

Chapter 3.1 Armored Scale Insects as Pests

3.1.1 A List of the Armored Scale Insect Pests

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INTRODUCTION

Compilation of a list of armored scale insect pests is not as simple as it might seem since there is no objective definition of "pest" that is appropriate to the current state of knowledge of the Diaspididae. Most major works on armored scale insects lack even cursory information on economic importance, and almost none provide data useful for making some sort of quantitative assessment of the economic impact of a particular species. In trying to establish categories of pest severity, it is unclear whether a major pest should be one that is polyphagous but causes small economic loss world-wide or one that is monophagous or oligophagous and causes major losses in a small area of the world, or some combination thereof.

Beardsley and Gonzalez (1975) compiled a list of "principal armored scale pests of the world" and included those species that possessed the most published biological and ecological information. Schmutterer et al. (1957) gave a similar list that included nearly all armored scale insects reported to infest agriculturally important hosts regardless of the scale's known pest status. Several commodity-oriented publications give detailed information about a few species, e.g. Ebeling (1959), but this kind of data is limited to a small number of crop systems. Some faunal treatments include a limited amount of information on the economic impact of a particular scale species, e.g. Dekle (1977), and a few studies have treated only the economic species in a limited geographic area, e.g. Borchsenius (1937).

The following list is a compilation of selected armored scale insect publications from various parts of the world. Publications have been chosen that; (1) provide data on economic importance; (2) discuss a large number of armored scale insect species; (3) treat different geographic areas of the world. We also have used unpublished information from our study on the economically-important armored scale insects of the United States. The list includes three columns of information. Column one includes the scientific name of each species; combinations are based primarily on Borchsenius (1966). Species with a double asterisk (**) are considered to be serious pests in many areas of the world; those with a single asterisk (*) are considered to be serious pests in a small area of the world; names without an asterisk are believed to be occasional pests. Column two includes a common name in English; for the sake of brevity, the word "scale" has been deleted from each name. In several instances where no English name was available, it was necessary to translate from another language, particularly from Russian. Several species have the same common name and some have none. Primary references for common names were Borchsenius (1966), Dekle (1977), Gozmány et al. (1979) and Werner (1982). Column three

includes the reference or references that implicate the species as a pest. Numbers refer to the following references: (1) Avidov and Harpaz (1969)(Israel); (2) Balachowsky (1948, 1950, 1951, 1953, 1954)(Palearctic); (3) Beardsley and Gonzalez (1975)(world); (4) Borchsenius (1966)(U.S.S.R.); (5) J.A. Davidson and D.R. Miller (unpublished data, 1989)(U.S.A.); (6) Dekle (1977)(Florida); (7) Ebeling (1959)(world, on citrus); (8) Schmutterer et al. (1957)(world); (9) Talhouk (1975)(world, on citrus); (10) Zimmerman (1948)(Hawaii).

LIST OF ARMORED SCALE INSECT PESTS

<i>Abgrallaspis cyanophylli</i> (Signoret)*	cyanophyllum	2, 4, 5, 6, 8
<i>Abgrallaspis degenerata</i> (Leonardi)	degenerate	8
<i>Abgrallaspis fraxini</i> (McKenzie)	ash	8
<i>Abgrallaspis howardi</i> (Cockerell)	Howard	8
<i>Abgrallaspis ithacae</i> (Ferris)	hemlock	5
<i>Abgrallaspis townsendi</i> (Cockerell)	Townsend	5
<i>Acanthomytilus intermittens</i> (Hall)		4
<i>Acutaspis perseae</i> (Comstock)	red bay	4, 8
<i>Acutaspis scutiformis</i> (Cockerell)		8
<i>Adiscodiaspis tamaricicola</i> Malenotti	tamarisk	8
<i>Anamaspis lowi</i> (Colvée)	white pine needle	4
<i>Andaspis hawaiensis</i> (Maskell)	Hawaiian	2, 8
<i>Aonidia lauri</i> (Bouché)	laurel	4, 8
<i>Aonidiella aurantii</i> (Maskell)**	California red	1, 2, 3, 4, 5, 7, 8, 9
<i>Aonidiella citrina</i> (Coquillett)**	yellow	3, 4, 5, 6, 7, 8, 9
<i>Aonidiella comperei</i> McKenzie	Compere	8
<i>Aonidiella gracilis</i> (Balachowsky)		8
<i>Aonidiella orientalis</i> (Newstead)*	oriental	2, 5, 6, 7, 8, 9
<i>Aonidiella taxus</i> Leonardi	Asiatic red	5, 8
<i>Aonidomytilus albus</i> (Cockerell)	cassava	8
<i>Aspidiella hartii</i> (Cockerell)	yam	8
<i>Aspidiella sacchari</i> (Cockerell)	sugarcane	5, 6, 8
<i>Aspidiotus cryptomeriae</i> Kuwana	cryptomeria	5, 8
<i>Aspidiotus destructor</i> Signoret**	coconut	2, 3, 4, 5, 6, 7, 8, 9
<i>Aspidiotus excisus</i> Green*	aglaonema	5, 6, 7, 9
<i>Aspidiotus nerii</i> Bouché**	oleander	1, 2, 3, 4, 5, 7, 8, 9
<i>Aspidiotus rigidus</i> Reyne		8
<i>Aulacaspis madiunensis</i> (Zehntner)		8
<i>Aulacaspis mali</i> Borchsenius	Far East apple	8
<i>Aulacaspis rosae</i> (Bouché)*	rose	2, 3, 4, 5, 8
<i>Aulacaspis tegalensis</i> (Zehntner)*	sugarcane	3, 8

<i>Aulacaspis tubercularis</i> (Newstead)		2, 8
<i>Carulaspis juniperi</i> (Bouché)**	juniper	3, 4, 5, 8
<i>Carulaspis minima</i> (Targioni Tozzetti)**	minute cypress	2, 3, 5, 6, 8
<i>Chionaspis alnus</i> (Kuwana)	alder	4
<i>Chionaspis americana</i> Johnson	elm	scurfy 5, 8
<i>Chionaspis caryae</i> Cooley	hickory	8
<i>Chionaspis corni</i> Cooley	dogwood	5, 8
<i>Chionaspis etrusca</i> Leonardi	tamarisk	4
<i>Chionaspis furfura</i> (Fitch)*	scurfy	8
<i>Chionaspis heterophyllae</i> Cooley	pine	5
<i>Chionaspis pinifoliae</i> (Fitch)*	pine needle	3, 5, 8
<i>Chionaspis salicis</i> (Linnaeus)	cottonwood	4, 8
<i>Chionaspis salicisnigrae</i> (Walsh)	black willow	5, 8
<i>Chlidaspis prunorum</i> (Borchsenius)	plum	2, 8
<i>Chortinaspis subterranea</i> (Lindigner)	grass root	4
<i>Chrysomphalus ansei</i> (Green)		8
<i>Chrysomphalus aonidum</i> (Linnaeus)**	Florida red	1, 2, 3, 5, 6, 7, 8, 9
<i>Chrysomphalus bifasciculatus</i> Ferris	bifasciculate	8, 5
<i>Chrysomphalus dictyospermi</i> (Morgan)**	dictyospermum	2, 3, 4, 5, 6, 7, 8, 9
<i>Chrysomphalus pinnulifer</i> (Maskell)	pinnule	8
<i>Clavaspis herculeana</i> (Doane & Hadden)	herculeana	5
<i>Clavaspis ulmi</i> (Johnson)	elm	5
<i>Comstockiella sabalis</i> (Comstock)	palmetto	5, 8
<i>Cupressaspis shastae</i> (Coleman)	redwood	5, 8
<i>Diaspidiotus aenylus</i> (Putnam)	Putnam	5, 8
<i>Diaspidiotus caucasicus</i> (Borchsenius)	Caucasus	4, 8
<i>Diaspidiotus elaeagni</i> (Borchsenius)	Russian olive	8
<i>Diaspidiotus leguminosum</i> (Archangelskaya)	legume	2, 8
<i>Diaspidiotus liquidambaris</i> (Kotinsky)	sweetgum	5, 6
<i>Diaspidiotus osborni</i> (Newell & Cockerell)	Osborn	5
<i>Diaspidiotus pectinatus</i> (Lindigner)		8
<i>Diaspidiotus prunorum</i> (Laing)	Turan oystershell	4
<i>Diaspidiotus transcaspiensis</i> (Marlatt)	Transcaspian	4
<i>Diaspidiotus turanicus</i> (Borchsenius)	Turan willow	4

<i>Diaspidiotus uvae</i> (Comstock)	grape	5, 8
<i>Diaspis boisduvalii</i> Signoret**	Boisduval	2, 3, 4, 5, 6, 8
<i>Diaspis bromeliae</i> (Kerner)**	pineapple	2, 3, 4, 5, 8, 10
<i>Diaspis echinocacti</i> (Bouché)**	cactus	2, 4, 5, 6, 8, 10
<i>Duplaspidiotus clavigera</i> (Cockerell)*	camellia mining	5, 6, 10
<i>Duplaspidiotus tesseratus</i> (Grandpré & Charmoy)	tesseract	5, 8
<i>Duplachionaspis berlesii</i> (Leonardi)		4
<i>Dynaspidiotus britannicus</i> (Newstead)	holly	2, 4, 5, 8
<i>Ephedraspis ephedrarum</i> (Lindinger)	ephedra white	4
<i>Epidiaspis leperii</i> (Signoret)**	Italian pear	2, 3, 4, 5, 8
<i>Fiorinia externa</i> Ferris	elongate hemlock	5
<i>Fiorinia fioriniae</i> (Targioni Tozzetti)**	fiorinia	3, 4, 5, 6, 8
<i>Fiorinia japonica</i> Kuwana	coniferous fiorinia	5
<i>Fiorinia pinicola</i> Maskell		2
<i>Fiorinia theae</i> Green**	tea	3, 5, 6, 8
<i>Furchadaspis zamiae</i> (Morgan)	cycad	4, 8
<i>Furcaspis biformis</i> (Cockerell)	orchid	8, 10
<i>Furcaspis oceanica</i> Lindinger	coconut red	8
<i>Genaparlatoria pseudaspidotus</i> (Lindinger)	vanda orchid	2, 8
<i>Gymnaspis aechmeae</i> Newstead*	flyspeck	4, 6, 8
<i>Hemiberlesia diffinis</i> (Newstead)	diffinis	5
<i>Hemiberlesia lataniae</i> (Signoret)**	latania	1, 2, 3, 4, 5, 6, 8, 10
<i>Hemiberlesia palmae</i> (Cockerell)	tropical palm	4, 8
<i>Hemiberlesia rapax</i> (Comstock)**	greedy	1, 2, 3, 4, 5, 6, 7, 8, 9
<i>Howardia biclavis</i> (Comstock)**	mining	2, 3, 4, 5, 6, 8
<i>Ischnaspis longirostris</i> (Signoret)**	black thread	2, 3, 4, 5, 8, 10
<i>Kuwanaspis howardi</i> (Cooley)	bamboo white	2, 6, 8
<i>Kuwanaspis pseudoleucaspis</i> (Kuwana)	bamboo	4, 8
<i>Leonardianna pimentae</i> (Newstead)	pimento	8
<i>Lepidosaphes baluchistanensis</i> Rao		8
<i>Lepidosaphes beckii</i> (Newman)**	purple	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
<i>Lepidosaphes camelliae</i> Hoke*	camellia	5, 6, 8

<i>Lepidosaphes conchiformis</i> (Gmelin)**	fig	3, 4, 5, 8
<i>Lepidosaphes flava</i> (Targioni Tozzetti)	De Stefan	8
<i>Lepidosaphes gloverii</i> (Packard)**	Glover	2, 3, 4, 5, 6, 7, 8, 9
<i>Lepidosaphes granati</i> (Koronéos)	pomegranate	8
<i>Lepidosaphes juniperi</i> Lindigner	juniper comma	4
<i>Lepidosaphes kirgisica</i> Borchsenius	Kirgis comma	2, 8
<i>Lepidosaphes kuwacula</i> (Kuwana)		8
<i>Lepidosaphes malicola</i> Borchsenius	Armenian comma	2, 8
<i>Lepidosaphes newsteadi</i> (Šulc)	Newstead	2, 8
<i>Lepidosaphes noxia</i> McKenzie		8, 10
<i>Lepidosaphes pallida</i> (Maskell)*	Maskell	4, 5, 6
<i>Lepidosaphes pini</i> (Maskell)	Oriental pine	8
<i>Lepidosaphes pinnaeformis</i> (Bouché)	cymbidium	2, 8
<i>Lepidosaphes pistaciae</i> Archangelskaya*	yellow pistachio	2, 4, 8
<i>Lepidosaphes tokionis</i> (Kuwana)	croton	10
<i>Lepidosaphes tubulorum</i> Ferris		4, 8
<i>Lepidosaphes ulmi</i> (Linnaeus)**	oystershell	1, 2, 3, 4, 5, 8
<i>Lepidosaphes yanagicolae</i> Kuwana	firebush	4, 5
<i>Leucaspis pini</i> (Hartig)	smooth pine	1, 8
<i>Leucaspis pusilla</i> Löw	pine	1, 2, 4, 8
<i>Leucaspis riccae</i> Targioni Tozzetti		4, 8
<i>Leucaspis signoreti</i> Targioni Tozzetti	Southern Europe pine	2, 8
<i>Lindingaspis rossi</i> (Maskell)	black araucaria	8
<i>Lineaspis striata</i> (Newstead)	cypress snow	1
<i>Lopholeucaspis cockerelli</i> (Grandpré & Charmoy)	Cockerell	8, 10
<i>Lopholeucaspis japonica</i> (Cockerell)**	Japanese maple	2, 4, 5, 7, 8, 9
<i>Maniaspis gigas</i> (Maskell)		8
<i>Melanaspis inopinata</i> (Leonardi)	glassy	2, 4, 8
<i>Melanaspis obscura</i> (Comstock)*	obscure	5, 6, 8
<i>Melanaspis paulista</i> (Hempel)		8
<i>Melanaspis tenebricosa</i> (Comstock)	gloomy	5, 8
<i>Morganella longispina</i> (Morgan)	plumose	5, 7, 8
<i>Mycetaspis personata</i> (Comstock)	masked	2, 8

<i>Neopinnaspis harperi</i>	Harper	5
McKenzie		
<i>Neoselenaspis silvaticus</i>		7, 8
(Lindinger)		
<i>Nilotaspis halli</i> (Green)*	Hall	2, 5, 8
<i>Nuculaspis abietis</i> (Schrank)	spruce	4, 8
<i>Nuculaspis californica</i>	black pineleaf	5, 8
(Coleman)*		
<i>Nuculaspis tsugae</i> (Marlatt)	shortneedle evergreen	5
<i>Oceanaspidiotus spinosus</i>	spinose	4, 5, 10
(Comstock)*		
<i>Octaspidiotus tamarindi</i> (Green)		8
<i>Odonaspis saccharicaulis</i>	para grass	8
(Zehntner)		
<i>Odonaspis ruthae</i> Kotinsky*	Bermuda grass	5, 6
<i>Odonaspis secreta</i> (Cockerell)	cryptic bamboo	4, 8
<i>Opuntiaspis philococcus</i>		2, 8
(Cockerell)		
<i>Parainsulaspis cocculi</i> (Green)		8
<i>Parlatoreopsis chinensis</i>	Chinese obscure	5, 8
(Marlatt)		
<i>Parlatoreopsis longispinus</i>	Asiatic pomegranate	8
(Newstead)		
<i>Parlatoria blanchardi</i>	parlatoria date	1, 2, 3, 4, 5, 8
(Targioni Tozzetti)**		
<i>Parlatoria camelliae</i> Comstock	camellia parlatoria	5, 8
<i>Parlatoria cinerea</i>	tropical gray chaff	1, 9
Doane & Hadden		
<i>Parlatoria crypta</i> McKenzie		2, 8
<i>Parlatoria oleae</i> (Colvée)**	olive	1, 2, 3, 4, 5, 8
<i>Parlatoria pergandii</i>	chaff	1, 3, 4, 5, 6, 7, 8, 9
(Comstock)**		
<i>Parlatoria pittospori</i> Maskell	pittosporum	5
<i>Parlatoria proteus</i> (Curtis)**	proteus	2, 3, 4, 5, 6, 8
<i>Parlatoria theae</i> Cockerell*	tea parlatoria	2, 3, 4, 5, 8
<i>Parlatoria ziziphi</i> (Lucas)**	black parlatoria	3, 4, 7, 8, 9, 10
<i>Pinnaspis aspidistrae</i>	fern	3, 4, 5, 6, 7, 8, 9, 10
(Signoret)**		
<i>Pinnaspis buxi</i> (Bouché)*	boxwood	2, 8, 10
<i>Pinnaspis strachani</i> (Cooley)**	lesser snow	2, 3, 4, 5, 6, 7, 8, 10
<i>Pinnaspis theae</i> (Maskell)		8
<i>Pseudaonidia duplex</i>	camphor	3, 4, 5, 7, 8, 9
(Cockerell)**		
<i>Pseudaonidia paeoniae</i>	peony	4, 5, 6, 8
(Cockerell)*		
<i>Pseudaonidia trilobitiformis</i>	trilobite	5, 8
(Green)		
<i>Pseudaulacaspis cockerelli</i>	false oleander	5, 6, 8
(Cooley)*		
<i>Pseudaulacaspis major</i>	lychee bark	6
(Cockerell)		
<i>Pseudaulacaspis pentagona</i>	white peach	2, 3, 4, 5, 6, 8
(Targioni Tozzetti)**		
<i>Pseudaulacaspis prunicola</i>	white prunicola	5
(Maskell)		
<i>Pseudischnaspis bowreyi</i>	Bowrey	5
(Cockerell)		

<i>Pseudoparlatoria ostreata</i>	gray	5, 6, 8
Cockerell		
<i>Pseudoparlatoria parlatorioides</i>	false parlatoria	4, 5, 8
(Comstock)*		
<i>Quadraspidiotus almaatensis</i>	Alma Ata	4, 8
(Borchsenius)		
<i>Quadraspidiotus armenicus</i>	Armenian	4
(Borchsenius)		
<i>Quadraspidiotus forbesi</i>	Forbes	3, 5, 8
(Johnson)*		
<i>Quadraspidiotus gigas</i>	willow	4, 5, 8
(Thiem & Gerneck)*		
<i>Quadraspidiotus juglansregiae</i>	walnut	3, 5, 8
(Comstock)**		
<i>Quadraspidiotus lenticularis</i>	round olive	4
(Lindinger)		
<i>Quadraspidiotus maleti</i>		2, 8
(Vayssiére)		
<i>Quadraspidiotus marani</i>	southern pear	8
Zahradník		
<i>Quadraspidiotus ostreaeformis</i>	European fruit	2, 3, 4, 5, 8
(Curtis)**		
<i>Quadraspidiotus perniciosus</i>	San José	2, 3, 4, 5, 6, 8
(Comstock)**		
<i>Quadraspidiotus pyri</i>	false San José	2, 3, 4, 8
(Lichtenstein)**		
<i>Quadraspidiotus slavonicus</i>	convex poplar	2, 4, 8
(Green)		
<i>Quadraspidiotus zonatus</i>	black oyster	4
(Frauenfelt)		
<i>Quernaspis quercus</i> (Comstock)	oak	5
<i>Rhizaspidiotus artemisiae</i>	wormwood	4
(Hall)		
<i>Rhizaspidiotus dearnessi</i>	Dearness	5
(Cockerell)		
<i>Rhizaspidiotus kiritchenkoi</i>		4
(Laing)		
<i>Saharaspis ceardi</i>		2, 8
(Balachowsky)		
<i>Salicicola kermanensis</i>	Iranian poplar	4, 8
(Lindinger)		
<i>Schizotargionia arthrophyti</i>	arthrophytum	4, 8
(Archangelskaya)		
<i>Selenaspis articulatus</i>	rufous	2, 3, 5, 7, 8, 9
(Morgan)**		
<i>Situlaspis yuccae</i> (Cockerell)	small situlaspis	5
<i>Suturaspis archangelskyae</i>	Archangelskaya	4, 8
(Lindinger)		
<i>Syngenaspis parlatoriae</i> Šulc	fir	4, 8
<i>Targionia vitis</i> (Signoret)		2, 4, 8
<i>Tecaspis asiatica</i>	Asiatic plum	4, 8
(Archangelskaya)		
<i>Unaspis citri</i> (Comstock)**	citrus snow	2, 3, 5, 6, 7, 8, 9
<i>Unaspis euonymi</i> (Comstock)**	euonymus	2, 3, 4, 5, 6, 8
<i>Unaspis yanoniensis</i>	arrowhead	2, 3, 7, 8, 9
(Kuwana)**		
<i>Voraspis ceratoniae</i> (Marchal)		2, 8

DISCUSSION

It is interesting to note the similarity in the percentage of pest species in the various studies where such a comparison can be made: in Balachowsky (1948–1954) 23% of all of the species mentioned are considered to be pests; in Dekle (1977) 30% are pests; in D.R. Davidson and J.A. Miller (unpublished information, 1989), compared with the complete list of species from the U.S.A. (Nakahara, 1982), 34% are pests; in Ebeling (1959) 41% of all species recorded from citrus are pests. If these figures are translated to the world fauna, which contains approximately 1700 known species (Beardsley and Gonzalez, 1975), we would expect about 490 species to be pests. The list compiled here includes only 199 species (12% of the world fauna); we do not pretend that our coverage is complete. We believe that we have included all of the obvious pest species, but we think that our list excludes many of the species that are pests in small geographic areas and/or on a narrow range of hosts.

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