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RESURRECTION OF NATALASPIS MACGILLIVRAY, WITH NOTES
ON THE IDENTITY AND ON THE LARVAE OF THE
TYPE-SPECIES (HOMOPTERA : COCCOIDEA)

By Y. BEN-DOV and SADAŌ TAKAGI

Abstract

BEN-DOV, Y. & TAKAGI, S. 1974. Resurrection of *Natalaspis* MacGillivray, with notes on the identity and on the larvae of its type-species (Homoptera: Coccoidea). *Ins. matsum.* n.s. 3: 43-53, 2 tabs., 2 figs.

Odonaspis simplex Green var. *formosana* Takahashi is identical with the unnamed species *Chionaspis simplex* Green var.: Brain, 1920. The former is accepted as the first scientific name of the type-species of *Natalaspis* MacGillivray. The type-species is distinct from *Chionaspis simplex* Green, yet the two are congeneric. Because the latter is the type-species of *Poliaspoides* MacGillivray and *Natalaspis* has line precedence on the same page over *Poliaspoides*, *Natalaspis* is the valid name of the genus. Specimens of *Natalaspis formosana* from Reunion, South Africa and Taiwan have been examined, and the distinguishing characters from *N. simplex* are discussed. The second instar female and first instar larva of *N. formosana* are described.

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HISTORICAL REVIEW

The genus *Natalaspis* was established by MacGillivray (1921) for an unnamed South African species, described by Brain (1920) as a variety — *Chionaspis simplex* Green, var. A few lines further in the same page, MacGillivray introduced the genus *Poliaspoides* with *Chionaspis simplex* Green, 1899 as its type-species. Since the type-species of both genera are congeneric, the name *Natalaspis*, which has line precedence, should have been employed. However, the accurate identity of the type-species of *Natalaspis* has not been so far clarified, nor has it been given a scientific name. In its original description (Brain, 1920) this species was regarded as a variety of *C. simplex* Green, and its naming by MacGillivray (1921, p. 309, 354) — *Chionaspis simplex* Brain (not Green) — is nomenclatorially inadmissible. Ferris (1938) noted the uncertainty about Brain's species, and therefore selected the name *Poliaspoides* MacGillivray, which was accepted by subsequent authors (Mamet, 1946; Borchsenius, 1966; Takagi, 1969).

Some assumptions were made during the years regarding the identity of Brain's species. Brain (1920) himself supposed it to be identical with a variety of *C. simplex* Green mentioned from Mauritius in the original description of the latter. In 1930 Takahashi described from Taiwan the variety *Odonaspis simplex* Green, var. *formosana*, which was collected from bamboo, and said that it "... may be the same as *Chionaspis simplex* Green, var. recorded by Brain from Natal..." Mamet (1946) raised Takahashi's variety to specific rank and placed it in *Poliaspoides*. He endorsed Takahashi's assumption that *formosana* might be identical with Brain's species. This author also synonymized *Chionaspis simplex* var. *mauritiensis* de Charmoy, 1899 (nomen nudum) with *P. formosana*.

The characters of *Poliaspoides* together with a redescription of *P. formosanus* were recently presented by Takagi (1969), who also amended its specific name from *formosana* to *formosanus*. However, Takagi was doubtful as to the conspecificity of *formosanus* and Brain's species from Natal, following comparisons of Taiwanese specimens of the former with Ferris' (1938) figure of the latter.

IDENTITY OF THE TYPE-SPECIES OF NATALASPIS

Brain (1920) in describing his species from Natal mentions its collection number 175. Five slides labelled C.K.B. 175 are available in the Brain Collection, deposited in the National Collection of Insects, Pretoria, with 18 mounted females. These specimens as well as recently collected material from the type-locality in Durban and additional collections taken from bamboo in various localities along the Natal coast were compared with original material of *Odonaspis simplex* var. *formosana* from Taiwan. It is concluded that *Odonaspis simplex* Green var. *formosana* Takahashi is conspecific and identical with *Chionaspis simplex* Green, var., sensu Brain, 1920, and the former is accepted here as the

first scientific name of Brain's species and as the type-species of *Natalaspis*. Consequently the genus *Natalaspis*, having line precedence over *Poliaspoides*, should be resurrected. The amendments regarding *Natalaspis* and its type-species are summed up as follows:

Natalaspis MacGillivray, 1921

Natalaspis. MacGillivray, 1921: 309 (line 21). Type-species: *Odonaspis simplex* Green, var. *formosana* Takahashi, 1930 (= *Chionaspis simplex* Green, var., sensu Brain, 1920).

Poliaspoides. MacGillivray, 1921: 309 (line 38). Type-species: *Chionaspis simplex* Green, 1899.

Poliaspidoidea. Goux, 1937: 35. A lapsus or unacceptable emendation.

Natalaspis formosana (Takahashi, 1930), comb. nov.

Chionaspis simplex var. *mauritiensis*. de Charmoy, 1899: 5. A nomen nudum, teste Mamet, 1946: 244.

Chionaspis simplex Green, var. Brain, 1920: 96.

Chionaspis simplex Brain. MacGillivray, 1921: 309.

Natalaspis simplex Brain. MacGillivray, 1921: 354.

Odonaspis simplex Green, var. *formosana*. Takahashi, 1930: 29.

Poliaspoides formosana (Takahashi). Mamet, 1946: 244.

Poliaspoides formosanus (Takahashi). Takagi, 1969: 58.

Natalaspis formosana was recorded so far from Mauritius, Reunion, South Africa and Taiwan and in all cases it was found to infest bamboo. The bamboo species on which this scale was found in South Africa were introduced to the country years ago (Wood, 1915), apparently from the Far East, thus it is highly probable that this armoured scale is an introduced species in South Africa.

As mentioned, *Chionaspis simplex* Green, known from Ceylon and India, is referred to this genus. *Poliaspidoidea massiliensis* Goux may tentatively be kept in the genus. After Balachowsky (1954), this species, originally described from France, is identical with *Mohelnaspis moravica* Šulc from Czechoslovakia and *M. recepti* Bodenheimer from Turkey. *Mohelnaspis massiliensis* is, then, accepted by him as belonging to his Lepidosaphedina. In the original description of *P. massiliensis* is also described the second instar female, which appears quite peculiar for a lepidosaphedine (see also Taxonomic notes).

A redescription of *Poliaspoides formosanus*, based on specimens from Taiwan, was presented by Takagi (1969). This should be complemented by the following notes on the variation in some features (Table 1 and 2) as observed in specimens from various countries (see Material examined).

Brain (1920) noted that the specimens of this species from Natal possess five groups of perivulvar pores as compared with seven in *simplex*. The examination of the original material from Natal revealed that Brain apparently overlooked the occurrence of additional posterior group(s) in some of the specimens — a character which was noted also, in two specimens from Natal, by Ferris (1938).

Table 1. Variation in two features of *Natalaspis formosana* from various countries.

Material	No. of specimens	No. of groups	Perivulvar pores				Spiracular pores associated with anterior spiracle*
			No. of pores				
			median	antero-lateral	postero-lateral	posterior	
South Africa							
C.K.B. 175	18	5-7**	20-27	29-45	52-62	1-9**	6-9
H.C. 5721	38	5	22-28	30-48	42-59	—	4-9
Taiwan							
Takahashi 1928	5	5	19-34	39-60	38-72	—	6-10
Takagi 1965	2	5	16-23	34-53	35-51	—	5-8
Reunion	5	5	14-23	25-47	39-60	—	4-8

* The spiracular disc pores, examined at $\times 2000$ (oil immersion) and in phase contrast, were found to be trilobular. ** See discussion in the text on the frequency of the additional posterior groups.

Nine specimens out of the 18 original ones possess only the usual five groups of perivulvar pores, seven specimens have one additional group (with 1-7 pores) placed posteriorly to the posterolateral group, and only two specimens are provided with two additional groups (totaling 7-9 pores in both). Of special interest is the fact that the 1973 topotypic specimens from Natal do not reveal this variation in the additional groups — all of them possess only five groups of perivulvar pores. Specimens of *formosana* which have the additional group(s) can easily be distinguished from *simplex* by the smaller number of pores in these (in the original description of *simplex* it is stated that 15-25 pores are found in each of the additional groups), and by the absence of spiracular pores at the posterior spiracles.

Comparisons have been made, between South African and Taiwanese specimens of *N. formosana*, concerning the numbers of ducts in some duct groups of the dorsal and ventral surfaces of the pygidium (Table 2). As shown in the table,

Table 2. Variation in the number of ducts in the South African and Taiwanese forms of *Natalaspis formosana*.

Material	Duct group			
	A	B	C	D
South Africa				
C.K.B. 175	26-39	18-35	16-43	9-12
H.C. 5721	24-38	39-60	32-62	10-16
Taiwan				
Takahashi 1928	24-37	20-39	50-75	11-15

A: dorsal ducts on segments VI, VII, VIII, within the intersegmental line V/VI (in this region ducts are not arranged in distinct segmental groups).
 B: ventral ducts on VII. C: ventral ducts on VI. D: ventral ducts on the area framed by the vulva, and by the anterolateral and the median group of perivulvar pores.

the range of the number of ventral ducts in Group B is lower in Brain's material (C.K.B. 175) in comparison with the newly collected topotypic material, whereas Brain's material from South Africa and Takahashi's material from Taiwan are practically identical in this character. In any group of ducts the difference seems to be insufficient to distinguish between the South African and Taiwanese forms.

LARVAL CHARACTERS

The following descriptions are based on larvae of *Natalaspis formosana* collected from bamboo at Durban (see Material examined). No males were found to occur in populations of this species in Natal, South Africa, thus the following descriptions are supposed to be of the female larval instars.

Second instar female

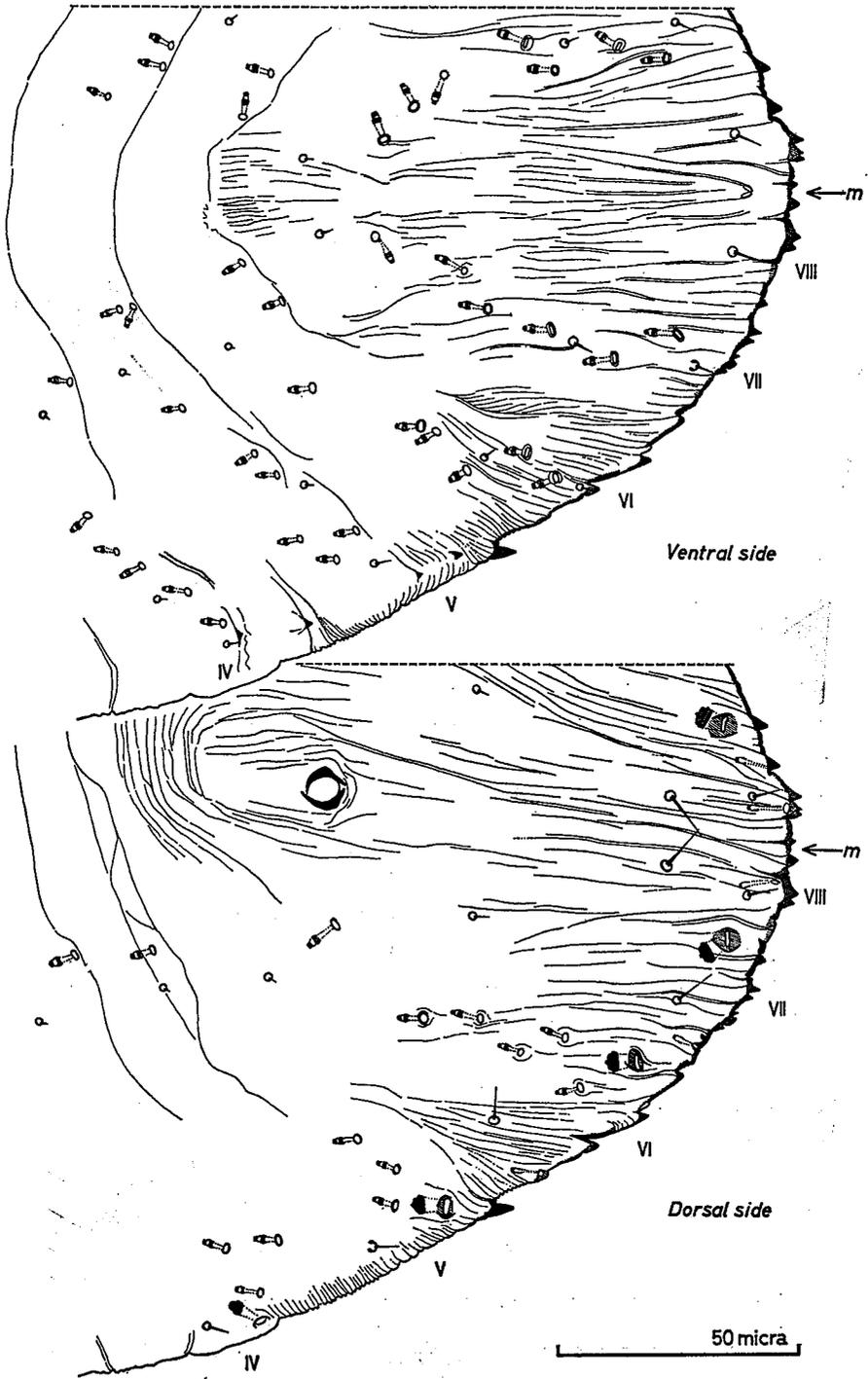
The pygidium of one specimen is drawn to show a rugged margin on one side (Fig. 1). On the other side and in the other specimens available the marginal processes are more or less obscure, being entangled within the margin, and this is the case with many prepared exuvial casts of this instar. Usually a pair of subapical processes, with small apical processes between them, are distinctly shown even in the exuvial casts. They are supposed to belong to the eighth abdominal segment and may be homologous with the median lobes of other diaspidids.

Body oval in outline. Ducts of larger size occur submarginally from the seventh abdominal segment to the prothorax; on segments VII to IV they are dorsal, usually one duct on a segment (on segments IV and V occur at times two ducts on each); on segment III and as high as the prothorax the ducts are ventral, occurring 1-3 ducts on each segment (1-4 on the metathorax). Ducts of smaller size occur ventrally and dorsally on the submarginal and submedian areas from sixth (dorsal) or seventh (ventral) abdominal segment as high as the head. Antennal tubercle bisetose. Anterior spiracle with three or four trilocular pores, posterior one without associated disc pores. The anal opening is thickly rimmed and situated towards the bottom of the pygidium.

First instar larva

The newly hatched larva is elongate elliptical, about 2.5 times as long as wide. The head, hind leg and posterior abdominal segments are illustrated (Fig. 2). The antennae are interpreted as five-segmented. The tibio-tarsus is obviously shorter than the femur. The posterior apex of the abdomen is furnished with a pair of sharp processes; laterally to the apical setae a pair of robust,

Fig. 1. *Natalaspis formosana*, second instar female: pygidium in ventral and dorsal sides. *m*: median. IV-VIII: supposed fourth to eighth abdominal segments. H.C. 5721.



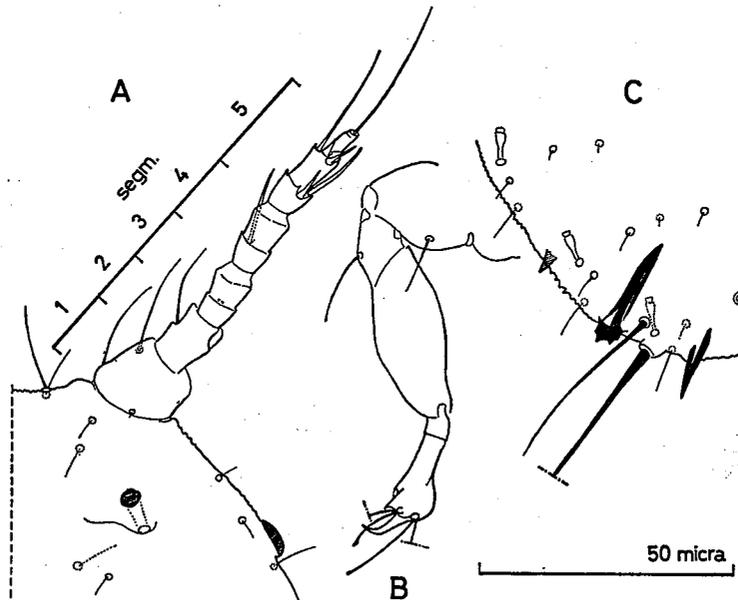


Fig. 2. *Natalaspis formosana*, first instar larva: head (A), hind leg (B), and posterior abdominal segments (C). South African material.

unilobed processes; other processes are much reduced. Slender ducts occur along the body margin, one on each segment as far as the prothorax; a pair of enlarged ducts are found on the dorsal side of the head, showing a "geminate pore" structure at the inner end.

TAXONOMIC NOTES

With the information presented above we feel no need to change the taxonomic position of *Natalaspis*. The genus has been referred to the Rugaspidiotini*, which include specialized relics of the Diaspididae parlatoriiformes (Takagi, 1969). All the species which have been assigned so far to the genus are known only from gramineous host plants in countries of the Old World.

In addition to the present description of the second instar female of *Natalaspis formosana*, descriptions are available for this instar of some of the species of the Rugaspidiotini. Goux (1937) described the second instar female of *Poliastipidooides massiliensis*, and Ferris (1938a) presented figures of the pygidia of the second instar females for five North American species of *Rugaspidiotus*,

* The type-species of *Rugaspidiotus*, *R. arizonicus* (Cockerell), is a peculiar form of unknown affinities, and assignment of some other species to *Rugaspidiotus* is quite tentative. Our concept of the tribe Rugaspidiotini is, in reality, based on the bulk of the *Rugaspidiotus*-species and other forms such as *Natalaspis* and *Smilacicola*. Under this situation it is unfortunate that the name of the tribe is based on *R. arizonicus*.

based on the exuvial casts. Takagi (1969) gives detailed figures of the second instar male and female of *Smilacicola apicalis* Takagi. Three of the North American *Rugaspidiotus*-species, namely, *R. circumdatus* Ferris, *R. fuscitatis* Ferris and *R. nebulosus* Ferris, are quite similar in the second instar females, forming a common pattern. On the other hand, *Rugaspidiotus arizonicus* (Cockerell), *R. sculptratus* Ferris, *Smilacicola apicalis*, *Poliastpidoides massiliensis*, and *Natalaspis formosana* differ from each other in the pattern of the second instar female. This information points to the significance of taxonomic studies of the second instar female, as well as other larval stages, in this group of scale insects.

The occurrence of marginal processes on the pygidium of the second instar female of *Natalaspis formosana* is of special interest, since it resembles in this respect the second instar male of *Smilacicola apicalis*. However, in *N. formosana* these processes are much reduced, while in *S. apicalis* they agree with the pattern of *Parlatoria* of the distinct tribe Parlatoriini.

The marginal processes are often obscured, being entangled within the pygidial margin, as mentioned in the description of the second instar female of *Natalaspis formosana*. Thus it is possible that these processes have been overlooked in other species. This is suggested by the description of the pygidium of the second instar female of *Poliastpidoides massiliensis*: "Son bord est arrondi, il porte 4 dents insérées ventralement." as described by Goux (1937).

Chionaspis simplex Green is regarded as congeneric with *Natalaspis formosana*, and *Poliastpidoides massiliensis* may have some relation with the two. These three species, however, differ in features of the first instar larva. This instar of *N. formosana* has a five-segmented antenna, whereas this instar of *C. simplex* possesses a six-segmented antenna (according to Ferris, 1937), by which the latter resembles *P. massiliensis*. The tibio-tarsus in comparison with the trochanter-femur is shorter in *N. formosana*, whereas it is longer in *P. massiliensis*, which is also characterized by having a much elongate claw. We think, therefore, that the true relationship of these three species, which may tentatively be lumped together in *Natalaspis*, remains open for future study.

MATERIAL EXAMINED

South Africa

Natal: five slides (C.K.B. 175) labelled "*Chionaspis simplex* Green, var., on Bamboo, Bot. Gardens, Durban, Natal, A. Kelly, 31.3.15". These slides include 18 females, 16 of which were remounted each female on a separate slide.

Durban: Botanical Gardens, 19. vi. 1973, on bamboo, A. J. M. Carnegie, H.C. 5721.

Esperanza district, 27. viii. 1964, on bamboo, J. Munting, H.C. 1598.
Cape Province: Transkei, Lusikisiki, 5. vii. 1973, on bamboo, Y. Ben-Dov,
H.C. 5727.
Port St. Johns, 1. vii. 1973, on bamboo, Y. Ben-Dov, H.C. 5729.

Reunion

Five females on a slide, from Mamet's collection deposited in the Muséum National d'Histoire Naturelle, Paris. Labelled "*Poliaspoides formosana* (Takahashi), on bamboo, Reunion Island, stopped by Plant Inspection, Mauritius, VII. 49."

Taiwan

Five females mounted on a slide, from Takahashi's collection deposited in Taiwan Agricultural Research Institute, Taipei. Labelled "*Odonaspis simplex* Gr. var. *formosanus* Tak., Dec. 1928, Bamboo, Maruyama, R. Takahashi, Host *Dendrocalamus*."

Two females on a slide, deposited in Takagi's collection, Sapporo. Labelled "*Poliaspoides formosanus* (Takahashi), Yang-ming Shan, ex bamboo, 28. III. '65."

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