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NOMENCLATURAL CHANGES IN THE DIASPIDIDAE (HEMIPTERA: COCCOIDEA)

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Abstract.—A database containing taxonomic information on two subfamilies of the diaspidid scale insects of the world is available on the World Wide Web. Several nomenclatural changes need to be validated including: *Diaspis amygdali rubra* (Maskell) new illustration and lectotype designation; *Diaspis barberi* Green **new junior synonym** of *D. amygdali rubra* and lectotype designation; *Pseudaulacaspis ernesti* Miller, Gimpel, and Williams a **new replacement name** for *Diaspis grandilobis* Green (junior, secondary homonym of *Diaspis grandilobis* (Maskell)) and new illustration; *Diaspis grandilobis* Green lectotype designation; *Lepidosaphes linearis* (Modeer) discussed as a species *incertae sedis*; *Pseudaulacaspis frutescens* (Hu) **new combination**; *Lepidosaphes meliae* (Tang) **new combination**; *Lepidosaphes lithocarpicola* (Tang) **new combination**, and *Lepidosaphes pseudogloverii* (Borchsenius), **new combination**. The correct spelling of an Asian armored scale should be *Chionaspis kinshinensis* Kuwana, not *C. kiushuensis*. Twenty-six changes of adjectival species epithets are necessary for gender agreement with the genus.

Key Words: armored scales, Coccoidea, Diaspididae, ScaleNet, catalog, new combinations, lectotype, internet

We recently completed a draft of a database on two subfamilies of the Diaspididae or armored scales (Diaspidinae and Leucaspidinae) of the world including about 1,500 valid species. This research is part of a larger project called "ScaleNet" (Ben-Dov et al. 2002) to develop a queriable systematic database of the Coccoidea of the world (see Ben-Dov et al. 1997, Miller et al. 2002, and Miller and Gimpel 1996). A controversial subject in synthesizing systematic data on diaspidids is to clarify the status of genera in the Lepidosaphini. Borchsenius (1966) recognized many genera that we considered to be synonyms of *Lepidosaphes* Shimer, such as *Mytilaspis* Targioni Tozzetti, *Cornuaspis* MacGillivray, *Scobinaspis* MacGillivray, *Insulaspis* Mamet, *Paralepidosaphes* Borchsenius, *Cornimytilus* Borchsenius, *Eucornuaspis* Borchsenius, *Parainsulaspis* Borchsenius, *Pinomytilus* Borchsenius, and *Pistaciaspis* Borchsenius. Other researchers such as Takagi (1970), Danzig (1993), Gill (1997), and Williams and Watson (1988) agreed that there were insufficient criteria for the separation of these genera. Unfortunately, synonymy of these genera causes

several new combinations to be formed and they are given here.

A similar situation occurred with *Phenacaspis* Cooley and Cockerell which is widely considered to be a junior synonym of *Chionaspis* Signoret. In fact, Knipscher et al. (1976) demonstrated that *Phenacaspis nyssae* (Comstock) was the leaf form of *Chionaspis sylvatica* Sanders which occurs on the bark. Liu et al. (1989) provided information on other species with bark and leaf forms that previously were placed in *Chionaspis* and *Phenacaspis*. Others agreeing with the synonymy of *Chionaspis* and *Phenacaspis* include: Takahashi (1953), Takagi (1985), and Danzig and Pellizzari-Scaltriti (1998); those who considered them as distinct include: Borchsenius (1966), Yang, (1982), and Chen (1983). Species once included in *Phenacaspis* are now usually placed in *Chionaspis, Pseudaulacaspis* MacGillivray (Takagi 1985), or *Rutherfordia* MacGillivray (Takagi et al.1989).

Depositories

Abbreviations given for type depositories are as follows: BMNH—The Natural History Museum, London, U.K.; NZAC—New Zealand Arthropod Collection, Landcare Research, Auckland, New Zealand; USNM—United States National Entomological Collection, National Museum of Natural History, Washington, D.C., U.S.A.

New Combinations

Pseudaulacaspis frutescens (Hu), **n. comb.**
Phenacaspis frutescens Hu 1986: 217

Lepidosaphes meliae (Tang), **n. comb.**
Paralepidosaphes meliae Tang 1986: 278

Lepidosaphes lithocarpicola (Tang), **n. comb.**
Cornimytilus lithocarpicola Tang 1986: 71

Lepidosaphes pseudogloverii (Borchsenius), **n. comb.**
Insulaspis pseudogloverii Borchsenius 1964: 160.

Species Incertae Sedis

Lepidosaphes linearis (Modeer), *incertae sedis*

Chermes arborum linearis Geoffroy 1762: 509
Coccus linearis Modeer 1778: 22
Mytilaspis linearis: Targioni Tozzetti 1868: 737
Lepidosaphes linearis: Lindinger 1936: 149

Remarks.—There has been much confusion about both the identity and authorship of *Coccus linearis*. It was originally described by Geoffroy (1762), but his description is invalid because he did not consistently use binominal nomenclature (Commission on Zoological Nomenclature Opinion 228). It was Modeer (1778) who gave the first valid description even though he was validating the work of Geoffroy. The author of the species has been given as several different individuals including: Targioni Tozzetti (Borchsenius 1966); Geoffroy (Signoret 1870); and Geoffroy and Modeer (Douglas 1886). *Lepidosaphes linearis* also has been considered a junior synonym of both *L. conchiformis* (Gmelin) (Gómez Menor Ortega 1937, 1956; Borchsenius 1966) and of *L. ulmi* (Linnaeus) (Lindinger 1911, 1931; Green 1928). Cockerell (1894) thought that it might be a senior synonym of *L. pomorum* Bouché (= *L. ulmi*). To further confuse matters, *Diaspis linearis* Costa is a junior synonym of *L. ulmi*. Because original material is apparently lost and we are unable to determine the true identity of this species, we consider it to be a species *incertae sedis*.

Homonymy, Lectotype, and Replacement Name

Pseudaulacaspis ernesti Miller, Gimpel, and Williams, **new replacement name** (Fig. 1)

Diaspis grandilobis Green 1922: 1015
Pseudaulacaspis grandilobis: Lindinger 1935: 130
Chionaspis grandilobis: Takagi 1970: 52

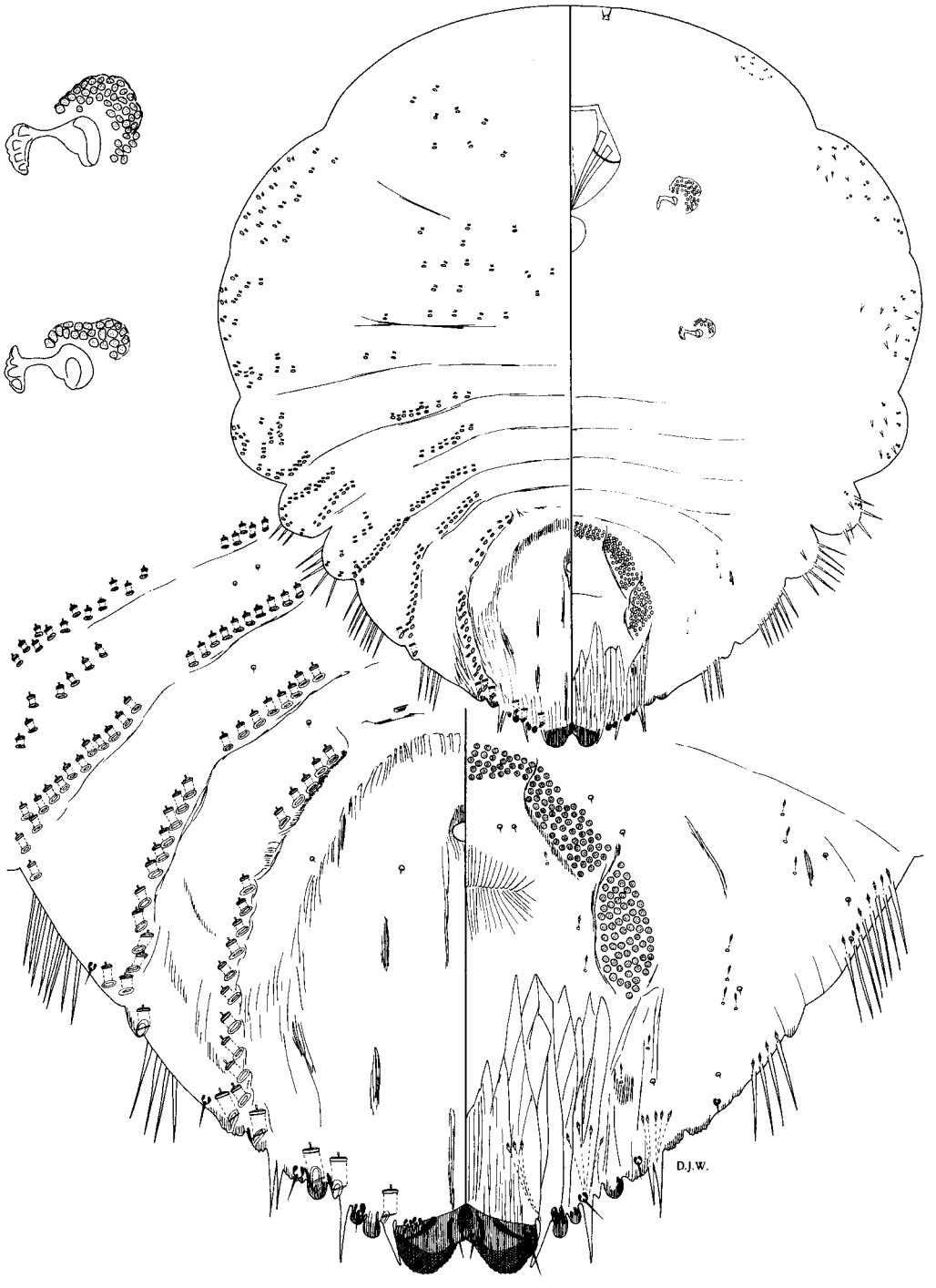

Fig. 1. Adult female *Pseudaulacaspis ernesti,* Peradeniya, Sri Lanka, on *Diospyros thwaitesii,* E. E. Green.

Pseudaulacaspis grandilobis: Takagi 1975: 23

Remarks.—We concur with Lindinger's placement of *D. grandilobis* Green in *Pseudaulacaspis* as did Takagi (1975). Therefore, *Pseudaulacaspis grandilobis* Green (1922) became a junior, secondary homonym of *P. grandilobis* (Maskell 1894) when the latter species was moved into *Pseudaulacaspis* by Takagi (1985). Because no replacement name was given, we have selected the epithet "*ernesti*" in honor of Edward Ernest Green, the author of the species. A lectotype is here designated for *Diaspis grandilobis* Green to stabilize the nomenclatural status of this previously poorly known species. We have examined a single type slide which contains a series of syntypes as follows: a second instar, 4 complete adult females, 1 torn adult-female pygidium, and 1 prepygidium (probably from the same specimen). The slide is labeled as follows: right "Diaspis grandilobis/ ~~flacourtiae~~/ Green ~~Ruthfd.~~/ from Diospyros/ thwaitesii/ Ceylon." left label "TYPE." We have placed a label on the back of the slide that gives a map of the location of the lectotype. The lectotype is the smallest of the adult females and is located in the center of the cover slip. It is deposited in BMNH.

Because the identity of this species is not well known, we have included an illustration of the adult female (Fig. 1). In general appearance it resembles *Rutherfordia major* (Cockerell) by having an oval to turbinate body, large median lobes, and numerous macroducts. It possesses well-developed second and third lobes, however, and in *Rutherfordia,* these characters are rudimentary according to the concept of Takagi et al. (1989). Within *Pseudaulacaspis, P. ernesti* Miller, Gimpel, and Williams is most similar to *P. pentagona* (Targioni Tozzetti), *P. prunicola* (Maskell), and *P. manni* (Green). The former two species differ by lacking macroducts on the thorax. *Pseudaulacaspis manni* is more elongate and only the median and second lobes are well developed.

Lectotype Designation

Pseudaulacaspis rubra (Maskell), **new status**
(Figs. 2–3)

Diaspis amygdali rubra Maskell 1898: 228
Diaspis barberi Green 1908: 35–36, **new synonymy**
Aulacaspis barberi: Rutherford 1915: 110
Pseudaulacaspis barberi: MacGillivray 1921: 316

Remarks.—Maskell (1898) included two species (from two locations) in the type series of *Diaspis amygdali rubra.* One species was from Japan on *Orixa japonica* Thunb. and was considered to be *Pseudaulacaspis prunicola* by Davidson et al. (1983). They treated *Diaspis amygdali rubra* as a junior subjective synonym of *P. prunicola* but did not designate a lectotype to formalize the action. The second part of the type series was from Sri Lanka (= Ceylon) on *Loranthus* sp. collected by Koebele (Koebele lot no. 1410; Maskell lot no. 565). (There is a note in the Maskell correspondence file at the USNM indicating that Koebele collected the specimens in Kandy, Ceylon). The second series of specimens is the same species as *Diaspis barberi* Green (1908). To clarify the identity of these species and to stabilize their nomenclatural status, we here designate lectotypes of *Diaspis amygdali rubra* and *Diaspis barberi.*

We have selected the lectotype of *D. amygdali rubra* from the series of specimens from Sri Lanka, thus making *Diaspis amygdali rubra* (= *Pseudaulacaspis rubra*) the valid name and *D. barberi* (= *Pseudaulacaspis barberi*) a junior synonym. This action will allow the primary type to be part of the Maskell collection in NZAC, and will include a series of paralectotype specimens in the USNM.

From the syntype series of slides we have selected as lectotype an adult female mounted alone which is labeled as follows:

Fig. 2. Adult female *Pseudaulacaspis rubra,* Tanjore, India, on *Loranthus* sp., C. A. Barber. Showing round body form.

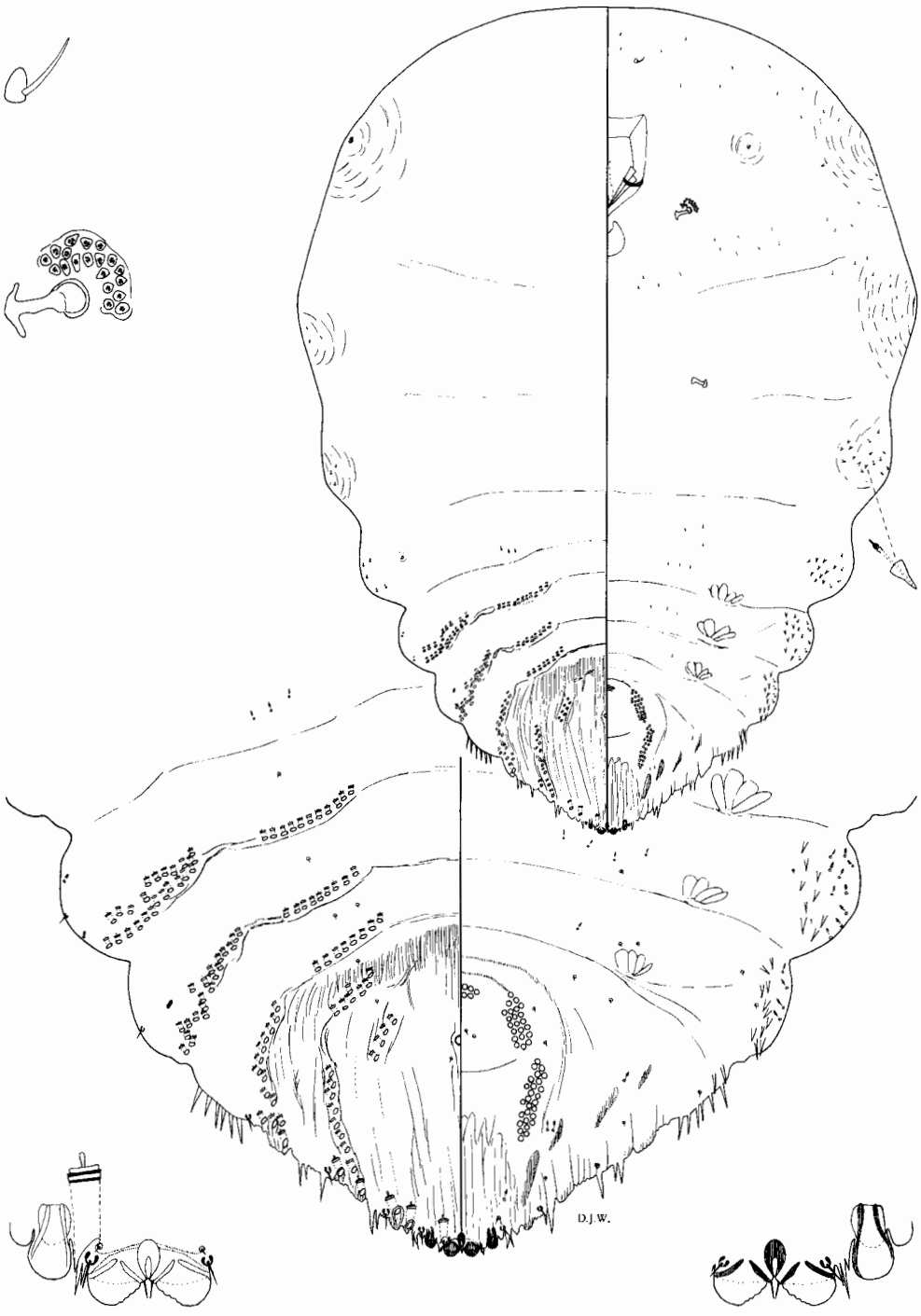

Fig. 3. Adult female *Pseudaulacaspis rubra,* Bangalore, India, on mango stems, VII-1973, Q. K. U. Kumar. Showing more elongate body form.

left "Diaspis/ amygdali/ var/ rubra/ adult female/ 1897 W. M. M./ Entomology Div., DSIR, NZ/ W.M. Maskell Collection." We have placed a label on the right side of the slide indicating that it is the lectotype. This is an original slide that was mounted by Maskell and is deposited in NZAC. In addition, there are 6 other slides in the USNM from the type series as follows: 1 slide with part of a cover; 1 with 2 adult females; 1 with 5 first instars; 1 with 1 first instar, 2 second instars, an immature soft scale, and a very poor prepupa; 1 with 3 adult females; and 1 with 3 adult female scale covers. These were mounted after the original description was published from dry type material and are paralectotypes with the exception of the soft scale.

The type series of *D. barberi* consists of 1 original slide that contains 6 second-instar females and 6 adult females. The slide is labeled as follows: right "Diaspis/ barberi, Green (~~type~~)/ From Loranthus/ Tanjore, India/ Coll. C. A. Barber" left label "TYPE." The lectotype is an adult female and is closest to the bottom of the cover slip. We have placed a label on the back of the slide that gives a map of the location of the lectotype. The lectotype slide is deposited in BMNH. There are 2 additional slides that were mounted from dry type material with the same data as the original slide. They each contain 2 adult females: 1 slide is in BMNH and 1 is in USNM.

Because the identity of this species is not well known, we have included two illustrations of the adult female. Fig. 2 shows a specimen with an oval body from *Loranthus,* and Fig. 3 shows a female with a more elongate body from mango. This species is most similar to *Pseudaulacaspis prunicola* by having: an oval body shape; simple pygidial gland spines; and 3 distinct pairs of lobes. *Pseudaulacaspis rubra* differs by having at least 2 submedial macroducts on each side of segment 6, whereas, these are absent from *P. prunicola.*

Changed Species Epithet Ending

Under normal circumstances, changes in species epithet endings to agree with generic gender would not be worth mentioning in a nomenclatural paper, but in this instance it seemed best to provide a journal reference for these changes rather than a web page such as ScaleNet. Thus, we are including a series of species epithet ending changes.

Aulacaspis intermedia for *Aulacaspis intermedius* Chen, Wu, and Su, 1980: 290, 295. *Chionaspis discadenata* for *Chionaspis discadenatus* Danzig, 1976: 3.

Coccomytilus convexus for *Mytilaspis convexa* Maskell, 1894: 70.

Diaspis carmanica for *Diaspis carmanicus* Davatchi and Balachowsky, 1956: 106–109.

Diaspis cuneata for *Diaspis cuneatus* Vernalha, Rocha, Loyola, and Gabardo, 1965: 5–7. *Diaspis digna* for *Diaspis dignus* Hoke, 1928: 671–672.

Diaspis obliqua for *Diaspis obliquus* Costa, 1829: 21.

Diaspis uniglandulosa for *Diaspis uniglandulosus* Balachowsky and Ferrero, 1967a: 985–988.

Discodiaspis numidica for *Rugaspidiotus numidicus* Balachowsky, 1949: 107–108.

Ferreroaspis hungarica for *Acanthomytilus hungaricus* Vinis, 1981: 201–207.

Guizhoaspis subterranea for *Guizhoaspis subterraneus* Young, 1986: 205–206.

Heimaspis centrafricana for *Heimaspis centrafricanus* Balachowsky and Ferrero, 1967b: 40–42. *Kuwanaspis foliosa* for *Kuwanaspis foliosus* Wu, 1986: 306–307.

Kuwanaspis multipora for *Kuwanaspis multiporus* Tang, 1986: 95.

Lepidosaphes cornuta for *Lepidosaphes cornutus* Ramakrishna Ayyar, 1937: 147.

Lepidosaphes lobulata for *Mytilaspis lobulatus* Froggatt, 1914: 680.

Mohelnaspis toletana for *Berlesaspis toletanus* Gómez-Menor Ortega, 1927: 289–292.

Nimbaspis reticulata for *Nimbaspis reticulatus* Balachowsky, 1952: 129–132.

Nimbaspis squamosa for *Nimbaspis squamosus* Balachowsky and Ferrero, 1967c: 1021–1025. *Pinnaspis tuberculata* for *Pinnaspis tuberculatus* Tang, 1986: 297–298.

Protodiaspis parvula for *Protodiaspis parvulus* Cockerell, 1898: 428–429.

Protodiaspis vara for *Protodiaspis varus* Hoke, 1928:672–674.

Pseudaulacaspis sordida for *Pseudaulacaspis sordidus* Hempel, 1932: 333–334.

Sclopetaspis lanigera for *Chionaspis laniger* Newstead, 1920: 206–207.

Sclopetaspis malawica for *Sclopetaspis malawicus* Munting, 1970: 12–14.

Vinculaspis mamillata for *Vinculaspis mamillatus* Fonseca, 1973: 254–255.

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