur-like, apically pointed .... ***Parlatoria proteus*** **(Curtis)**
— Eye variable, usually low dome-shaped **62**

62(61). With about 60 perivulvar pores; most plates in spaces between first 3 lobes with 2 microducts .... ***Parlatoria theae*** **Cockerell**
— With about 25 perivulvar pores; most plates in spaces between first 3 lobes with 1 microduct .... ***Parlatoria camelliae*** **Comstock**

63(9). Median lobes with basal sclerosis **79**
— Median lobes without basal sclerosis **64**

64(63). With perivulvar pores **65**
— Without perivulvar pores **75**

65(64). Paraphyses conspicuous, most as long as or longer than the length of the median lobes **66**
— Paraphyses absent or inconspicuous; all paraphyses shorter than median lobes **69**

66(65). Paraphyses ∩-shape between median lobes, between median and second lobes, and between the second and third lobes .... ***Hypaspidiotus jordani*** **(Kuwana)**
— Paraphyses straight-shape between median lobes, between median and second lobes, and between the second and third lobes **67**

67(66). With at least 1 cluster of macroducts on submarginal areas of prepygidial segments **68**
— Without a cluster of macroducts on submarginal areas of prepygidial segments .... ***Chrysomphalus dictyospermi*** **(Morgan)**

68(67). With a cluster of macroducts on submarginal areas of abdominal segment 2 .... ***Chrysomphalus aonidum*** **(Linnaeus)**
— With a cluster of macroducts on submarginal areas of abdominal segments 2 and 3 .... ***Chrysomphalus bifasciculatus*** **Ferris**

69(65). Occurring on conifers **70**
— Rarely occurring on conifers **72**

70(69). Second lobes about same size as, or slightly smaller than median lobes, normally same shape as median lobes; anal opening same or narrower than median lobes **71**
— Second lobes conspicuously smaller than median lobes, different shape from median lobes; anal opening wider than median lobes .... ***Hemiberlesia lataniae*** **(Signoret)** (in part)

71(70). Perivulvar pores present in five groups; median lobes and second lobes broadly rounded; with submarginal macroduct on abdominal segment 1 .... ***Dynaspidiotus tsugae*** **(Marlatt)**
— Perivulvar pores present in four groups; median lobes and second lobes narrowly rounded; without submarginal macroduct on abdominal segment 1 .... ***Dynaspidiotus pseudomeyeri*** **(Kuwana)**

72(69). Anal opening large (wider and longer than median lobes) and separated from bases of median lobes by not more than 2 times than its longitudinal diameter .... ***Hemiberlesia lataniae*** **(Signoret)** (in part)
— Anal opening small (narrower and shorter than median lobes) and separated from bases of median lobes by more than 2 times than its longitudinal diameter **73**

73(72). Third lobes with well-developed sclerotized point ....***Selenomphalus distylii* Takagi**
— Third lobes simple without a sclerotized point **74**

74(73). Median lobes closely appressed by less than one-fifth of their width; on *Castanea* and *Quercus* (Fagaceae) ....***Diaspidiotus cryptoxanthus* (Cockerell)**
— Median lobes separated by distinct space by more than one-half of their width; primarily on *Camellia* (Theaceae) ....***Diaspidiotus degeneratus* (Leonardi)**

75(64). Second and third lobes about same size as median lobes **76**
— Second and/or third lobes conspicuously smaller than median lobes **77**

76(75). Scleroses associated with apophysis anterolaterad of the vulva present on venter of pygidium ....***Aonidiella citrina* (Coquillett)**
— Scleroses associated with apophysis anterolaterad of the vulva absent from venter of pygidium ....***Aonidiella taxus* Leonardi**

77(75). Median lobes with lateral and medial notches; simple shaped plates anterior of seta marking abdominal segment 6; usually occurring on *Pinus* (Pinaceae) ....***Diaspidiotus makii* (Kuwana)**
— Median lobes with usually lateral notch; bifurcate shaped plates anterior of seta marking abdominal segment 6; occurring on various hosts **78**

78(77). Anal opening large (wider than median lobes); with marginal macroducts on abdominal segment 3 ....***Comstockaspis macroporana* (Takagi)**
— Anal opening small (narrower than median lobes); without marginal macroducts on abdominal segment 3 ....***Comstockaspis perniciosa* (Comstock)**

79(63). Plates lateral to third lobe dentate, edges sclerotized, with fleshy processes; dorsal marginal setae on the second and third lobes lanceolate (thick and dorsoventrally flattened) .... ***Octaspidiotus stauntoniae* (Takahashi)**
— Plates lateral to third lobe not dentate or sclerotized; dorsal marginal setae on the second and third lobes slender to thick, not flattened **80**

80(81). Pygidial macroducts long (1.5 times distance between posterior apex of anal opening and base of median lobes), normal; usually occurring on leaves **81**
— Pygidial macroducts short (less than 0.5 times distance between posterior apex of anal opening and base of median lobes), minute; usually occurring on roots **82**

81(80). Second lobes normally protruding beyond median lobes .....***Aspidiotus destructor* Signoret**
— Second lobes not protruding beyond median lobes .... ***Aspidiotus cryptomeriae* Kuwana**

82(80). With perivulvar pores ....***Rhizaspidiotus canariensis* (Lindinger)**
— Without perivulvar pores ....***Aspidiella phragmitis* (Takahashi)**

Discussion

The purpose of the present work is to provide a checklist and a key for the identification of Korean armored scale insects. This information will aid in the correct identification of each species which is essential for assessing the threat that each species poses and the management strategy that is to be taken. Armored scale insects have received much attention throughout the world due to the damage caused in economically important food crops and ornamental plants and also to the strong possibility of becoming invasive species with international trades for plants.

Of the nine scale species known to occur only in greenhouses, five species were just found on potted seedlings imported into Korea during the survey. They are considered to have failed to establish in the exterior environments. In addition this work provides correct information on the current status of nine greenhouse diaspidid species.

To date, eighty species of armored scale insects in 30 genera have been recorded from the Republic of Korea. However, it can be expected that more species of armored scale insects are likely to be found in Korea if taxonomic studies continue to be performed.

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Table 1. Checklist of taxa treated in the identification key with distribution data in Korea (Codes for collecting regions in the Republic of Korea are as follows: GG, Gyeonggido; GW, Gangwondo; CB, Chungcheongbukdo; CN, Chungcheongnamdo; GB, Gyengsangbukdo; GN, Gyengsangnamdo; JB, Jeollabukdo; JN, Jeollanamdo; JJ, Jejudo. The nomenclature used here for the Diaspididae follows that of the scale insect database ScaleNet (García et al. 2016). The column headed 'NC' indicates if the species was collected in the Republic of Korea during the survey (2006 to 2015). The asterisk mark (*) indicates 'unknown' (specimens not found outside of greenhouses in the Republic of Korea).

Scientific Name	Distribution within Korea									
	GG	GW	CB	CN	GB	GN	JB	JN	JJ	NC
Andaspis crawii (Cockerell)								●	●	
Andaspis kashicola (Takahashi)					●				●	
Andaspis recurrens Takagi and Kawai								●		
Aonidiella citrina (Coquillett)									●	
Aonidiella taxus Leonardi						●			●	
Aspidiella phragmitis (Takahashi)									●	
Aspidiotus cryptomeriae Kuwana		●			●	●		●	●	
Aspidiotus destructor Signoret						●			●	
Aulacaspis difficilis (Cockerell)						●		●		
Aulacaspis latissima (Cockerell)						●			●	
Aulacaspis rosae (Bouché)	●	●	●			●			●	
Aulacaspis rosarum Borchsenius	●				●	●	●	●		
Aulacaspis spinosa (Maskell)	●			●	●	●		●	●	
Aulacaspis yabunikkei Kuwana						●		●	●	
Carulaspis juniperi (Bouché)				●						
Chionaspis acer (Takagi and Kawai)	●						●			
Chionaspis alnus Kuwana					●	●				
Chionaspis saitamaensis Kuwana						●		●		
Chionaspis salicis (Linnaeus)										●
Chionaspis wistariae Cooley	●			●		●		●		
**Chrysomphalus aonidum* (Linnaeus)	●									
Chrysomphalus bifasciculatus Ferris				●		●		●	●	
**Chrysomphalus dictyospermi* (Morgan)										●
Comstockaspis macroporana (Takagi)										●
Comstockaspis perniciosa (Comstock)	●		●		●	●	●		●	
Cryptoparlatorea leucaspis Lindinger								●		
Diaspidiotus cryptoxanthus (Cockerell)	●					●		●		
Diaspidiotus degeneratus (Leonardi)						●		●	●	
Diaspidiotus makii (Kuwana)						●				
**Diaspis boisduvalii* Signoret										●
**Diaspis bromeliae* (Kerner)									●	
**Diaspis echinocacti* (Bouché)									●	
Duplachionaspis divergens (Green)								●		
Dynaspidiotus pseudomeyeri (Kuwana)	●			●	●	●	●	●	●	
Dynaspidiotus tsugae (Marlatt)										●
Fiorinia japonica Kuwana						●		●		
**Hemiberlesia lataniae* (Signoret)	●									
Hypaspidiotus jordani (Kuwana)						●		●	●	
Kuwanaspis hikosani (Kuwana)		●				●		●		
Kuwanaspis howardi (Cooley)						●		●		
Kuwanaspis pseudoleucaspis (Kuwana)	●					●			●	
Lepidosaphes conchiformis (Gmelin)						●	●	●	●	
Lepidosaphes gloverii (Packard)									●	
Lepidosaphes japonica (Kuwana)				●						

Scientific Name	Distribution within Korea									
	GG	GW	CB	CN	GB	GN	JB	JN	JJ	NC
Lepidosaphes kamakurensis (Kuwana)						●		●		
Lepidosaphes okitsuensis Kuwana						●				
Lepidosaphes pallida (Maskell)	●	●		●	●	●	●	●	●	
Lepidosaphes pini (Maskell)	●	●	●	●	●	●	●	●	●	
Lepidosaphes pinnaeformis (Bouché)			●			●		●	●	
Lepidosaphes towadensis Takagi and Kawai										●
Lepidosaphes tubulorum Ferris				●						
Lepidosaphes ulmi (Linnaeus)										●
Lepidosaphes ussuriensis (Borchsenius)	●			●	●	●	●		●	
Lepidosaphes yanagicola Kuwana	●	●						●	●	
Lopholeucaspis japonica (Cockerell)	●	●	●	●	●	●	●	●	●	
Octaspidiotus stauntoniae (Takahashi)						●		●	●	
Odonaspis secreta (Cockerell)	●					●	●	●	●	
Parlatoria camelliae Comstock						●				
Parlatoria pergandii Comstock									●	
**Parlatoria proteus* (Curtis)						●				
Parlatoria theae Cockerell	●			●	●	●	●	●	●	
Pinnaspis aspidistrae (Signoret)	●	●				●			●	
**Pinnaspis buxi* (Bouché)										●
Pinnaspis chamaecyparidis Takagi						●	●	●		
Pinnaspis hikosana Takagi				●						
**Pinnaspis strachani* (Cooley)										●
Pinnaspis uniloba (Kuwana)								●		
Pseudaonidia duplex (Cockerell)						●		●	●	
Pseudaonidia paeoniae (Cockerell)						●		●	●	
Pseudaulacaspis cockerelli (Cooley)	●	●	●	●	●	●	●	●	●	
Pseudaulacaspis kiushiuensis (Kuwana)	●					●			●	
Pseudaulacaspis latiloba (Takagi and Kawai)						●		●		
Pseudaulacaspis pentagona (Targioni-Tozzetti)	●	●	●	●	●	●	●	●	●	
Pseudaulacaspis prunicola (Maskell)	●					●	●	●		
Pseudaulacaspis ulmicola Tang	●									
Rhizaspidiotus canariensis (Lindinger)		●								
Selenomphalus distylii Takagi									●	
Unachionaspis tenuis (Maskell)	●				●	●	●	●	●	
Unaspis euonymi (Comstock)	●	●	●	●	●	●	●	●	●	
Unaspis yanonensis (Kuwana)						●			●	