

A List of Diaspididae in the Insect Collection of Taiwan Agricultural Research Institute (3): Diaspidinae (Hemiptera: Sternorrhyncha: Coccoidea: Diaspididae)

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Abstract

Chen, S. P., J. Y. Wong, and H. C. Ku. 2016. A list of diaspididae in the insect collection of Taiwan Agricultural Research Institute (3): Diaspidinae (Hemiptera: Sternorrhyncha: Coccoidea: Diaspididae). *J. Taiwan Agric. Res.* 65(4):349–364.

A list of 35 species in 7 genera of Diaspidinae (Hemiptera: Sternorrhyncha: Coccoidea: Diaspididae) with 435 slide-mounted specimens deposited at the Insect Collection of Taiwan Agricultural Research Institute (TARI) is provided. The specimens were mainly collected during Japanese Colonial Period in Taiwan. The synonyms, host plants, distribution and photographs of slide-mounted specimens are also provided for each species.

Key words: Diaspidinae, Diaspididae, Slide-mounted specimens, Taiwan Agricultural Research Institute (TARI).

INTRODUCTION

Scale insects (Coccoidea) of Taiwan have been extensively studied by several western and Japanese entomologists such as Green, Ferris and Takahashi since 1923 (Tao 1978). Most of the slide-mounted specimens of Diaspidinae (Diaspididae) collected by Takahashi were deposited at the Insect Collection, Division of Applied Zoology, Taiwan Agricultural Research Institute (TARI), and many of them were types. However, a considerable number of species names used by Takahashi have been changed or synonymized with other names. In this study, taxonomic status of all slide-mounted specimens in TARI were examined and revised based on the current studies.

MATERIALS AND METHODS

A total of 435 slide-mounted specimens were re-examined by using a light microscope (mode: Leitz DMRB, Leica, Milton Keynes, U.K.) in this study. Distribution data of each species were compiled based on the information provided on the slide-mounted specimens deposited at the TARI Insect Collection. Photographs of slide-mounted specimens (adult female) were taken by using Leita DMRB light microscope, Automatic Piezo stepping motor (Leica Piezo Z-drive, Switzerland) and Leica DFC 420 Digital Microscope Cameras (Leica, Switzerland) for each species. The spelling of localities is followed by Chu & Yamanaka (1973, 1974, 1975) and the Taiwan Geographic Name Information

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Systems (<http://placesearch.moi.gov.tw/search/index.php>).

RESULTS

Among the identified 35 species (7 genera) of Diaspidinae in TARI, 12 species were described by Takahashi, 4 species by Cockerell, 4 species by Green, 2 species by Kuwana, 2 species by Maskell, 2 species by Signoret, 2 species by Zegbtber, and 7 species by Bouché, Comstock, Cooley, Doane & Ferris, Kerner, Newstead and Targioni-Tozzetti, respectively. There were 7 species not collected in Taiwan,

including *Aulacaspis cambodiensis* Takahashi, *Aulacaspis difficilis* (Cockerell), *Epidiaspis leperii* (Signoret), *Howardia biclavis* (Comstock), *Pseudaulacaspis kentiae* (Kuwana), *Pseudaulacaspis papayae* Takahashi, and *Pseudaulacaspis samoana* (Doane & Ferris). The following list provides comprehensive information on the nomenclature, synonymies, host plants and distribution of each species. Type specimens (female) with deposited label (for example #22-5-1-2) were recorded. Table 1 is a check list of the old name and current name of collection locality records included in the paper (Chu & Yamanaka 1973, 1974, 1975).

Table 1. A check list of the old name, current name and Chinese name of collection localities included in the paper.

Old name	Current name	Chinese name
Antsun, Anshuo	Taitung: Anshuo	台東：安朔
Arisan	Chiayi: Alishan	嘉義：阿里山
Botel Tobago	Taitung: Lanyu	台東：蘭嶼
Budai	Pingtung: Wutai	屏東：霧台
Byoritsu	Miaoli	苗栗
Chipponsan	Chipponsan	知本山
Chushinron near Rokki	Kaohsiung: Paoshan near Liouguei	高雄：寶山近六龜
Garambi, Garanbi	Pingtung: Eluanbi	屏東：鵝鑾鼻
Giran	Yilan	宜蘭
Heichin	Taoyuan: Puxin	桃園：埔心
Heito	Pingtung	屏東
Hokuto	Taipei: Beitou	台北：北投
Hori, Horin	Nantou: Puli	南投：埔里
Hozan	Kaohsiung, Fengshan	高雄：鳳山
Hsintien	New Taipei City: Xindian (Sindian)	新北市：新店
Ikenohata	Yilan: Chihtuan	宜蘭：池端
Ishiyama	Kaohsiung: Shishan (Shihshan)	高雄：石山
Kagi	Chiayi	嘉義
Kahodai	Taichung: Jiabaotai (Chiapaotai)	台中：佳保台
Kakayom	Taitung: Jiadai (Chiachiadai)	台東：嘉代(嘉嘉代)
Kankau	Pingtung: Gangkou	屏東：港口
Kanshirei	Tainan: Guanziling (Kuanytyling)	台南：關子嶺
Karenko	Hualien	花蓮
Kinyan	Yilan: Jinyang (Chinyang)	宜蘭：金洋
Kontei	Pingtung: Kending	屏東：墾丁

Table 1. A check list of the old name, current name and Chinese name of collection localities included in the paper (continued).

Old name	Current name	Chinese name
Kotosho	Taitung: Lanyu	台東：蘭嶼
Kuraru	Pingtung: Sheding	屏東：社頂
Kusshaku	New Taipei City: Quchi	新北市：屈尺
Maruyama	Taipei: Yuanshan	台北：圓山
Masuhowara, Masuhowaru, Masuhowaro	Kaohsiung: Meishan	高雄：梅山
Ouluanpi	Pingtung: Eluanbi	屏東：鵝鑾鼻
Mutosan	Pingtung: Wutoushan	屏東：霧頭山
Raisha	Pingtung: Laiyi	屏東：來義
Rarasan	Taoyuan: Lala Mountain (Lalashan)	桃園：拉拉山
Reikan	Kaohsiung: Linkuan	高雄：嶺關
Seisui	Taitung: Qingshui (Chingshui)	台東：清水
Shinten	New Taipei City: Xindian (Sindian)	新北市：新店
Shirin	Taipei: Shilin	台北：士林
Sozan	Taipei: Yangmingshan	台北：陽明山
Shin-Taiheizan	Yilan: Taiping Mountain (Taipingshan)	宜蘭：太平山
Suisha	Nantou: Shuishe	南投：魚池：水社
Taiheizan, Taihezan, Taiheisan	Yilan: Taiping Mountain (Taipingshan)	宜蘭：太平山
Taihoku	Taipei	台北
Taiju	Kaohsiung: Dashu	高雄：大樹
Tainan	Tainan	台南
Takao, Takaoshu	Kaohsiung	高雄
Takimi	Kaohsiung: Longjian (Lungchien)	高雄：龍澗
Tamsui, Tansui	New Taipei City: Danshui (Danshuei)	新北市：淡水
Tosei	Taichung: Dongshi	台中：東勢
Toyen	Taoyuan	桃園
Urai	New Taipei City: Wulai	新北市：烏來

***Aulacaspis cambodiensis* Takahashi, 1942** (Fig. 1A) (Takahashi 1942a; Ben-Dov & Miller 2014)

Original spelling on label: *Aulacaspis cambodiensis* Takah. (3 slides)

Distribution: Cambodia (Angkor).

Note: Syntypes, female [collected from Cambodia: Angkor, on undetermined tree, 24-IV-1940 by R. Takahashi (#21a-1-1-1 ~ 3)].

***Aulacaspis crawii* (Cockerell, 1898)** (Fig. 1B) (Cockerell 1898, 1902; Tao 1989; Ben-Dov & Miller 2014)

Original spelling on label: *Aulacaspis crawii* Ckll. (31 slides)

Distribution: China (Foochow); Taiwan (Taihoku: Hokuto, Maruyama, Taihoku, Tansui; Tainan; Toyen).

Host plant: *Hibiscus* sp. (Malvaceae); *Murraya* sp. (Rutaceae).

Syn.: *Diaspis crawii* Cockerell, 1898; *Diaspis crawii fulleri* Cockerell, 1901; *Aulacaspis crawii fulleri* (Cockerell, 1898); *Diaspis (Aulacaspis) fulleri* (Cockerell, 1898); *Pseudaulacaspis crawii* (Cockerell, 1898); *Pseudaulacaspis fulleri* (Cockerell, 1898); *Aulacaspis fulleri* (Cockerell, 1898).

***Aulacaspis difficilis* (Cockerell, 1896)** (Fig. 1C) (Cockerell 1896b; Tao 1989; Ben-Dov & Miller 2014)

Original spelling on label: *Aulacaspis difficilis* Ckll. (22 slides)

Distribution: Japan (Yamaguchi).

Host plant: *Elaeagnus* sp. (Elaeagnaceae).

Syn.: *Chionaspis difficilis* Cockerell, 1896; *Sasakiaspis difficilis* (Cockerell, 1896); *Pseudaulacaspis difficilis* (Cockerell, 1896).

***Aulacaspis divergens* Takahashi, 1935** (Fig. 1D) (Takahashi 1935; Tao 1989; Ben-Dov & Miller 2014)

Original spelling on label: *Aulacaspis kuzunoi divergens* Takah. (29 slides)

Distribution: Taiwan (Byoritsu; Taihoku; Tainan: Kanshirei; Taito: Kotosho; Takao: Masuhowaru).

Host plant: *Miscanthus* sp., *Miscanthus sinensis*, *Miscanthus floridulus* (Poaceae).

Syn.: *Aulacaspis kuzunoi divergens* Takahashi, 1935.

Note: Syntypes, female [collected from Taiwan: Taihoku, Kanshirei, Masuhowaru, Kotosho, on *Miscanthus* spp., by R. Takahashi (#21a-5-1-1–21a-5-5-1, #21a-5-5-3–21a-5-6-5)].

***Aulacaspis fagraeae* (Green, 1896)** (Fig. 1E) (Green 1896; Cockerell 1902; Ben-Dov & Miller 2014)

Original spelling on label: *Diaspis fagraeae* Green. (5 slides)

Distribution: Taiwan (Kagi: Arisan; Taihoku: Maruyama).

Syn.: *Diaspis fagraeae* Green, 1896.

***Aulacaspis formosana* (Takahashi, 1934)** (Fig. 1F) (Takahashi 1934; Takagi 1970, 1985; Tao 1989; Ben-Dov & Miller 2014)

Original spelling on label: *Phenacaspis formosana* Takah. (3 slides)

Distribution: Taiwan (Giran: Ikenohata; Heito: Mutosan).

Host plant: *Wickstroemia* sp. (Thymelaeaceae).

Syn.: *Phenacaspis formosana* Takahashi, 1934; *Dycryptaspis formosana* (Takahashi, 1934); *Chionaspis formosana* (Takahashi, 1934).

Note: Syntypes, female [collected from Taiwan: Ikenohata (Rato-Gun), on *Wickstroemia* sp., 1-VIII-1933, by R. Takahashi (#39-3-1-3–4)].

***Aulacaspis greeni* Takahashi, 1934** (Fig. 2A) (Takahashi 1934; Tao 1989; Ben-Dov & Miller 2014)

Original spelling on label: *Aulacaspis greeni* Takah. (13 slides)

Distribution: Taiwan (Heito: Garambi).

Host plant: *Cinnamomum* sp., *Cinnamomum reticulatum* (Lauraceae).

Note: Syntypes, female [collected from Taiwan: Garambi, Kankau, Kuraru, on *Cinnamomum reticulatum*. by R. Takahashi (#21a-4-3-5-a–b, 21a-4-1-1–21a-4-3-4)].

***Aulacaspis hedyotidis* (Green, 1899)** (Fig. 2B) (Green 1899; Takahashi 1942b; Takagi 1985; Ben-Dov & Miller 2014)

(1) **Original spelling on label:** *Phenacaspis dehyotidis* Green. (5 slides)

Distribution: Taiwan (Taito: Kotosho).

(2) **Original spelling on label:** *Phenacaspis hedyotidis* Green. (21 slides)

Distribution: Malaysia (Malaya: Seremban); Taiwan (Taihoku: Maruyama, Taihoku, Tansui); Thailand (Ubon).

Host plant: *Elaeagnus* sp., *Mallotus japonicus*, *Mallotus philippensis* (Elaeagnaceae); *Acalypha* sp. (Euphorbiaceae); *Machilus japonica* (Lauraceae); *Hydrangea integrifolia* (Saxifragaceae).

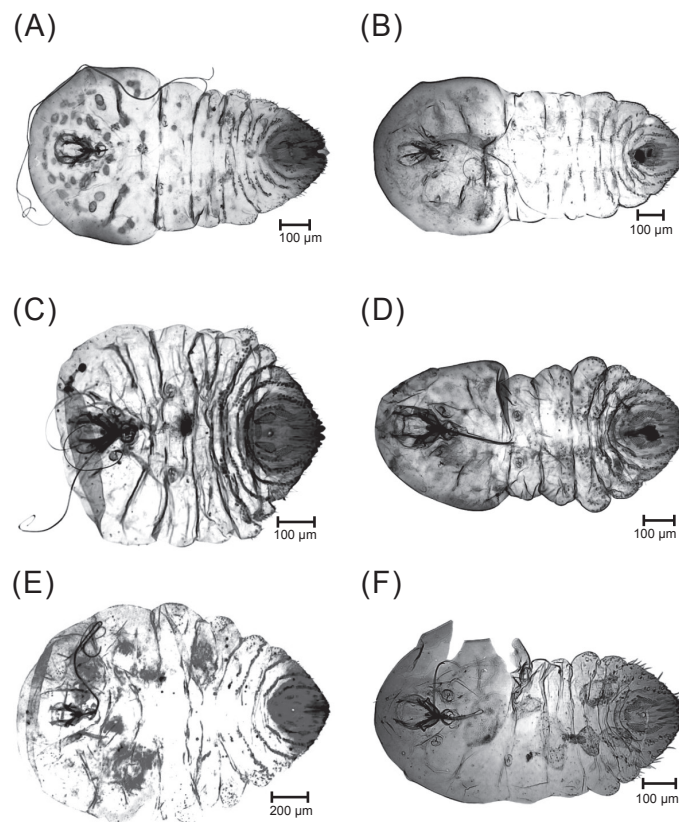


Fig. 1. (A) *Aulacaspis cambodiensis* Takahashi, 1942; (B) *Aulacaspis crawii* (Cockerell, 1898); (C) *Aulacaspis difficilis* (Cockerell 1896); (D) *Aulacaspis divergens* Takahashi, 1935; (E) *Aulacaspis fagraeae* (Green 1896); and (F) *Aulacaspis formosana* (Takahashi 1934).

Syn.: *Chionaspis hedyotidis* Green, 1899;
Trichomytilus hedyotidis (Green,
1899); *Phenacaspis hedyotidis*
(Green, 1899).

***Aulacaspis latissima* (Cockerell, 1897)** (Fig. 2C) (Cockerell 1897; Chou 1982; Ben-Dov & Miller 2014)

Original spelling on label: *Aulacaspis latissima* Ckll. (15 slides)

Distribution: Japan (Kyushu: Kagoshima; Okinawa: Haneji); Taiwan (Nantou: Suisha).

Host plant: *Distylium racemosum* (Hamamelidaceae); *Murraya* sp. (Rutaceae).

Syn.: *Chionaspis latissima* Cockerell, 1897; *Phenacaspis latissima* (Cockerell, 1897).

***Aulacaspis machili* (Takahashi, 1931)** (Fig. 2D) (Takahashi 1931b; Takagi & Kawai 1967; Takagi 1985; Tao 1989; Ben-Dov & Miller 2014)

Original spelling on label: *Diaspis machili* Takah. (3 slides)

Distribution: Taiwan (Giran; Nantou: Suisha; Taihoku).

Host plant: *Cinnamomum* sp., *Machilus kusanoi* (Lauraceae).

Syn.: *Diaspis machili* Takahashi, 1931; *Phenacaspis obovata* Takagi & Kawai, 1966; *Chionaspis machili* (Takahashi, 1931); *Chionaspis obovata* (Takahashi, 1931); *Phenacaspis machili* (Takahashi, 1931).

***Aulacaspis madiunensis* (Zehntner, 1898)** (Fig. 2E) (Takahashi 1940; Tao 1989; Ben-Dov & Miller 2014)

Original spelling on label: *Aulacaspis madiunensis* Zehntner. (14 slides)

Distribution: Taiwan (Tainan; Urai).

Host plant: *Saccharum* sp. (Poaceae).

Syn.: *Chionaspis madiunensis* Zehntner, 1898;
Sclopetaspis madiunensis (Zehntner, 1898).

***Aulacaspis murrayae* Takahashi, 1931** (Fig. 2F) (Takahashi 1931a; Tao 1989; Ben-Dov & Miller 2014)

Original spelling on label: *Aulacaspis murrayae* Takah. (28 slides)

Distribution: Taiwan (Heito: Garanbi; Takao; Toyen).

Host plant: *Murraya* sp., *Murraya exotica* (Rutaceae).

Note: Syntypes, female [collected from Taiwan: Takao, on *Murraya exotica*, 23-VI-1929, by R. Takahashi (#21b-3-4-1-2, #21b-3-4-4-5, 21b-4-1-1-21b-4-4-5)].

***Aulacaspis phoebicola* Takahashi, 1936** (Fig. 3A) (Takahashi 1936b; Tao 1989; Ben-Dov & Miller 2014)

Original spelling on label: *Aulacaspis yabunikkei* Kuw. Nar. *phoebicola* Tak. (9 slides)

Distribution: Taiwan (Taito: Antsun; Toen: Rarasan).

Host plant: *Phoebe* sp., *Phoebe formosana* (Lauraceae).

Note: Syntypes, female [collected from Taiwan: Rarasan, near Urai, 31-VII-1933

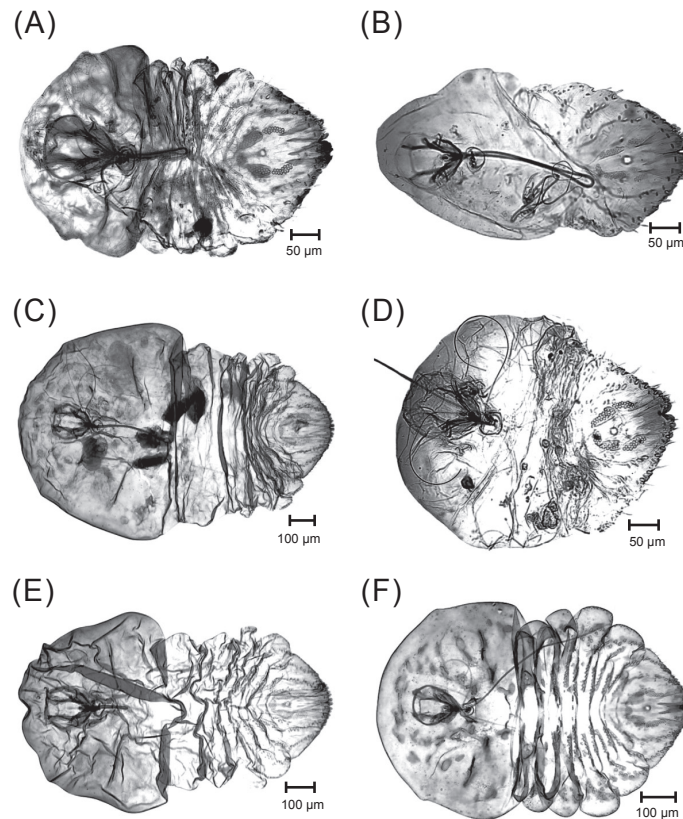


Fig. 2. (A) *Aulacaspis greeni* Takahashi, 1934; (B) *Aulacaspis hedyotidis* (Green 1899); (C) *Aulacaspis latissima* (Cockerell 1897); (D) *Aulacaspis machili* (Takahashi 1931); (E) *Aulacaspis madiunensis* (Zehntner 1898); and (F) *Aulacaspis murrayae* Takahashi, 1931.

(#22-5-1-1) and Antsun, Taitocho, 13-V-1935 (#22-5-1-2, #22-5-1-5, #22-4-1-3, #22-5-2-1-22-5-2-5), by R. Takahashi].

***Aulacaspis robusta* Takahashi, 1931** (Fig. 3B)
(Takahashi 1931a; Tao 1989; Ben-Dov & Miller 2014)

Original spelling on label: *Aulacaspis robusta* Takah. (12 slides)

Distribution: Taiwan (Taihoku: Shirin, Taihoku).

Host plant: *Bladhia* sp., *Ardisia sieboldii* (Myrsinaceae).

Note: Syntypes, female [collected from Taiwan: Shirin, on *Bladhia sieboldii*, 30-XII-1930, by R. Takahashi (#21b-5-1-2, #21b-5-1-3)].

***Aulacaspis rosae* (Bouché, 1833)** (Fig. 3C) ^(Cockrell 1896a; Chou 1982; Ben-Dov & Miller 2014)

Original spelling on label: *Aulacaspis rosae* Bouché. (14 slides)

Distribution: Taiwan (Giran: Taihezan; Taihoku).

Host plant: *Rosa* sp., *Rubus* sp. (Rosaceae).

Syn.: *Aspidiotus rosae* Bouché, 1833; *Chermes rosae* (Bouché, 1834); *Diaspis rosae* (Bouché, 1834); *Aulacaspis (Diaspis) rosae* (Bouché, 1834); *Diaspis (Aulacaspis) rosae* (Bouché, 1834); *Anamaspis rosae* (Bouché, 1834).

***Aulacaspis spinosa* (Maskell, 1897)** (Fig. 3D)
(Maskell 1897; Fernald 1903; Tao 1989; Ben-Dov & Miller 2014)

Original spelling on label: *Aulacaspis spinosa* Mask. (13 slides)

Distribution: Taiwan (Giran: Taihezan; Nantou: Suisha).

Host plant: *Smilax* sp. (Smilacaceae).

Syn.: *Diaspis rosae spinosa* Maskell, 1897; *Aulacaspis rosae spinosa* (Maskell, 1897); *Aulacaspis pseudospinosa* Chen, Wu & Su, 1980.

***Aulacaspis tegalensis* (Zehntner, 1898)** (Fig. 3E) ^(Ferris 1921; Tao 1989; Ben-Dov & Miller 2014)

Original spelling on label: *Aulacaspis tegalensis* Zehntner. (3 slides)

Distribution: Taiwan (Taihoku).

Host plant: *Saccharum* sp. (Poaceae).

Syn.: *Chionaspis tegalensis* Zehntner, 1898; *Aulacaspis major* Rutherford, 1916; *Aulacaspis tegalensis* (Zehntner, 1898); *Aulacaspis rutherfordi* (Zehntner, 1898); *Diaspis rutherfordi* (Zehntner, 1898); *Miscanthaspis tegalensis* (Zehntner, 1898).

***Aulacaspis tubercularis* Newstead, 1906** (Fig. 3F) ^(Tao 1989; Ben-Dov & Miller 2014)

Original spelling on label: *Aulacaspis mangiferae* Newst. (16 slides)

Distribution: Taiwan (Heito: Budai; Taihoku: Hokuto; Tainan); Thailand (Bangkok).

Host plant: *Acer* sp. (Aceraceae); *Mangifera* sp. (Anacardiaceae); *Machilus* sp. (Lauraceae).

Syn.: *Aulacaspis (Diaspis) tubercularis* Newstead, 1906; *Aulacaspis cinnamomi* Newstead, 1908; *Aulacaspis tubercularis* (Newstead, 1906); *Diaspis (Aulacaspis) cinnamomi mangiferae* Newstead, 1911; *Aulacaspis cinnamomi mangiferae* (Newstead, 1911); *Diaspis mangiferae* (Newstead, 1911); *Diaspis cinnamomi-mangiferae* (Newstead, 1911); *Aulacaspis mangifera* (Newstead); *Diaspis (Aulacaspis) cinnamomi* Newstead, 1911; *Diaspis (Aulacaspis) tubercularis* (Newstead, 1906).

***Aulacaspis vitis* (Green, 1896)** (Fig. 4A) ^(Chou 1982; Takagi 1985; Ben-Dov & Miller 2014)

Original spelling on label: *Phenacaspis vitis* Green. (24 slides)

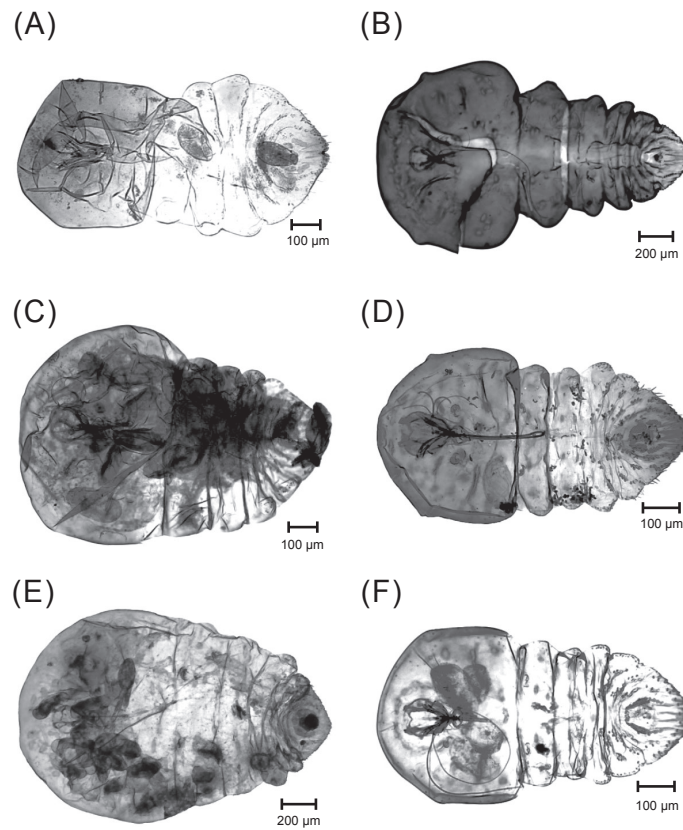


Fig. 3. (A) *Aulacaspis phoebicola* Takahashi, 1936; (B) *Aulacaspis robusta* Takahashi, 1931; (C) *Aulacaspis rosae* (Bouché 1833); (D) *Aulacaspis spinosa* (Maskell 1897); (E) *Aulacaspis tegalensis* (Zehntner 1898); and (F) *Aulacaspis tubercularis* Newstead, 1906.

Distribution: Japan (Okinawa: Haneji); Taiwan (Kankau; Nantou: Hori, Suisha; Taichu: Tosei; Taihoku: Hokuto, Sozan, Taihoku; Taito: Kotosho); Thailand (Ubon).

Host plant: *Elaeagnus* sp., *Mallotus* sp., *Elaeagnus glabra* (Elaeagnaceae); *Acalypha* sp. (Euphorbiaceae); *Machilus* sp. (Lauraceae); *Hydrangea integrifolia* (Saxifragaceae).

Syn.: *Chionaspis vitis* Green, 1896; *Trichomytilus vitis* (Green, 1896); *Poliaspis vitis* (Green, 1896); *Phenacaspis vitis* (Green, 1896).

Aulacaspis yabunikkei Kuwana, 1926 (Fig.

4B) (Kuwana, 1926; Tao 1989; Ben-Dov & Miller 2014)

Original spelling on label: *Aulacaspis yabunikkei* Kuwana. (28 slides)

Distribution: China (Hong Kong, Hwangyen); Japan (Kyushu: Naze); Taiwan (Heito: Garanbi, Heito, Kuraru, Raisha; Nantou: Suisha; Taihoku: Hokuto, Kusshaku, Shirin, Taihoku; Taito: Chipponsan, Kakayom, Seisui; Takaoshu: Chushinron near Rokki, Ishiyama, Takimi).

Host plant: *Actinodaphne* sp., *Beilschmiedia erythrophloia*, *Cinnamomum sieboldii*, *Cinnamomum* sp., *Lindera oldhami*, *Neolitsea* sp., *Tetradenia* sp. (Lauraceae).

***Diaspis boisduvalii* Signoret, 1869** (Fig. 4C)

(Signoret 1869; Tao 1989; Ben-Dov & Miller 2014)

Original spelling on label: *Diaspis boisduvalii* Signoret, 1869. (3 slides)**Distribution:** Malaysia (Malaya: Kuala Lumpur); Taiwan (Taihoku).**Host plant:** *Ananassa* sp., *Ananassa sativa* (Bromeliaceae); *Rhynchostylis retusa* (Orchidaceae).**Syn.:** *Diaspis trinacis* Colvée, 1881; *Aulacaspis boisduvalii* (Signoret, 1869); *Aulacaspis cattleyae* Cockerell, 1899; *Diaspis cattleyae* (Cockerell, 1899); *Aulacaspis cymbidii* (Cockerell, 1899).***Diaspis bromeliae* (Kerner, 1778)** (Fig. 4D)

(Curtis 1843; Signoret 1869; Tao 1989; Ben-Dov & Miller 2014)

Original spelling on label: *Diaspis bromeliae* Kern. (13 slides)**Distribution:** Malaysia (Malaya: Klang); Singapore; Taiwan (Heito; Hozan; Kagi; Taihoku; Takao: Taiju); USA (Hawaii).**Host plant:** *Ananas comosus* (Bromeliaceae).**Syn.:** *Coccus bromeliae* Kerner, 1778; *Aspidiotus bromeliae* (Kerner, 1778); *Aspidiotus bromeliae* Bouché, 1844; *Chermes bromeliae* (Kerner, 1778); *Aulacaspis bromeliae* (Kerner, 1778).***Dinaspis taiwana* Takahashi, 1936** (Fig. 4E)

(Takahashi 1936a; Tao 1978; Ben-Dov & Miller 2014)

Original spelling on label: *Dinaspis taiwana* Takahashi, 1936. (4 slides)**Distribution:** Taiwan (Taihoku: Shinten).**Note:** Syntypes, female [collected from Taiwan: Shinten, on *Actinodaphne pedicellata*, 22-IV-1936, by R. Takahashi (#25-2-2-1-4)].***Epidiaspis leperii* (Signoret, 1869)** (Fig. 4F) (Si-

gnoret 1869; Ben-Dov & Miller 2014)

Original spelling on label: *Diaspis leperii*

Signet. (5 slides)

Distribution: Turkey (Angora).**Host plant:** *Pyrus* sp., *Pyrus communis* (Rosaceae).**Syn.:** *Diaspis leperii* Signoret, 1869; *Diaspis pyri* Colvée, 1881; *Aspidiotus piricola* Del Guercio, 1894; *Diaspis piricola* (Del Guercio, 1894); *Epidiaspis piricola* (Del Guercio, 1894); *Epidiaspis pyri* (Colvée, 1881).***Howardia biclavis* (Comstock, 1883)** (Fig. 5A)(Tao 1989; Wong *et al.* 1999; Ben-Dov & Miller 2014)**Original spelling on label:** *Howardia biclavis* Comst. (1 slide)**Distribution:** Micronesia (Caroline Is.: Truk: Tol Olej).**Host plant:** *Citrus limon* (Rutaceae).**Syn.:** *Chionaspis biclavis* Comstock, 1883; *Chionaspis biclavis detecta* Maskell, 1895; *Chionaspis (Howardia) biclavis* (Comstock, 1883); *Howardia biclavis detecta* (Comstock, 1883); *Megalodiaspis biclavis* (Comstock, 1883); *Howardia (Chionaspis) biclavis* (Comstock, 1883).***Pseudaulacaspis brideliae* (Takahashi, 1933)**

(Fig. 5B) (Takahashi 1933; Tao 1989; Ben-Dov & Miller 2014)

Original spelling on label: *Chionaspis brideliae* Takah. (3 slides)**Distribution:** Taiwan (Taihoku: Shinten).**Host plant:** *Bridelia* sp., *Bridelia ovata* (Euphorbiaceae).**Syn.:** *Chionaspis brideliae* Takahashi, 1933; *Trichomytilus brideliae* (Takahashi, 1933); *Phenacaspis brideliae* (Takahashi, 1933).**Note:** Syntypes, female [collected from Taiwan: Shinten, Taihoku, on *Bridelia* sp., 04-IX-1932 by R. Takahashi (#23-2-4-3)].

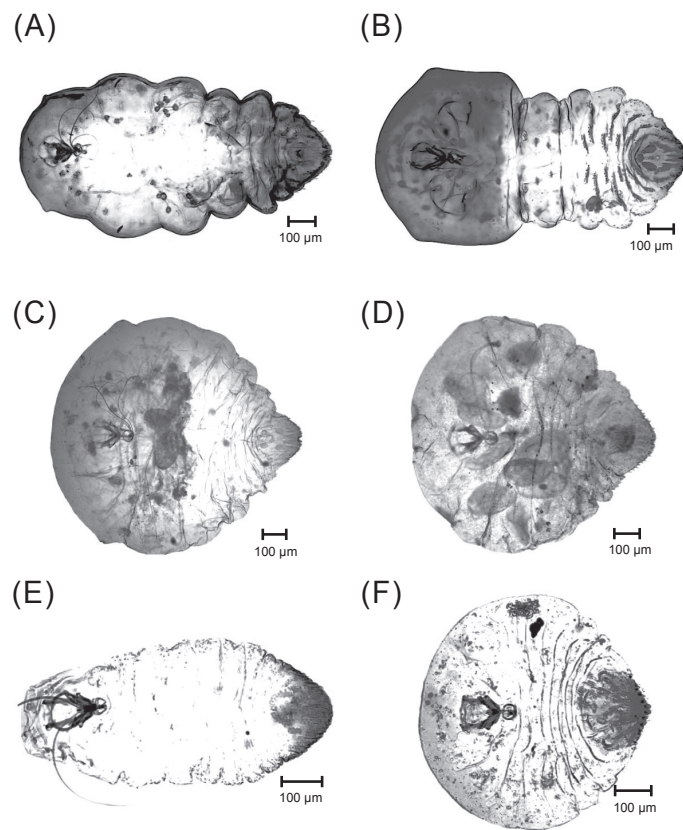


Fig. 4. (A) *Aulacaspis vitis* (Green 1896); (B) *Aulacaspis yabunikkei* Kuwana, 1926; (C) *Diaspis boisduvalii* Signoret, 1869; (D) *Diaspis bromeliae* (Kerner 1778); (E) *Dinaspis taiwana* Takahashi, 1936; and (F) *Epidiaspis leperii* (Signoret 1869).

***Pseudaulacaspis cockerelli* (Cooley, 1897)**

(Fig. 5C) (Cooley 1897; Green 1899; Takagi & Kawai 1967; Tao 1989; Wong et al. 1999; Ben-Dov & Miller 2014)

(1) **Original spelling on label:** *Chionaspis dilatata* Green. (1 slide)

Distribution: South Asia.

(2) **Original spelling on label:** *Phenacaspis cockerelli* Cooley. (2 slides)

Distribution: China (Hong Kong).

(3) **Original spelling on label:** *Phenacaspis inday* (Banks, 1906). (8 slides)

Distribution: Cambodia (Angkor); Palau Isls. (Arumizu-Arakasao; Babeldaob; Ngiwal-Ngarard; Peliliou).

(4) **Original spelling on label:** *Phenacaspis dilatata* Green. (18 slides)

Distribution: Cambodia (Angkor); Malaysia (Malaya: Kepong, Malacca); Taiwan (Formosa; Heito: Garanbi, Kon-tei; Kagi; Taihoku: Sozan; Takaoshu: Ishiyama, Reikan, Takimi); Thailand (Bangkok; Mt. Sutep).

Host plant: *Mangifera* sp. (Anacardiaceae); *Trachycarpus* sp., *Phoenix* sp. (Arecaceae); *Hevea* sp. (Euphorbiaceae); *Stauntonia* sp. (Lardizabalaceae); *Laurac* sp. (Lauraceae); *Camellia* sp. (Theaceae).

Syn.: *Chionaspis cockerelli* Cooley, 1897; *Chionaspis dilatata* Green, 1899; *Phenacaspis natalensis* Cockerell, 1902; *Phenacaspis dilatata* (Green,

1899); *Chionaspis (Phenacaspis) dilatata* (Green, 1899); *Chionaspis candida* Banks, 1906; *Chionaspis inday* Banks, 1906; *Chionaspis (Phenacaspis) natalensis* (Cockerell, 1902); *Aulacaspis dilatata* (Green, 1899); *Aulacaspis natalensis* (Cockerell, 1902); *Phenacaspis eugeniae sandwicensis* Fullaway, 1932; *Trichomytilus aucubae* (Cooley, 1897); *Trichomytilus cockerelli* (Cooley, 1897); *Trichomytilus dilatatus* (Green, 1899); *Trichomytilus inday* (Banks, 1906); *Trichomytilus natalensis* (Cockerell, 1902); *Chionaspis syringae* Borchsenius, 1938; *Chionaspis hattorii* Kanda, 1941; *Phenacaspis sandwicensis* (Fullaway, 1932); *Chionaspis akebiae* Takahashi, 1952; *Phenacaspis syringae* (Borchsenius, 1938); *Phenacaspis akebiae* (Takahashi, 1952); *Phenacaspis ferrisi* Mamet, 1959; *Phenacaspis hattorii* (Kanda, 1941); *Phenacaspis inday* (Banks, 1906); *Phenacaspis cockerelli* (Cooley, 1897).

***Pseudaulacaspis eugeniae* (Maskell, 1892)** (Fig. 5D) (Cockerell 1899; Maskell 1892; Takagi 1985; Ben-Dov & Miller 2014)

Original spelling on label: *Phenacaspis eugeniae* Mask. (6 slides)

Distribution: Taiwan (Taihoku); USA (Hawaii: Honolulu).

Host plant: *Bischofia javanica* (Euphorbiaceae); *Michelia* sp., *Michelia fuscata* (Magnoliaceae).

Syn.: *Chionaspis eugeniae* Maskell, 1892; *Phenacaspis eugeniae* (Maskell, 1892); *Howardia eugeniae* (Maskell, 1892); *Aulacaspis eugeniae* (Maskell, 1892); *Trichomytilus eugeniae* (Maskell, 1892); *Poliaspis eugeniae* (Maskell, 1892).

***Pseudaulacaspis kentiae* (Kuwana, 1931)** (Fig. 5E) (Kuwana 1931; Takagi 1985; Ben-Dov & Miller 2014)

Original spelling on label: *Phenacaspis kentiae* Kuw. (1 slide)

Distribution: Japan (Honshu: Hyogo).

Syn.: *Phenacaspis kentiae* Kuwana, 1931; *Trichomytilus kentiae* (Kuwana, 1931); *Chionaspis kentiae* (Kuwana, 1931).

***Pseudaulacaspis manni* (Green in Green & Mann, 1907)** (Fig. 5F) (Takahashi 1931a, 1934; Tao 1989; Ben-Dov & Miller 2014)

(1) **Original spelling on label:** *Chionaspis manni* Green in Green & Mann, 1907. (1 slide)

Distribution: Taiwan (Heito: Kuraru).

(2) **Original spelling on label:** *Diaspis gordoniae* Takah. (4 slides)

Distribution: Taiwan (Nantou: Suisha; Tai-chu: Kahodai; Taihoku).

Host plant: *Bischofia javanica* (Euphorbiaceae); *Lithocarpus* sp. (Fagaceae).

Syn.: *Chionaspis manni* Green in Green & Mann, 1907; *Phenacaspis manni* (Green in Green & Mann, 1907); *Diaspis gordoniae* Takahashi, 1931; *Trichomytilus manni* (Green in Green & Mann, 1907); *Diaspis manni* (Green in Green & Mann, 1907).

***Pseudaulacaspis papayae* Takahashi, 1942** (Fig. 6A) (Takahashi 1942b; Ben-Dov & Miller 2014)

Original spelling on label: *Phenacaspis papayae* Takah. (5 slides)

Distribution: Thailand (Bangkok).

Host plant: *Carica papaya* (Caricaceae); *Zizyphus* sp. (Rhamnaceae).

Syn.: *Phenacaspis papayae* Takahashi, 1942.

Note: Syntypes, female [collected from Thailand: Bangkok, on *Zizyphus jujuba*, V-1940 (#39-5-2-5) and papaya, 19-V-1940 by R. Takahashi (#39-5-2-1)].

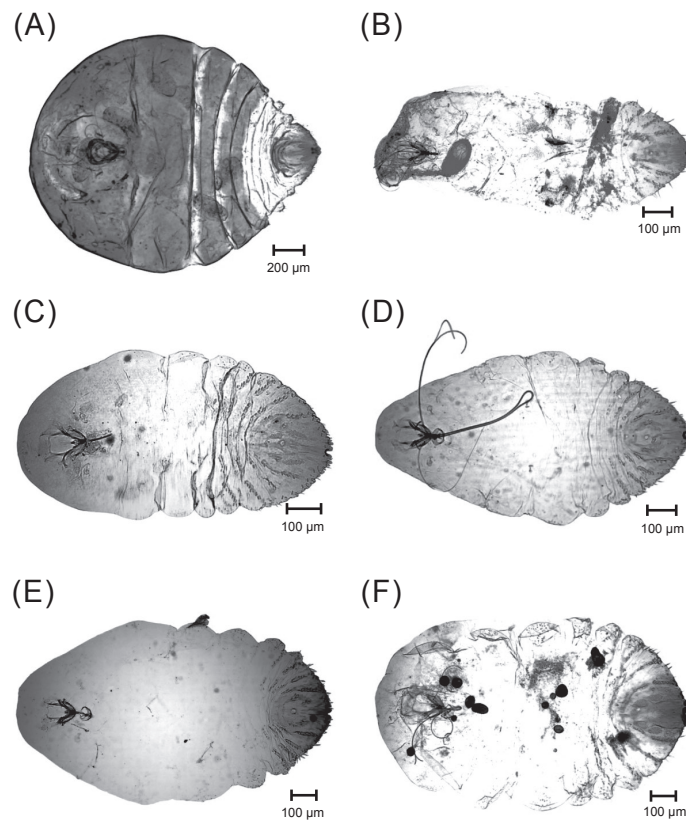


Fig. 5. (A) *Howardia biclavis* (Comstock 1883); (B) *Pseudaulacaspis brideliae* (Takahashi 1933); (C) *Pseudaulacaspis cockerelli* (Cooley 1897); (D) *Pseudaulacaspis eugeniae* (Maskell 1892); (E) *Pseudaulacaspis kentiae* (Kuwana 1931); and (F) *Pseudaulacaspis manni* (Green in Green & Mann 1907).

***Pseudaulacaspis pentagona* (Targioni-Tozzetti, 1886)** (Fig. 6B) (MacGillivray 1921; Tao 1989; Wong et al. 1999; Ben-Dov & Miller 2014)

(1) **Original spelling on label:** *Diaspis pentagona* Targ. (18 slides)

Distribution: Fiji (Fiji; Kadavu; Nayuso); Japan (Hokkaido: Sapporo; Loochoo: Naze); Korea (Keijo); Palau (Korror); Taiwan (Taihoku; Tainan; Toyen; Heichin); USA (Saipan).

(2) **Original spelling on label:** *Pseudaulacaspis pentagona* Targ. (1 slide)

Distribution: Japan (Hokkaido: Sapporo).

(3) **Original spelling on label:** *Sasakiaspis pentagona* Targ. (16 slides)

Distribution: Japan (Honshu: Yamagachi; Kyoto); Taiwan (Hualien: Karenko;

Taihoku; Shinten; Toyen).

Host plant: *Cercidiphyllum japonicum* (Cercidiphyllaceae); *Cossava* sp. (Euphorbiaceae); *Crotalaria* sp. (Fabaceae); *Beilschmiedia erythrophloia* (Lauraceae); *Urena* sp., *Hibiscus mutabilis* (Malvaceae); *Melia azedarach* (Meliaceae); *Mulberry* sp. (Moraceae); *Amygdalus persica*, *Prunus* sp., *Prunus mume* (Rosaceae); *Antirrhinum majus*, *Paulownia tomentosa* (Scrophulariaceae).

Syn.: *Diaspis pentagona* Targioni Tozzetti, 1886; *Diaspis Amygdali* Tryon, 1889; *Diaspis lanatus* Morgan & Cockerell in Cockerell, 1892; *Diaspis pateliformis* Sasaki, 1894; *Aspidiotus*

vitiensis Maskell, 1895; *Diaspis lanata* (Morgan & Cockerell in Cockerell, 1892); *Aulacaspis (Diaspis) pentagona* (Targioni Tozzetti, 1886); *Aulacaspis pentagona* (Targioni Tozzetti, 1886); *Diaspis (Aulacaspis) pentagona* (Targioni Tozzetti, 1886); *Epidiaspis vitiensis* (Maskell, 1895); *Aspidiotus lanatus* (Morgan & Cockerell in Cockerell, 1892); *Sasakiaspis pentagona* (Targioni Tozzetti, 1886).

***Pseudaulacaspis samoana* (Doane & Ferris, 1916)** (Fig. 6C) (Doane & Ferris 1916; MacGillivray 1921; Takagi 1985; Ben-Dov & Miller 2014)

Original spelling on label: *Phenacaspis sa-*

moana Doane et Ferris. (2 slides)

Distribution: Japan (Okinawa).

Syn.: *Chionaspis samoana* Doane & Ferris, 1916; *Phenacaspis samoana* (Doane & Ferris, 1916); *Trichomytilus samoanus* (Doane & Ferris, 1916).

***Pseudaulacaspis taiwana* (Takahashi, 1935)** (Fig. 6D) (Takahashi 1935; Takagi 1970; Tao 1989; Ben-Dov & Miller 2014)

Original spelling on label: *Phenacaspis taiwana* Takah. (5 slides)

Distribution: Taiwan (Giran: Kinyan).

Syn.: *Phenacaspis taiwana* Takahashi, 1935; *Chionaspis taiwana* (Takahashi, 1935).

Note: Syntypes, female [collected from Tai-

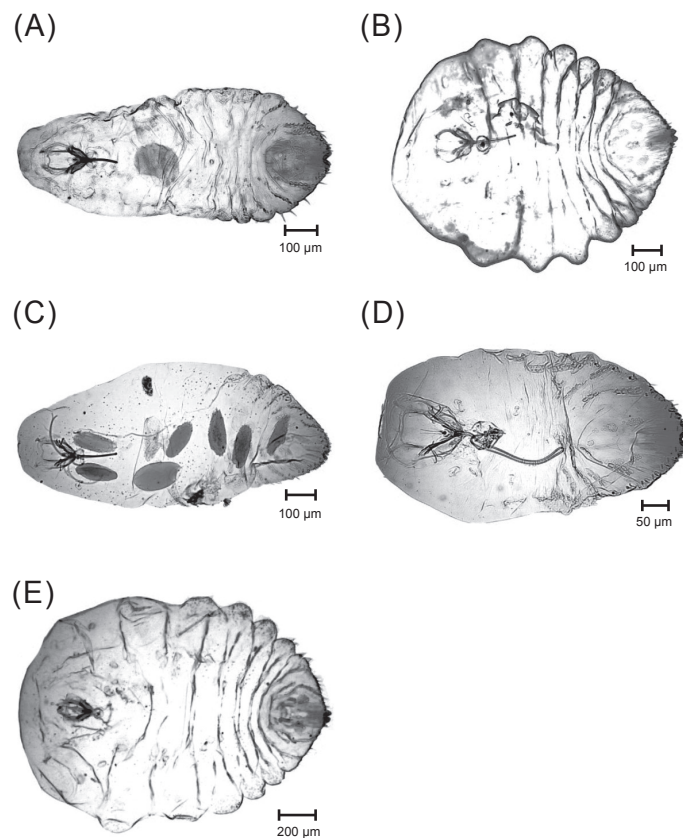


Fig. 6. (A) *Pseudaulacaspis papayae* Takahashi, 1942; (B) *Pseudaulacaspis pentagona* (Targioni-Tozzetti 1886); (C) *Pseudaulacaspis samoana* (Doane & Ferris 1916); (D) *Pseudaulacaspis taiwana* (Takahashi 1935); and (E) *Rutherfordia major* (Cockerell 1894).

wan: Taihoku Prefecture, Suo-Gun, Kin-yan, on *Quercus* sp., 16/-VIII-1934, by R. Takahashi (#39-5-5-1-5)].

***Rutherfordia major* (Cockerell, 1894)** (Fig. 6E) (Cockerell 1894; MacGillivray 1921; Takahashi 1929; Takagi et al. 1989; Tao 1989; Ben-Dov & Miller 2014)

Original spelling on label: *Diaspis major* Ckll. (7 slides)

Distribution: Taiwan (Heito: Garanbi; Taihoku).

Syn.: *Chionaspis major* Cockerell, 1894; *Diaspis euphoriae* Grandpré & Charmoy, 1899; *Aulacaspis flacourtae* Rutherford, 1914; *Diaspis (Aulacaspis) flacourtae* (Grandpré & Charmoy, 1899); *Pseudaulacaspis flacourtae* (Rutherford, 1914); *Unachionaspis major* (Cockerell, 1894); *Aulacaspis major* (Cockerell, 1894); *Diaspis major* (Cockerell, 1894); *Pseudaulacaspis hwangyensis* Chen, 1937; *Pseudaulacaspis euphorbiae* (Grandpré & Charmoy, 1899); *Pseudaulacaspis major* (Cockerell, 1894).

DISCUSSION

Based on the modern taxonomic system, the number of Diaspidinae species at TARI is 35. The present paper could be a database to set up the online information of scientific name, synonyms, host plants, distribution and digital archives through Digital Insect of TARI website (<http://digiins.tari.gov.tw/>) which will meet of the requirement of both basic and applied works and will be helpful to taxonomic researchers, quarantine inspector and farmers in the future.

ACKNOWLEDGMENTS

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REFERENCES

- Ben-Dov, Y. and D. Miller. 2014. ScaleNet: A database of the scale insects of the world. <http://www.sel.barc.usda.gov/scalenet/scalenet.htm> (visit on 2/12/2014)
- Chou, I. 1982. Monograph of the Diaspididae of China. Vol. 1. Shanxi Publishing House of Science and Technology. Shanxi. 195 pp. (in Chinese)
- Chu, Y. I. and T. Yamanaka. 1973. A check list of the present and old name of insect collect localities in Taiwan. *J. Taiwan Mus.* 16:31-72.
- Chu, Y. I. and T. Yamanaka. 1974. A check list of the present and old name of insect collect localities in Taiwan (continued). *J. Taiwan Mus.* 17:51-120.
- Chu, Y. I. and T. Yamanaka. 1975. A check list of the present and old name of insect collect localities in Taiwan (continued). *J. Taiwan Mus.* 17:121-150.
- Cockerell, T. D. A. 1894. *Diaspis lanatus*. *Entomol. News* 5:43.
- Cockerell, T. D. A. 1896a. Coccidae or scale insects. IX. *Bull. Bot. Dep. Jamaica (n.s.)* 3:256-259.
- Cockerell, T. D. A. 1896b. X. Preliminary diagnoses of new Coccidae. *Psyche* 7:18-21.
- Cockerell, T. D. A. 1897. Notes on scale insects. 2. *Calif. Fruit Grower* 20:4-5.
- Cockerell, T. D. A. 1898. Two new scale-insects quarantined at San Francisco. *Psyche* 8:190-191.
- Cockerell, T. D. A. 1899. Article VII. First supplement to the check-list of the Coccidae. *Bull. Ill. Nat. Hist. Surv.* 5:389-398.
- Cockerell, T. D. A. 1902. The coccid genus *Aulacaspis*. *Entomologist* 35:58-59.
- Cooley, R. A. 1897. New species of *Chionaspis*. *Can. Entomol.* 29:278-282.
- Curtis, J. (Ruricola) 1843. *Entomology*- No. XLVII. The small white-scale, or oleander shield-bearer, *Aspidiotus nerii* (Bouche). *Gard. Chronicle* 34:588.
- Doane, R. W. and G. F. Ferris. 1916. Notes on Samoan Coccidae with descriptions of three new species. *Bull. Entomol. Res.* 6:399-402.
- Fernald, M. E. 1903. A Catalogue of the Coccidae of the World. Press of Carpenter & Morehouse. Amherst, MA. 374 pp.
- Ferris, G. F. 1921. Some Coccidae from Eastern Asia. *Bull. Entomol. Res.* 12:211-220.

- Green, E. E. 1896. Catalogue of Coccidae collected in Ceylon. *Indian Mus. Notes* 4:2–10.
- Green, E. E. 1899. *The Coccidae of Ceylon, Part II*. Dula. London. 234 pp.
- Kuwana, I. 1926. *The Diaspine Coccidae of Japan, IV, Genera Cryptoparlatoria, Howardia, Sasakiaspis, Diaspis, Aulacaspis, Pinnaspis and Prontaspis*. Imperial Plant Quarantine Service. Yokohama, Japan. 44 pp.
- Kuwana, I. 1931. *The diaspine Coccidae of Japan, VI. Genus Phenacaspis*. *Sci. Bull. Minist. Agric. For. Jpn. Tokyo*. 2:1–14.
- MacGillivray, A. D. 1921. *The Coccidae. Scarab. Urbana*, IL. 502 pp.
- Maskell, W. M. 1892. Further coccid notes: With descriptions of new species, and remarks on coccids from New Zealand, Australia and elsewhere. *Trans. Proc. N. Z. Inst.* 24:1–64.
- Maskell, W. M. 1897. On a collection of Coccidae, principally from China and Japan. *Entomol. Mon. Mag.* 33:239–244.
- Signoret, V. 1869. *Essai sur les cochenilles ou gallinsectes (Homopteres-Coccides), 5e partie*. *Ann. Soc. Entomol. Fr.* 9:431–452. (in French)
- Takagi, S. 1970. Diaspididae of Taiwan based on material collected in connection with the Japan-U.S. Cooperative Science Programme, 1965 (Homoptera: Coccoidea). Part II. *Insecta Matsumurana* 33:1–146.
- Takagi, S. 1985. The scale insect genus *Chionaspis*; a revised concept (Homoptera: Coccoidea: Diaspididae). *Insecta Matsumurana (n.s.)* 33:1–77.
- Takagi, S. and S. Kawai. 1967. The genera *Chionaspis* and *Pseudaulacaspis* with a criticism on *Phenacaspis* (Homoptera: Coccoidea). *Insecta Matsumurana* 30:29–43.
- Takagi, S., T. Y. Pongand, and K. S. Ghee. 1989. Beginning with *Diaulacaspis* (Homoptera: Coccoidea: Diaspididae): Convergence or effect? *Insecta Matsumurana (n.s.)* 42:143–199.
- Takahashi, R. 1929. Observations on the Coccidae of Formosa, Part I. *Formosa Govt. Res. Inst. Dept. Agric. Rept.* 40. Taihoku. 80 pp.
- Takahashi, R. 1931a. Descriptions of some new Formosan Coccidae (Rhynchota). *Bull. Entomol. Res.* 22:211–220.
- Takahashi, R. 1931b. Some Coccidae of Formosa. *Trans. Nat. Hist. Soc. Formosa* 21:1–5.
- Takahashi, R. 1933. Observations on the Coccidae of Formosa. Part III. *Formosa Govt. Res. Inst. Dept. Agric. Rept.* 60. Taihoku. 64 pp.
- Takahashi, R. 1934. Observations on the Coccidae of Formosa, Part IV. *Formosa Govt. Res. Inst. Dept. Agric. Rept.* 63. Taihoku. 38 pp.
- Takahashi, R. 1935. Observations on the Coccidae of Formosa. Part V. *Formosa Govt. Res. Inst. Dept. Agric. Rept.* 66. Taihoku. 37 pp.
- Takahashi, R. 1936a. A new scale insect causing galls in Formosa (Homoptera). *Trans. Nat. Hist. Soc. Formosa* 26:426–428.
- Takahashi, R. 1936b. Two interesting scale insects attacking the Lauraceae in Formosa (Homoptera). *Trans. Nat. Hist. Soc. Formosa* 26:80–83.
- Takahashi, R. 1940. Some Coccidae from Formosa and Japan (Homoptera). Part V. *Mushi* 13:18–28.
- Takahashi, R. 1942a. Some Coccidae from Malaya and Hongkong (Homoptera). *Trans. Nat. Hist. Soc. Formosa* 32:63–68.
- Takahashi, R. 1942b. Some Injurious Insects of Agricultural Plants and Forest Trees in Thailand and Indo-China. II. Coccidae. Report. *Formosa Govt. Res. Inst. Dept. Agric. Rept.* 81. Taihoku. 56 pp.
- Tao, C. C. C. 1978. Check list and host plant index to scale insects of Taiwan, Republic of China. *J. Agric. Res. China* 27:77–141. (in Chinese with English abstract)
- Tao, C. C. C. 1989. Scale insects name list of Taiwan, Republic of China. *Bull. Taichung Dist. Agric. Improve. Stat.* 22:57–70. (in Chinese with English abstract)
- Wong, C. Y., S. P. Chen, and L. Y. Chou. 1999. *Guidebook to Scale Insects of Taiwan*. *Agric. Res. Inst. Pub. No. 89*. Taichung. 98 pp. (in Chinese)

農業試驗所昆蟲標本館盾介殼蟲科 (3)： 盾介殼蟲亞科 (半翅目、胸喙亞目、介殼蟲總科： 盾介殼蟲科) 標本名錄

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摘要

陳淑佩、翁振宇、古琇芷。2016。農業試驗所昆蟲標本館盾介殼蟲科 (3)：盾介殼蟲亞科 (半翅目、胸喙亞目、介殼蟲總科：盾介殼蟲科) 標本名錄。台灣農業研究 65(4):349-364。

本文羅列 7 屬 35 種 (435 片玻片標本) 行政院農業委員會農業試驗所館藏之盾介殼蟲亞科 [半翅目 (Hemiptera) 胸喙亞目 (Sternorrhyncha) 介殼蟲總科 (Coccoidea) 盾介殼蟲科 (Diaspididae)] 名錄，其中亦包含異名、寄主植物、採集分佈、存放標示及標本形態圖等資料。

關鍵詞：盾介殼蟲亞科、盾介殼蟲科、玻片標本、農業試驗所。

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