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Title	A contribution to the knowledge of the Diaspidini of Japan (Homoptera : Coccoidea) Part 3
Author(s)	Takagi, Sadao
Citation	Insecta matsumurana, 24(2), 69-103
Issue Date	1961-11
Doc URL	https://hdl.handle.net/2115/9674
Type	departmental bulletin paper
File Information	24(2)_p69-103.pdf

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A CONTRIBUTION TO THE KNOWLEDGE OF THE DIASPIDINI OF JAPAN

(HOMOPTERA: COCCOIDEA)

Part III*

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XIX. Genus ***Miscanthaspis*** novum

Type: *Aulacaspis kuzunoi* Kuwana et Muramatsu.

Adult female. Body elongate; prosoma swollen, slightly wider than metathorax; second abdominal segment more or less produced laterally; pygidium rounded along its free margin. Antennae set apart, each with a seta. Anterior and posterior spiracles each with a cluster of accompanying disc pores. Dorsal macroducts occurring on third to sixth abdominal segments, arranged in definite segmental rows, which are divided into submedian and submarginal series on the third to fifth segments, the sixth with a submedian series of macroducts on each side. Marginal macroducts of pygidium seven in number on each side. Anus moderate in size, rounded, situated about middle of pygidium. Perivulvar pores in five groups. Median lobes more or less square in shape, set close, parallel, projecting, united basally by a thick yoke, which is deeply sunken into the apex of the pygidium. Second lobes well developed, bilobulate. Third lobes smaller than the second.

First stage female (exuvium). Oval. Interantennal margin slightly concave. Antennae five-segmented; terminal segment elongate and annulate; basal segment robust, conical, being strongly produced anteriorly and pointed at the anterior extremity. A pair of dorsal ducts present on head.

This genus is distinguishable from *Aulacaspis* by the median lobes which are square in shape and not sunken into the pygidium, although the basal yoke is strongly produced anteriorly, forming a deep, narrow incision at the apex of the pygidium. It is especially characterized in the first stage by the basal antennal segment which is unique in shape as described and figured herein. The above description is based on the type species; judging from the literature, *Aulacaspis wakayamaensis* and *Chionaspis tegalensis* Zehntner should be referred to this genus. As at present understood this genus contains grass-infesting species and is probably Asiatic.

* This part closes the work. Part I: Insecta Matsumurana, Vol. 23, No. 2, pp. 67–100, December, 1960; Part II: ibid., Vol. 24, No. 1, pp. 4–42, March, 1961.

[Insecta Matsumurana, Vol. 24, No. 2, November, 1961]

74. ***Miscanthaspis kuzunoi*** (Kuwana et Muramatsu) comb. nov.

Aulacaspis kuzunoi Kuwana et Muramatsu (1932, Journal of Plant Protection, Vol. XIX, No. 2, p. 12). *Phenacaspis susukicola* Siraiwa (1939 a, p. 17).

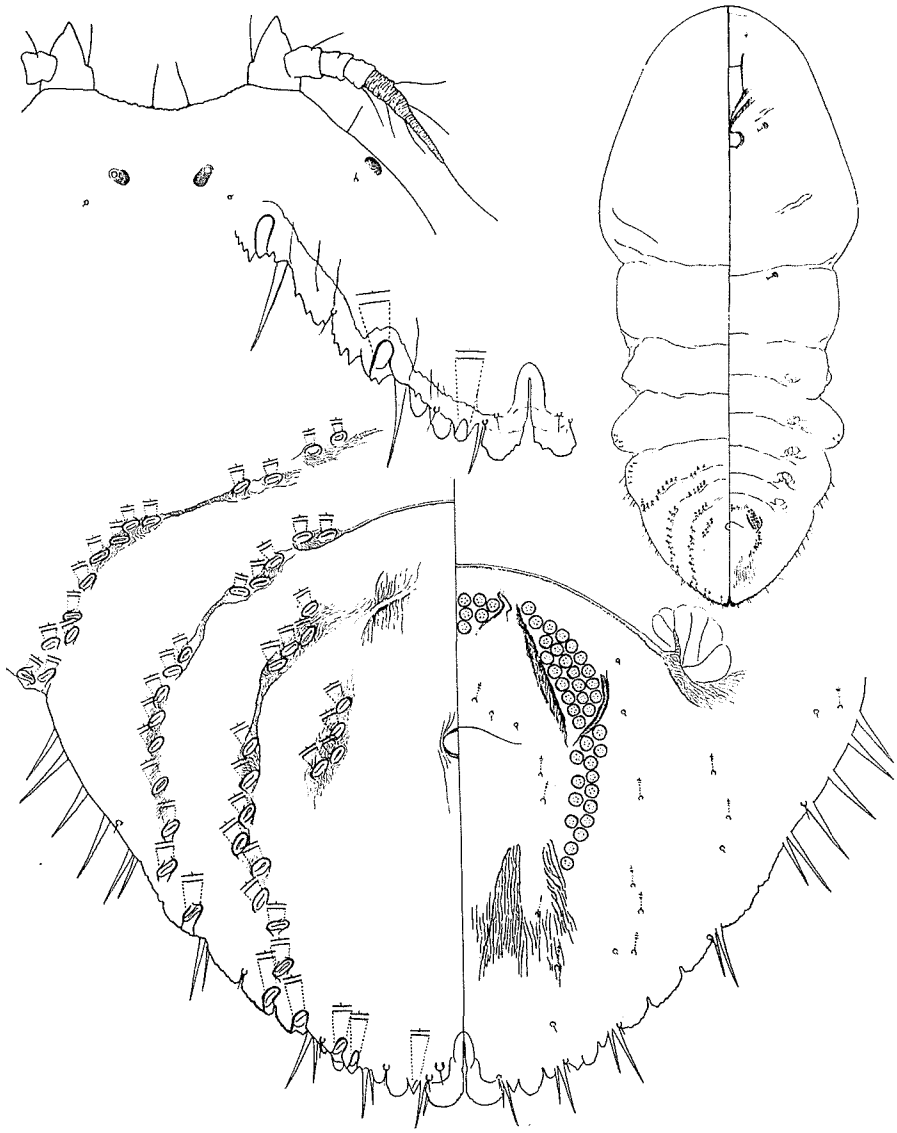

Fig. 38. *Miscanthaspis kuzunoi* (Kuwana et Muramatsu). Adult female: body (right) and pygidium; second stage female, exuvium: pygidial margin in dorsal aspect (middle); first stage female, exuvium: head and antennae (left).

Adult female. Body elongate, rather slender, attaining 1.34 mm. in length; prosoma longer than wide, 0.56 mm. in width, gradually narrowing anteriorly; second abdominal

segment rather strongly produced laterally. Cephalothorax and first abdominal segment tending to be sclerotized at full growth. Two to four submedian macroducts present on third abdominal segment, two to five on fourth, three to five on fifth, and three or four on sixth; five to ten submarginal macroducts on third abdominal segment, four to seven on fourth, and five to nine on fifth; six or seven much smaller macroducts scattered along lateral margin on second abdominal segment, and six to nine on third. Gland spines absent on thorax and first abdominal segment, two or three present on second abdominal segment, six to nine on third; pygidial gland spines slender, several ones on fourth abdominal segment, and caudad of the segment four pairs of spines on each side.

L. & H.: Amami-Ôsima, on *Miscanthus* sp.; Hatizyô-zima, on *Miscanthus* sp. (M. Kanda leg.).

This species was originally described from specimens collected at Mozi, Hukuoka-ken, Kyusyu, on *Miscanthus sinensis*. *Aulacaspis kuzunoi* var. *divergens* Takahashi from Formosa may be another species, having probably nothing to do with the present species.

75. ***Miscanthaspis wakayamaensis*** (Kuwana) comb. nov.

Aulacaspis wakayamaensis Kuwana (1926, p. 33); Takahashi (1935, p. 12).

This species was originally described from Wakayama-ken, Honsyu, as a feeder of *Ischaemum antheoporoides*, and later recorded by Takahashi from Formosa from specimens collected on *Saccharum officinarum*, *Oplismenus* sp., etc. No material of this species has been available, but, judging from the original description, it should be referred to the present genus by reason of the shape of the median lobes.

XX. Genus ***Pinnaspis*** Cockerell

Pinnaspis Cockerell (1892 d, p. 136); Ferris et Rao (1947); Balachowsky (1954 c, p. 275). *Hemichionaspis* Cockerell (1897 p. p. 592). *Jaapia* Lindinger (1914, p. 158). *Lepidaspidis* MacGillivray (1921, p. 275).

Type: *Aspidiotus buxi* Bouché.

The members of this genus are distinctly centred in south-eastern Asia. In Japan seven species are recognized.

76. ***Pinnaspis aspidistrae*** (Signoret)

Chionaspis aspidistrae Signoret (1869 a, p. 443). *Pinnaspis aspidistrae* Ferris et Rao (1947, p. 30); Balachowsky (1954 e, p. 281); Takahashi et Tachikawa (1956, Transactions of the Shikoku Entomological Society, Vol. 5, Pars 1-2, p. 11). *Pinnaspis ophiopogonis* Takahashi (1952 a, p. 11).

L. & H.: Sado, on an undetermined grass; Hukuoka, Kyusyu, on a Liliaceous grass; Miyazaki,Kyusyu, on *Rohdea japonica;* Kagosima, Kyusyu, on *Lemmaphyllum*; Amami-Ôsima, on *Lemmaphyllum* and an undetermined fern.

77. ***Pinnaspis strachani*** (Cooley)

Hemichionaspis minor strachani Cooley (1899, p. 54). *Pinnaspis strachani* Ferris et Rao (1947, p. 39); Balachowsky (1954 e, p. 284).

L. & H.: Okitu, Sizuoka-ken, Honsyu, on *Citrus* (R. Takahashi leg.).

78. ***Pinnaspis boehmeriae*** Takahashi

Pinnaspis boehmeriae Takahashi (1957, Transactions of the Shikoku Entomological Society, Vol. 5, Pars 7, p. 105).

L. & H.: Kôya-san, Wakayama-ken, Honsyu, on *Boehmeria spicata* (R. Takahashi leg.); Rokkô, Kôbe, Honsyu, on *Boehmeria japonica* (M. Yamamoto leg.) and *Cirsium spicatum* (M. Yamamoto leg.); Hiko-San, Kyusyu, on *Boehmeria spicata.*

79. ***Pinnaspis chamaecyparidis*** sp. nov.

Adult female. Body fusiform, 0.73 mm. in length and 0.32 mm. in width at maximum; free segments each slightly convex laterally; pygidium approximately triangular.

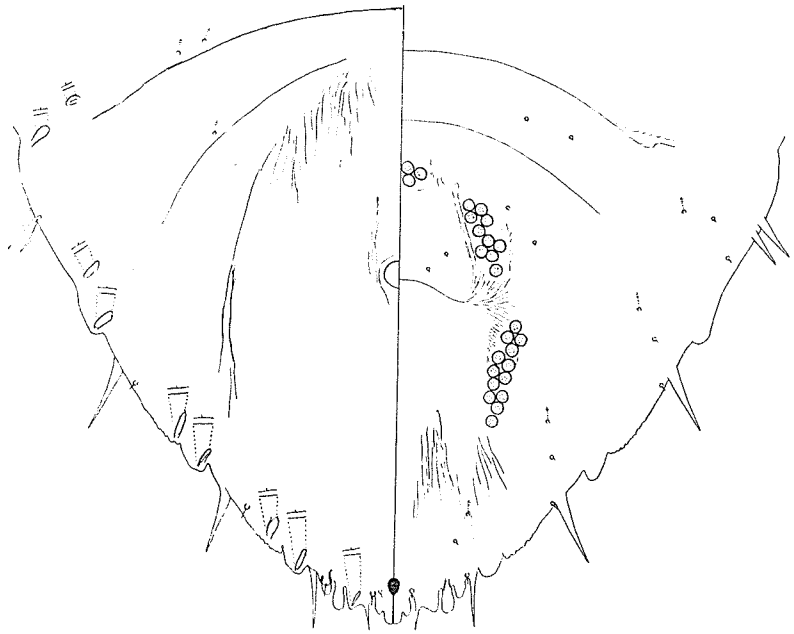

Fig. 39. *Pinnaspis chamaecyaridis* sp. nov.
Adult female: pygidium.

Derm membraneous except for weakly sclerotized areas of pygidium. Antennae set apart, with a seta. Anterior spiracles each with three to five accompanying disc pores; posterior spiracles each with a single pore. A small lateral macroduct present on metathorax, and a few similar lateral ones on first to third abdominal segments. Marginal macroducts of pygidium seven on each side from midline to posterior margin of fourth abdominal segment, third abdominal segment with a macroduct in each caudal angle; submarginal macroducts present or absent on third and fourth abdominal segments, if present one in number on each segment. A marginal gland spine present on third abdominal segment, two on fourth, pygidium with four single gland spines on each side.

Anus moderate in size, situated about middle of pygidium. Perivulvar pores in five groups, four to six pores in the median group, seven to fourteen in the laterocephalics each, and nine to fourteen in the laterocaudals each. Preanal scars absent. Median lobes small in size, closely appressed together, slightly elongate, deeply notched once on the outer side, the basal zygosis robust, and distinctly produced anteriorly into apex of pygidium. Second lobes well developed, bilobulate, the inner lobule slightly expanded apically, with a pair of slender basal scleroses. Third lobes obsolete.

Scale. In female elongate, moderately convex dorsally, and white in colour; in male tricarinate.

L. & H.: Namerikawa, Toyama-ken, Honsyu, on *Chamaecyparis obtusa* (8. I, 1955; 16. IV, 1956).

This species is similar to *P. juniperi*, from which it differs mainly by the second lobes which are well developed, with the inner lobule slightly expanded apically.

80. ***Pinnaspis juniperi*** Takahashi

Pinnaspis juniperi Takahashi (1956, Annotationes Zoologicae Japonenses, Vol. 29, No. 1, p. 57).

L. & H.: Ôsaka, Honsyu, on *Juniperus* sp.

81. ***Pinnaspis hikosana*** sp. nov.

Adult female. Body fusiform, attaining 1.02 mm. in length and 0.51 mm. in width; free segments each moderately convex laterally; pygidium triangular. Derm membraneous except for sclerotized areas of pygidium. Antennae set somewhat apart, with a seta. Anterior spiracles each with a small cluster of accompanying disc pores; posterior spiracles each with one or two pores. Lateral macroducts present on metathorax and first to third abdominal segments, few. Marginal macroducts of pygidium seven on each side from midline to posterior margin of fourth abdominal segment, third abdominal segment with a macroduct in caudal angle; one or two submarginal macroducts present on third abdominal segment, and one on fourth and fifth each. Anus moderate in size, situated about middle of pygidium. Perivulvar pores in five groups, eight in the median group, twelve to sixteen in the laterocephalics each, and thirteen to seventeen in the laterocaudals each. A short, rather robust submarginal gland spine present on second abdominal segment, one to three similar submarginal ones on third; pygidial marginal spines elongate, slender, two on fourth abdominal segment, and caudad of the segment four single ones on each side. Preanal scars normally present, slender, forming a more or less crescentic structure. Median lobes prominent, comparatively large, entirely projecting beyond apex of pygidium, closely appressed together, forming more or less of a half circle, each lobe deeply notched two or three times on the outer side, the basal zygosis small, slender, scarcely produced anteriorly beyond bases of the lobes. Second lobes present, with the inner lobule represented by a small, apically pointed process and the outer lobule by a very small, inconspicuous process. Third lobes obsolete.

Scale. In female elongate, and dark brown.

L. & H.: Hiko-San, Kyusyu, near the summit (1199 m.), on *Viburnum* sp. (10.

V, 1957).

This species may be related to the following three species from Ceylon, viz., *Pinnaspis mussaendae* (Green), *Pinnaspis rhododendri* (Green), and *Pinnaspis scrobicularum* (Green). It may come closest to *P. rhododendri*, from which it may be distinguishable by the metathorax and prepygidial abdominal segments which are moderately convex laterally, the median lobes deeply incised on the outer side, and the preanal scars normal in shape. It may differ from *P. mussaendae* by the second lobes apparently present, by having fewer submarginal macroducts, etc. It may be distinct from *P. scrobicularum* by lacking submedian macroducts, by having fewer submarginal macroducts, etc.

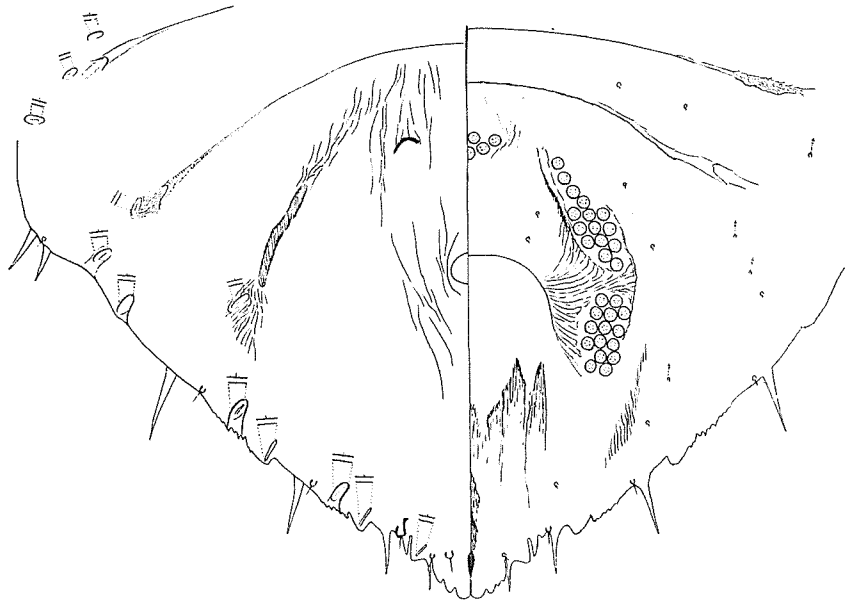

Fig. 40. *Pinnaspis hikosana* sp. nov.
Adult female: pygidium.

82. ***Pinnaspis uniloba*** (Kuwana)

Mytilaspis uniloba Kuwana (1909, p. 156). *Jaapia uniloba* Lindinger (1914, p. 158). *Lepidaspidis uniloba* MacGillivray (1921, p. 292). *Lepidosaphes uniloba* Kuwana (1925 a, p. 37). *Pinnaspis uniloba* Ferris et Rao (1947, p. 42).

L. & H.: Tokyo, on *Osmanthus* sp.; Hiko-San, Kyusyu, on *Cleyera japonica*; Amami-Ôsima, on an undetermined plant.

Key to the species

1. Median lobes entirely fused throughout, the basal zygosis distinctly produced anteriorly into apex of pygidium; second and third lobes obsolete; anus situated well towards base of pygidium; submedian macroducts absent; a few submarginal macroducts present in each anterior angle of pygidium. . . . . *P. uniloba.*

– Median lobes, although very closely appressed together, separated for at least some distance from

the apex, if not to the base. . . . . 2.

2. Submarginal macroducts always present on fourth abdominal segment, normally present on fifth; free abdominal segments each moderately convex laterally. . . . . 3.

– Submarginal macroducts present or absent on fourth abdominal segment, if present one in number on each side, always absent on fifth; free abdominal segments each weakly convex laterally. . . 6.

3. Basal zygosis of median lobes slender, scarcely produced anteriorly beyond bases of the lobes. . . . . *P. hikosana* sp. nov.

– Basal zygosis of median lobes robust, distinctly produced anteriorly beyond bases of the lobes . . 4.

4. Posterior spiracles without accompanying disc pores, or at times with a single pore (after Balachowsky); preanal scars normally present, forming a more or less crescentic structure; median lobes notched two or three times on the outer side; second lobes well represented; submarginal macroducts present on third and fourth abdominal segments and normally also on fifth; submedian dorsal microducts present on second to fourth abdominal segments. . . . . *P. strachani.*

– Posterior spiracles with accompanying disc pores two or more in number; preanal scars usually absent, but at times distinctly seen. . . . . 5.

5. Median lobes forming more or less of a half circle, rather weakly notched two or three times almost equidistantly on the outer side; second lobes well represented, the inner lobule slightly expanded apically; submarginal macroducts present on third and fourth abdominal segments and normally also on fifth, two to eight on third, two to six on fourth, and one or two on fifth; a few submedian dorsal microducts present at times on second to fourth abdominal segments. . . . . *P. aspidistrae.*

– Median lobes robust, irregularly dentate or notched almost equidistantly; second lobes well represented, with the inner lobule scarcely expanded apically; submarginal macroducts present on third and fourth abdominal segments and normally also on fifth, nine to eleven on third, five to eleven on fourth, andthree to five on fifth; submedian dorsal microducts present on second to fourth abdominal segments. . . . . *P. boehmeriae.*

6. Second lobes with the inner lobule membraneous and narrowing towards the apex, without basal paraphyses, the outer lobule represented by an inconspicuous prominence or practically obsolete; median lobes small, with a deep lateral notch; pygidium triangular, rather narrow; marginal macroducts of pygidium seven on each side, third abdominal segment with a macroduct in each caudal angle; preanal scars absent. . . . . *P. juniperi.*

– Second lobes well developed, sclerotized, the inner lobule slightly expanded apically, with a pair of basal paraphyses, the outer lobule smaller than the inner but well represented. . . . . *P. chamaecyparidis* sp. nov.

XXI. Genus *Aulacaspis* Cockerell

Aulacaspis Cockerell (1893 c, p. 180); Kuwana (1926, p. 21); Scott (1952); Balachowsky (1954 e, p. 240).

Type: *Aspidiotus rosae* Bouché.

In the scale insects belonging to this genus the prosoma is more or less strongly swollen into an angular or rounded mass, which is distinctly wider than the metathorax or, in certain species, even the whole of the postsoma; this dilation of the prosoma, giving the body a peculiar shape, is undoubtedly the most characteristic feature of the genus. There are, however, certain species (*A. difficilis*; *A. projecta* sp. nov.) in which the dilation of the prosoma is not displayed until the adult comes to full growth. In these species the adult female is more or less oval at first, and finally it shows itself

in true shape which is characteristic of the genus, at that time the prosoma being more or less strongly swollen.

This genus shows no particular characters in the first stage. It should be stated here that the basal antennal segment is normal in shape and not produced into a conical shape like *Miscanthaspis*.

This genus is evidently an Oriental one, being known many species from south-eastern Asia. So far as I am aware, eight species have been known from Japan as members of the genus, but *A. kuzunoi* and *A. wakayamaensis* should be not referred to this genus, but may represent members of the other distinct genus *Miscanthaspis*. In the course of the present study are added to the fauna four other species, which are new to science.

83. ***Aulacaspis amamiana*** sp. nov.

Adult female. Body robust, attaining 0.9 mm. in length; prosoma swollen into a prominent mass, slightly wider than metathorax, lacking a lateral tubercle on each side, 0.5–0.6 mm. in width; metathorax and first abdominal segment scarcely, and second abdominal segment rather strongly, produced laterally; pygidium rather large, broad, approximately triangular, with a deep incision at the apex. Antennae set somewhat apart, with a curved seta. Anterior spiracles each with a cluster of numerous accompanying disc pores; posterior spiracles each with a smaller cluster of pores. Six to eight submedian macroducts present on third abdominal segment, four to six on fourth, four or five on fifth, and two to four on sixth; seven to nine submarginal macroducts on third abdominal segment, five or six on fourth, and three to five on fifth; six to nine slightly smaller lateral macroducts scattered on second abdominal segment, and five to eight on third. Four to six submarginal gland spines present on second abdominal segment, six to eight on third; marginal gland spines of pygidium slender, two or three on fourth abdominal segment, and caudad of the segment four single ones on each side. A submarginal dorsal boss present on first abdominal segment and also between third and fourth. Anus situated about middle of pygidium. Perivulvar pores numerous, in five groups. Median lobes enormously large, in a deep incision, much longer than wide, finely serrate on the free margin, united basally by a robust yoke, and divergent from their bases. Second and third lobes well developed, but much smaller than the median, bilobulate; fourth lobes practically obsolete.

Scale. In female subcircular, convex dorsally, and white; in male elongate, tricarinate, felted, and white.

L. & H.: Amami-Ôsima, on *Rubus* sp. (15.–20. V, 1957).

This scale insect is evidently very close to *Aulacaspis megaloba* Scott, which occurs on *Rubus* in China. The only distinct difference between the two which I have learnt from the description of *A. megaloba* is that in the new species the second abdominal segment lacks dorsal macroducts, whereas in the other some submedian macroducts occur on the segment.

Fig. 41. *Aulacaspis amamiana* sp. nov.
Adult female: body (right) and pygidium; second stage female, exuvium: pygidial margin in dorsal aspect (left.).

84. ***Aulacaspis yabunikkei*** Kuwana

Aulacaspis yabunikkei Kuwana (1926, p. 32); Scott (1952, p. 41).

L. & H.: Amagi-san, Sizuoka-ken, Honsyu, on *Neolitsea sericea*; Hiko-San, Kyusyu, on *Neolitsea sericea*; Miyazaki, Kyusyu, on *Cinnamomum* sp.

85. *Aulacaspis latissima* (Cockerell)

Chionaspis latissima Cockerell (1897 j, p. 4). *Aulacaspis latissima* Kuwana (1926, p. 28); Scott (1952, p. 37).

L. & H.: Toyama, Honsyu, on *Distylium racemosum*.

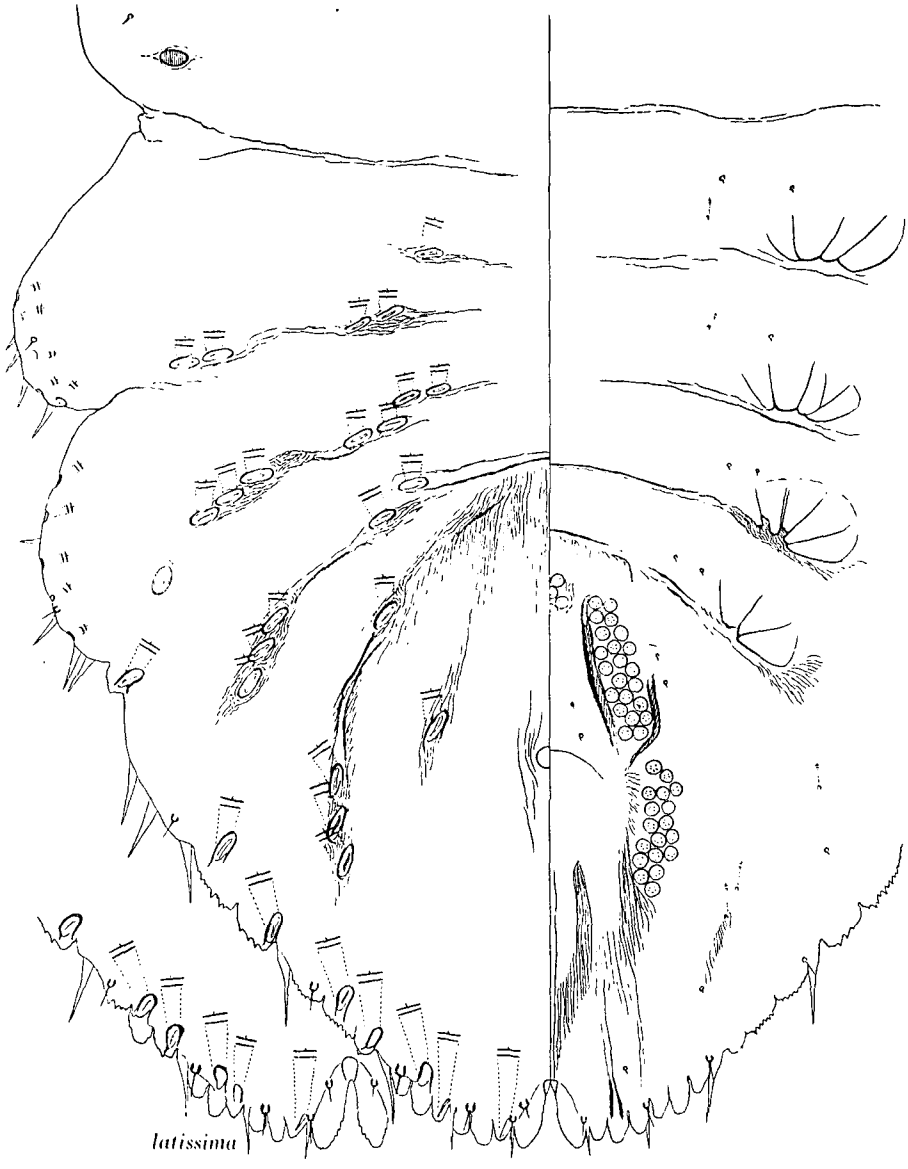

Fig. 42. *Aulacaspis distylii* Takahashi.
Adult female: abdomen; *Aulacaspis latissima* (Cockerell), adult female: pygidial margin in dorsal aspect.

86. ***Aulacaspis distylii*** Takahashi

Aulacaspis distylii Takahashi (1955, Bulletin of the Biogeographical Society of Japan, Vols. 16–19, p. 240); Takahashi et Tachikawa (1956, Transactions of the Shikoku Entomological Society, Vol. 5, Pars 1–2, p. 10).

L. & H.: Hukuoka, Kyusyu; Kagosima, Kyusyu; Amami-Ôsima. On *Distylium racemosum*.

This species is very close to *A. latissima* which occurs in central Honsyu on the same host plant with the former. *A. distylii* is widely distributed over southern Japan, and differs from *A. latissima* not only by the arrangement of dorsal macroducts but also by the shape of the median lobes as figured herein. Moreover, in all the examined specimens of the present species the fourth lobes are practically obsolete and there are merely two serrate, slight prominences where the fourth lobes should be expected, whereas in the available material of *A. latissima* the fourth lobes are apparently present, although the inner lobule alone is well represented.

87. ***Aulacaspis rosae*** (Bouché)

Aspidiotus rosae Bouché (1834, p. 14). *Aulacaspis rosae* Kuwana (1926, p. 22); Ferris (1937, SI-10); Scott (1952, p. 40); Balachowsky (1954 e, p. 242).

L. & H.: Isikari, Hokkaido, on *Rosa rugosa*; Sapporo, Hokkaido, on *Rosa* sp.; Kanagawa-ken, Honsyu, on *Rubus* sp.; Yamanasi-ken, Honsyu, on *Rubus* sp.; Ôsaka, Honsyu, on *Rosa* sp.; Rokkô, Kôbe, Honsyu, on *Agrimonia Eupatoria* (M. Yamamoto leg.); Hukuoka, Kyusyu, on *Rubus* sp.

88. ***Aulacaspis ericacearum*** sp. nov.

Adult female. Body stout, about 1.5 mm. in length; prosoma swollen, distinctly wider than postsoma, lacking a lateral tubercle on each side, 1.0 mm. in width; second abdominal segment not strongly produced laterally, equal in width to first abdominal segment or metathorax; pygidium triangular, with an incision at the apex. Antennae set apart, with a seta. Anterior spiracles each with a close cluster of numerous accompanying disc pores; posterior spiracles each with a smaller cluster of pores. Two to eight submedian dorsal macroducts present on third abdominal segment, three to six on fourth, two to five on fifth, and one to three on sixth; four to nine submarginal macroducts on third abdominal segment, four or five on fourth, and two to six on fifth; two to five, mostly three or four, much smaller lateral macroducts scattered on second abdominal segment, and one to four, mostly two or three, on third. Two to six short submarginal gland spines present on second abdominal segment, five to nine on third; marginal gland spines of pygidium slender, two, or rarely one or three, on fourth abdominal segment, and caudad of the segment four single ones on each side. A submarginal dorsal boss usually discernible on first abdominal segment and also between third and fourth. Anus situated slightly towards base of pygidium. Perivulvar pores numerous, in five groups, twelve to sixteen in the median group, twenty-two to twenty-six in the laterocephalics each, and sixteen to twenty-five in the laterocaudals each. Median lobes robust, united basally by a strongly sclerotized, robust yoke, deeply sunken

into apex of pygidium, usually slightly divergent though at times parallel on their inner basal margins, which are separated by a distinct space, then divergent strongly to their apices and finely serrate. Second and third lobes well developed, but much smaller than the median, bilobulate; fourth lobes obsolete.

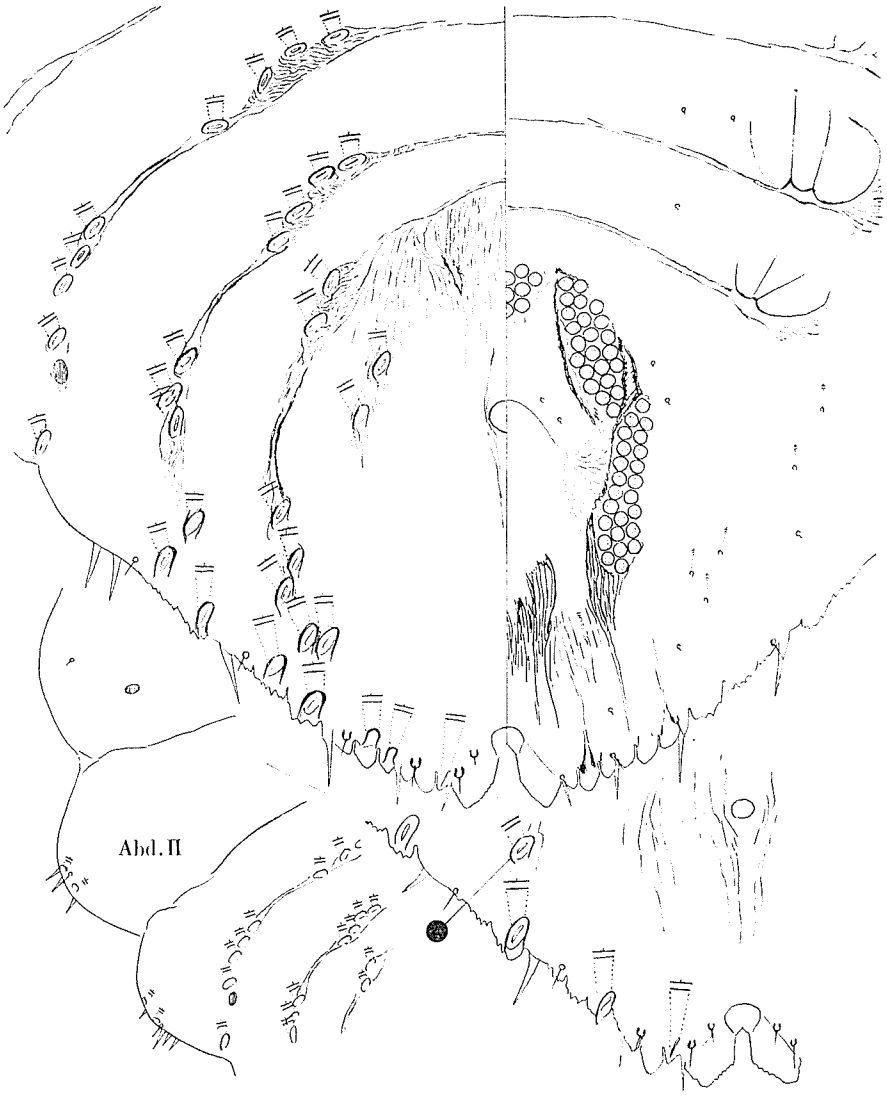

Fig. 43. *Aulacaspis ericacearum* sp. nov.

Adult female: part of abdomen (left) and pygidium; second stage female, exuvium: pygidium in dorsal aspect (right).

Second exuvium of female. Oval, 0.76 mm. in length and 0.53 mm. in width. Four single marginal macroducts present on each side, belonging probably to fourth to

seventh abdominal segments; a submarginal macroduct present on each side just cephalad of the marginal macroduct which comes in second from the anterior and may belong to the fifth abdominal segment.

Scale. In female subcircular, flat, and white in colour; in male elongate, felted, and white.

L. & H.: Aizan-Kei (ca. 1000 m.), Hokkaido, on *Leucothoe Grayana*, *Vaccinium axillare* var. *coriaceum*, and *Vaccinium Smalli* (25. VII, 1957).

This species is so closely similar in most details to *A. rosae*, that there may arise the question as to its distinctness. In the adult females the difference between the two is rather slight: in *A. rosae* the second abdominal segment is more or less strongly produced laterally and wider than either of the preceding two segments, while in *A. ericacearum* it is but weakly produced and almost as wide as the first abdominal segment or the metathorax. After my careful examinations I am convinced that *A. ericacearum* is sharply distinguished from *A. rosae* in the second stage: in the former the female of this stage is characterized by the fact that there is on either side of the body a submarginal macroduct in the region of the fifth abdominal segment, whereas in the latter the second stage female has merely four or five marginal macroducts on each side of the body, lacking submarginal ones.

The food-plants from which the present material was taken belong to the family Ericaceae. On the other hand, so far as our recent knowledge goes, *A. rosae* occurs characteristically on members of the family Rosaceae, especially *Rosa* and its closely related forms. Being given prominence to its host plants, I am inclined to believe that *A. ericacearum* should be best regarded as a good species.

89. ***Aulacaspis spinosa*** (Maskell)

Diaspis rosae var. *spinosa* Maskell (1897 a, p. 241). *Aulacaspis spinosa* Kuwana (1926, p. 24); Scott (1952, p. 40).

L. & H.: Kamidaki, Toyama-ken, Honsyu, on *Smilax China*; Miyazaki, Kyusyu, on *Smilax* sp.

90. ***Aulacaspis difficilis*** (Cockerell)

Chionaspis, difficilis Cockerell (1896 h, p. 21); MacGillivray (1921, p. 327). *Sasakiaspis difficilis* Kuwana (1926, p. 11). *Aulacaspis difficilus* Takahashi et Tachikawa (1956, Transactions of the Shikoku Entomological Society, Vol. 5, Pars 1–2, p. 9).

Adult female. Body stout, attaining about 1.5 mm. in length; prosoma becoming strongly swollen and sclerotized at full growth, about 1.2 mm. in width at maximum, prosomatic tubercles at most indicated by a slight prominence, usually practically absent; free postsomatic segments each scarcely produced laterally, all almost equal in width; pygidium almost triangular, or only slightly rounded. Anterior spiracles each with a close cluster of numerous accompanying disc pores; posterior spiracles each with a smaller cluster of pores. Dorsal macroducts somewhat variable in number but usually numerous; submedian series of macroducts present on second to sixth abdominal segments, divided into two subseries on second to fourth, the inner subseries being displaced anteriorly;

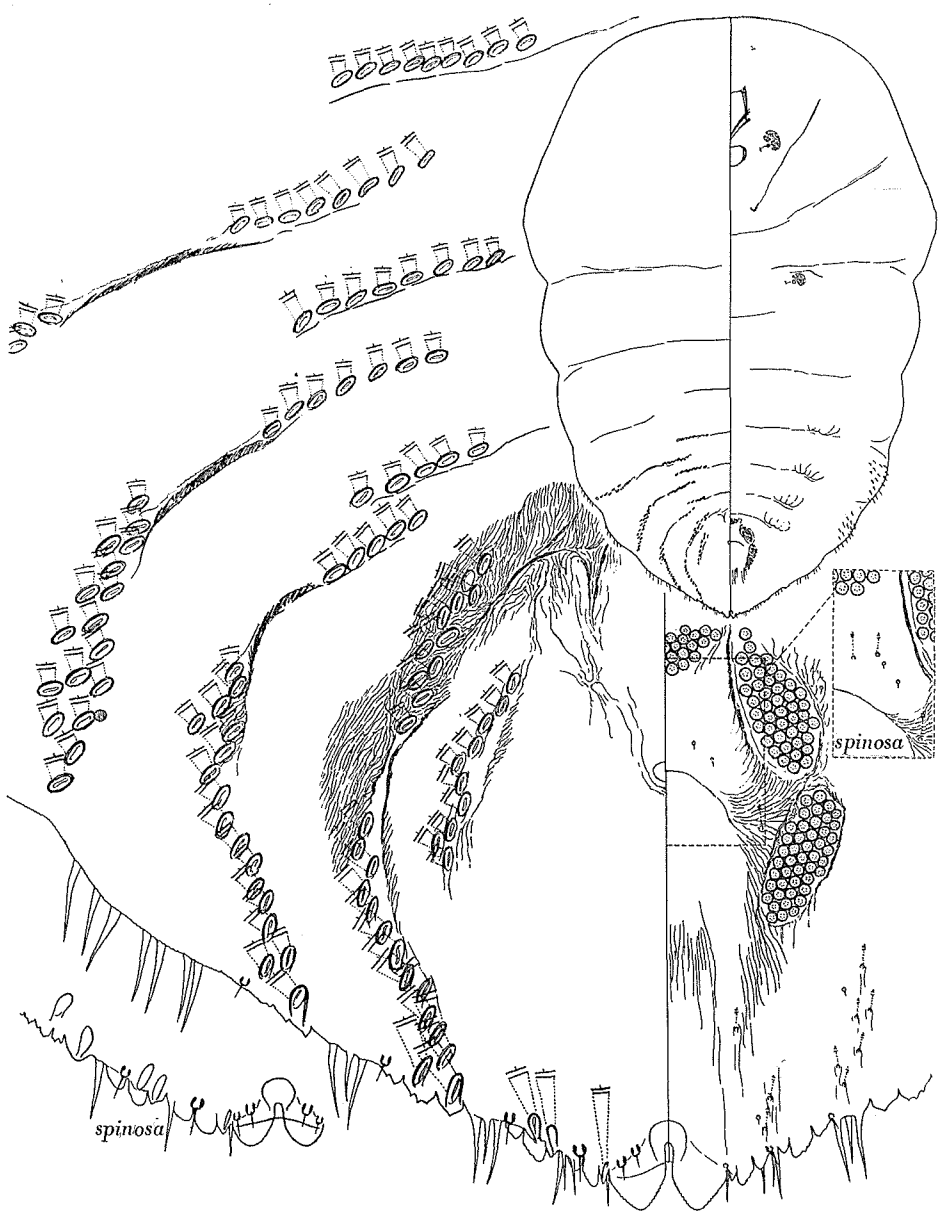

Fig. 44. *Aulacaspis difficilis* (Cockerell).

Adult female: body (right) and pygidium; *Aulacaspis spinosa* (Maskell), adult female: prevulvar region of pygidium (right) and pygidial margin in dorsal aspect (left).

submarginal macroducts on second to fifth abdominal segments; much smaller lateral macroducts present or absent on second and third abdominal segments, if present very few. A number of slender gland spines on second to fourth abdominal segments. A submarginal dorsal boss at times discernible in each anterior angle of fourth abdominal segment. Anus situated well towards base of pygidium. Perivulvar pores in five groups, numerous. Median lobes robust, united basally by a strongly sclerotized yoke, projecting or somewhat sunken into apex of pygidium, subtriangular, finely serrate. Second and third lobes much smaller than median lobes, bilobulate; fourth lobes practically obsolete.

L. & H.: Namerikawa, Toyama-ken, Honsyu; Ôsaka, Honsyu; Hiko-San, Kyusyu; Miyazaki, Kyusyu. On *Elaeagnus* spp.

The adult female of this species is variable in the shape of the body as figured by Takahashi et Tachikawa. This variation seems to be related, at least to some extent, to the maturity of the female. In quite young adult females the prosoma is scarcely swollen and the body is more or less oval, while in fully grown ones the prosoma is well swollen into such a great mass that at the time the body reveals the characteristic shape of the genus.

The resemblance of this species to *A. spinosa* is very close. After examining many specimens of the two I am convinced that these species are distinguished by a constant, though minute, difference: in *A. spinosa* there are a few ventral microducts in the region just cephalad of the vulvar opening, enclosed by perivulvar pores, whereas in *A. difficilis* no microducts are seen in this region. In both species the median lobes are somewhat variable in shape, but serve as an aid in identifying them: in *A. spinosa* the median lobes are always, though not entirely, in an incision and usually rounded along the free margin, while in *A. difficilis* the median lobes are approximately triangular, and sometimes produced beyond the apex of the pygidium, although they tend often to be sunken in some degree into the pygidium. The biological difference between the two is very distinct: *A. difficilis* has been, so far, known to occur on various species of the genus *Elaeagnus*, while *A. spinosa* on members of the genus *Smilax*.

91. ***Aulacaspis projecta*** sp. nov.

Adult female. Body stout, attaining 1.62 mm. in length; prosoma becoming strongly swollen and sclerotized at full growth, 1.15 mm. in width at maximum, prosomatic tubercles at most indicated by a slight prominence; free postsomatic segments each weakly produced laterally; pygidium broad, approximately triangular. Antennae set somewhat apart, with a seta. Anterior spiracles each with a close cluster of numerous accompanying disc pores; posterior spiracles each with pores more numerous than thirty and rather loosely and irregularly clustered. Submedian macroducts present or absent on first abdominal segment, if present few in number, a series of several ones present on second to sixth each, the series on second to fourth divided into two subseries, the inner subseries being displaced anteriorly; submarginal macroducts present or absent on second abdominal segment, if present variable in number, rather numerous ones present on third to fifth.

Marginal gland spines of pygidium slender, numerous; a few shorter gland spines present on third abdominal segment, the preceding segments lacking gland spines. Anus situated well towards base of pygidium. Perivulvar pores numerous in five groups. Median lobes projecting beyond apex of pygidium, robust, almost as long as wide, rounded and serrate along the free margin, united basally by a strongly sclerotized yoke, which is

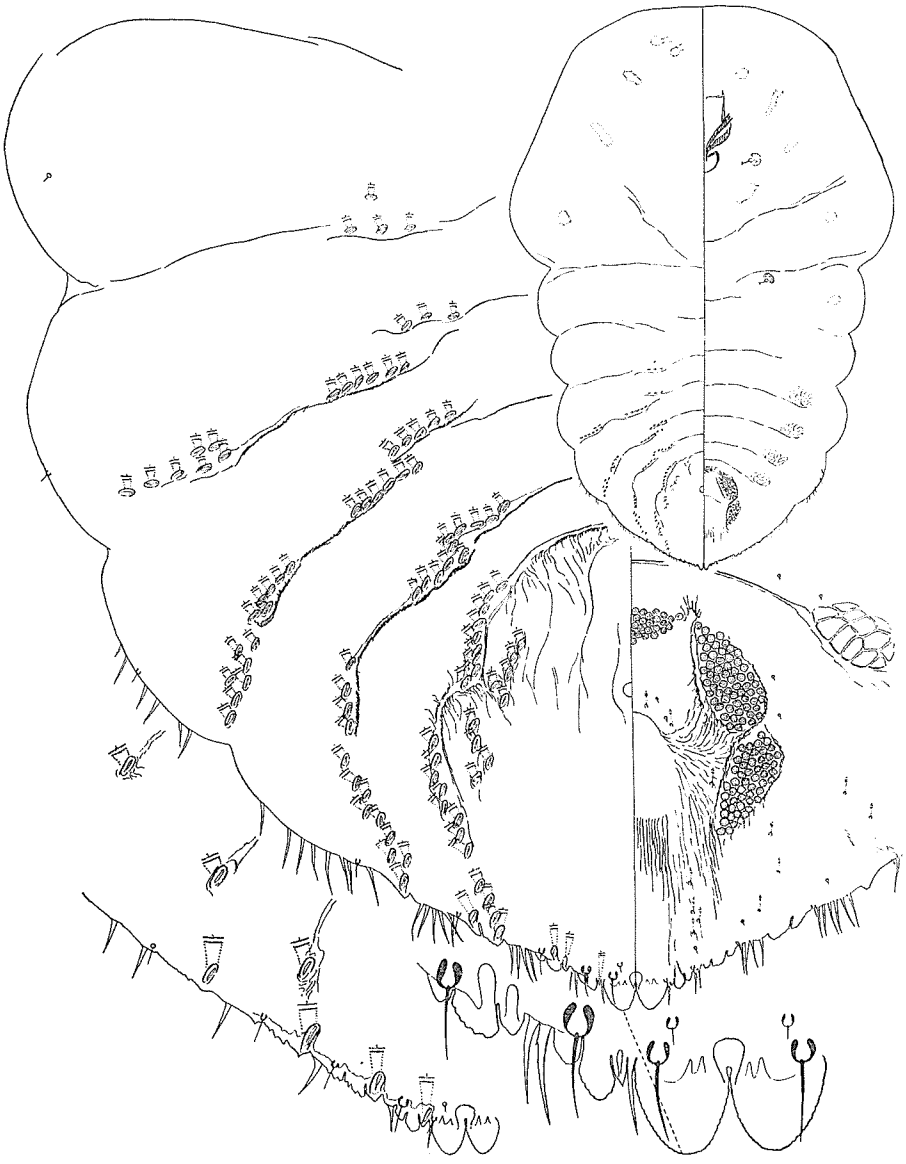

Fig. 45. *Aulacaspis projecta* sp. nov.
Adult female: body (right) and pygidium; second stage female, exuvium: pygidial margin in dorsal aspect (left).

produced anteriorly beyond the bases of the lobes. Fourth lobes represented by a slight prominence.

Second exuvium of female. Oval, attaining 0.95 mm. in length and 0.73 mm. in width. There are on each side four single marginal macroducts, belonging probably to the fourth to seventh abdominal segments, and three single submarginal macroducts, belonging probably to the third to fifth abdominal segments.

Scale. In female circular, weakly convex dorsally, and white.

L. & H.: Kurikara, Toyama-ken/Isikawa-ken, Honsyu, on an undetermined, non-coniferous, deciduous plant (23. VI, 1955).

This species is peculiar by the median lobes which are entirely produced beyond the apex of the pygidium. As the full-grown female is of the shape which is characteristic of the genus it is not open to doubt that this species is a member of *Aulacaspis*. Moreover, by the robust body, the arrangement of dorsal macroducts, etc. this species seems to be related to *A. spinosa* and *A. difficilis*; this may argue in favour of its position in *Aulacaspis*. It is clearly distinguishable from the two mainly by lacking gland spines on the second abdominal segment. It differs also in the second stage: the female of this stage of *A. projecta* is provided on each side of the body with four marginal and three submarginal macroducts, whereas *A. spinosa* and *A. difficilis* lack submarginal macroducts, having merely five marginal ones on each side.

92. ***Aulacaspis trifolium*** sp. nov.

Adult female. Body robust, attaining 1.28 mm. in length; prosoma swollen into a rounded mass, slightly wider than metathorax, 0.71 mm. in width at maximum; second abdominal segment rather produced laterally; pygidium broad, approximately triangular, the apex with a small incision. Antennae set apart, with a curved seta. Anterior spiracles each with a close cluster of numerous accompanying disc pores; posterior spiracles each with a smaller cluster of pores. Dorsal macroducts normally absent on first abdominal segment; submedian macroducts arranged in single segmental rows, three to five on second abdominal segment, three to six on third, three to five on fourth, three to six on fifth, and three to eight on sixth; submarginal macroducts in single or partly irregularly double segmental rows, three to seven on second abdominal segment, six to nine, including the outermost one opened in a marginal prominence, on third, four to eight on fourth, six to eleven on fifth, and one or two normally present on sixth, just cephalad of the marginal macroducts. Submarginal ventral microducts abundant on abdomen. Gland spines absent on thorax and first abdominal segment, eleven to seventeen gland spines present on second abdominal segment, twelve to seventeen on third, three to eight marginal ones on fourth, and caudad of the segment four single ones on each side. A submarginal dorsal boss present on first abdominal segment, and also in anterior angle of fourth and sixth abdominal segments each. Anus situated well towards base of pygidium. Perivulvar pores numerous, in five groups. Median lobes rather small, subtriangular, finely serrate, somewhat sunken into apex of pygidium, with their apices produced beyond pygidial margin, united basally by a robust, strongly

Fig. 46. *Aulacaspis trifolium* sp. nov.
Adult female: body (right) and pygidium; second stage female, exuvium: pygidial margin in dorsal aspect (left).

sclerotized yoke. Second lobes small, lowly produced; third lobes represented by slight prominences.

Second exuvium of female. Oval, 0.72 mm. in length and 0.50 mm. in width. Five single marginal macroducts present on each side, belonging probably to third to seventh abdominal segments; submarginal macroducts absent.

Scale. In female oval, convex dorsally, and white; in male elongate, non-carinate, and white.

L. & H.: Tiba, Honsyu, on *Trifolium pratense* (30. XI, 1959, K. Sekiguchi leg.).

This species is unique among the species of the genus I have ever examined, being characterized by having submarginal macroducts in the region of the sixth abdominal segment, which are situated just cephalad of the marginal macroducts. There is, however, no other particular character by which it is excluded from the genus. This species feeds on the roots of the host.

Key to the species

1. Median lobes longer than wide, deeply sunken into apex of pygidium, their apices being but slightly produced beyond pygidial margin; second abdominal segment with gland spines mostly less numerous than ten on each side. . . . . 2.
- Median lobes as long as wide or somewhat longer than wide, rounded or almost triangular, projecting or sunken into apex of pygidium in various degrees; gland spines present or absent on second abdominal segment, if present usually more numerous than ten on each side. . . . . 7.
2. Median lobes much elongate, divergent steadily from their bases on the inner margins. . . . . 3.
- Median lobes parallel or somewhat divergent on their inner basal margins, then strongly and more or less abruptly divergent to their apices. . . . . 4.
3. Sixth abdominal segment with two to four submedian macroducts on each side; median lobes enormously large. . . . . *A. amamiana* sp. nov.
- Sixth abdominal segment with or without a submedian macroduct on each side, third to fifth abdominal segments with submedian and submarginal macroducts few in number; median lobes large, thickly sclerotized; fourth lobes obsolete; second abdominal segment usually noticeably produced laterally and distinctly wider than either of the preceding two segments; a submarginal dorsal boss discernible on first abdominal segment and also between third and fourth. . . . . *A. yabunikkei.*
4. Dorsal macroducts few, each prepygidial submedian series of macroducts divided into two subseries, the inner subseries being slightly displaced anteriorly and containing one or two, rarely three, macroducts; second abdominal segment with or without dorsal macroducts; sixth abdominal segment with or without a submedian macroduct. . . . . 5.
- Prepygidial submedian series of macroducts not divided, or at most with a slight suggestion of division into two subseries; second abdominal segment with dorsal macroducts; sixth abdominal segment with submedian macroducts usually two to four in number on each side. . . . . 6.
5. Third to fifth abdominal segments with submedian and submarginal macroducts, sixth without submedian ones; median lobes only slightly divergent, rather coarsely serrate on the apical margin, the basal zygosis robust; fourth lobes with the inner lobule well represented; second abdominal segment noticeably produced laterally; a submarginal dorsal boss discernible on first abdominal segment and also between third and fourth. . . . . *A. latissima.*
- Submedian and submarginal macroducts present on third to fifth abdominal segments and also normally on second, sixth abdominal segment with or without a submedian macroduct on each side;

median lobes divergent, finely serrate on the apical margin, the basal zygosis represented by a pair of small sclerotized pieces, which are confluent merely through their anterior ends; fourth lobes obsolete; second abdominal segment noticeably produced laterally; a submarginal dorsal boss discernible on first abdominal segment and also between third and fourth. . . . . *A. distylii.*

6. Second abdominal segment produced laterally, wider than first; median lobes parallel on their inner basal margins; a submarginal dorsal boss often discernible on first abdominal segment and also between third and fourth; second stage female with four or five marginal macroducts on each side, lacking submarginal ones. . . . . *A. rosae.*

– Second abdominal segment almost as wide as either of the preceding two segments; median lobes usually though not always somewhat divergent on their inner basal margins; second stage female with four marginal and a submarginal macroducts on each side. . . . . *A. ericacearum* sp. nov.

7. Second and third abdominal segments each with gland spines more numerous than ten in number on each side. . . . . 8.

– Second abdominal segment without gland spines, third with a few spines. . . *A. projecta* sp. nov.

8 One or two submarginal macroducts present on each side of pygidium in the region of the sixth abdominal segment, just cephalad of the marginal macroducts. . . . . *A. trifolium* sp. nov.

– Sixth abdominal segment without submarginal macroducts. . . . . 9.

9. Median lobes projecting or sunken in some degree into apex of pygidium, nearly triangular, finely serrate; microducts absent in the region cephalad of the vulvar opening and enclosed by perivulvar pores. . . . . *A. difficilis.*

– Median lobes always distinctly though not entirely sunken into apex of pygidium, rounded or slightly triangular, very minutely serrate; fourth lobes obsolete; a few microducts present in the region cephalad of the vulvar opening and enclosed by perivulvar pores; dorsal macroducts rather numerous; submedian series of macroducts present on second to sixth abdominal segments, divided into two subseries on second to fourth, the inner subseries being displaced anteriorly; submarginal macroducts on second to fifth abdominal segments. . . . . *A. spinosa.*

XXII. Genus ***Pseudaulacaspis*** MacGillivray

Pseudaulacaspis MacGillivray (1921, p. 305); Ferris (1937, SI-108); Balachowsky (1954 e, p. 7). *Sasakiaspis* Kuwana (1926, p. 7).

Type: *Diaspis pentagona* Targioni.

The type species has been recorded from various parts of the World, but this genus may possibly be Asiatic. Three species are recognized herein as its members in Japan.

93. ***Pseudaulacaspis pentagona*** (Targioni)

Diaspis pentagona Targioni (1886). *Aulacaspis pentagona* Newstead (1901 b, p. 173). *Pseudaulacaspis pentagona* MacGillivray (1921, p. 315); Ferris (1937, SI-109); Balachowsky (1954 e, p. 236). *Sasakiaspis pentagona* Kuwana (1926, p. 9).

L. & H.: Unaduki, Toyama-ken, Honsyu, on *Morus* sp.; Awasuno, Toyama-ken, Honsyu, on *Salix* sp.; Toyama, Honsyu, on *Prunus Mume*; Wakasugi-yama, Hukuoka-ken, Kyusyu, on a species of the family Rosaceae.

94. ***Pseudaulacaspis biformis*** Takagi

Pseudaulacaspis biformis Takagi (1956, Insecta Matsumurana, Vol. 19, Nos. 3-4, p. 114).

L. & H.: Types and many other specimens, Sapporo, Hokkaido, on *Cercidiphyllum japonicum, Cornus controversa, Kalopanax septemlobus, Ligustrum Tschonoskii,*

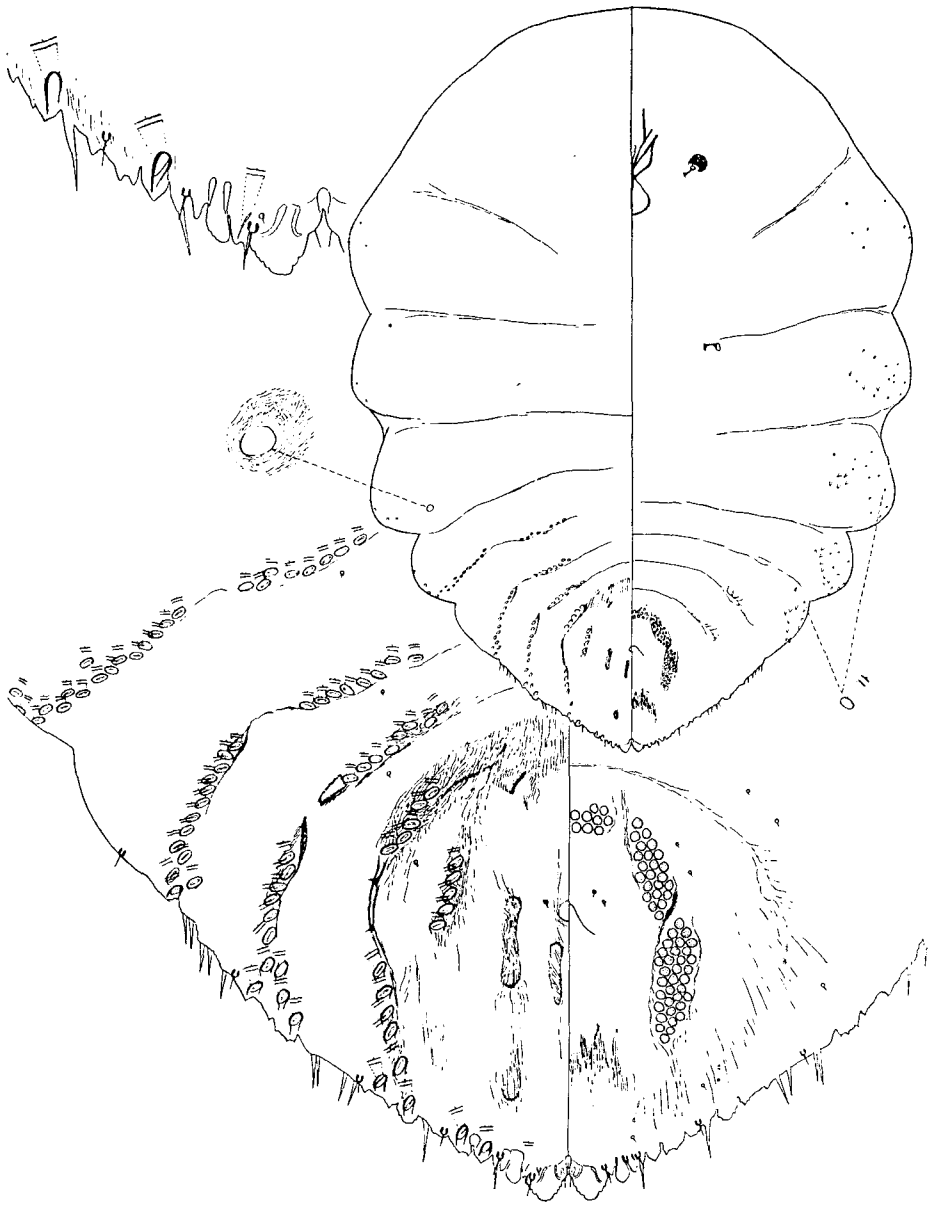

Fig. 47. *Pseudaulacaspis biformis* Takagi.

Adult female: body (right) and pygidium; second stage female, exuvium: pygidial margin in dorsal aspect (left).

Magnolia Kobus, *Sorbus* sp., *Syringa vulgaris*, and *Ulmus Davidiana* var. *japonica*.

Having examined newly prepared young adult females of this species I have been convinced that the semicircular form of the median lobes described by me in the original description may possibly be produced by the defacement of the apical part of the lobes. This defacement is frequently seen in specimens collected on *Cornus controversa*, on which the female scale becomes much more convex dorsally than on any other hosts.

This species is evidently very close to *P. pentagona*, from which it differs, in the adult female, by the two characters, the presence of submedian macroducts on the sixth abdominal segment and the marginal gland spines of the pygidium which are simple and not divided apically. It differs also in the second stage female: in all the examined exuvia of this stage there are on each side merely five marginal macroducts, whereas in *P. pentagona* the second stage female has, in addition, at least one or two submarginal macroducts on each side of the body in the region of the third abdominal segment.

95. ***Pseudaulacaspis simplex*** sp. nov.

Pseudaulacaspis pentagona Takagi (1956, Insecta Matsumurana, Vol. 19, Nos. 3-4, p. 113) (nec Targioni).

Adult female. Body stout, broadly oval, attaining 1.5 mm. in length and 1.0 mm. in width; meso- and metathorax and free abdominal segments each strongly produced laterally; pygidium broad, subtriangular, well sclerotized. A thickly sclerotized, mostly conical, small tubercle present on each side of prosoma, on a slight prominence. Antennae set close, with a seta. Anterior spiracles each with a close cluster of numerous accompanying disc pores; posterior spiracles each with one to five pores. Two to five submedian macroducts present on second abdominal segment, four or five on third, mostly four on fourth, and usually two or three on fifth; seven to ten submarginal macroducts present on second and third abdominal segments each, five to seven on fourth, and three to five on fifth; several much smaller lateral macroducts scattered on meso- and metathorax and first to third abdominal segments. A few submarginal gland spines usually present on mesothorax, several submarginal ones on metathorax and first to third abdominal segments; marginal gland spines of pygidium simple, not divided apically. A pair of preanal scars present. Anus situated well towards base of pygidium. Perivulvar pores in five groups, numerous. Median lobes prominent, projecting, united basally through a strongly sclerotized yoke, each lobe subtriangular with the inner and outer margins convergent posteriorly and incised. Second lobes bilobulate, the inner lobule being well developed, somewhat elongate, and the outer lobule much smaller but apparently seen. Third lobes with the inner lobule represented by a low, broad prominence.

Second exuvium of female. Oval, attaining 0.81 mm. in length and 0.63 mm. in width. Five single marginal macroducts present on each side, belonging probably to third to seventh abdominal segments. Submarginal macroducts absent.

Scale. In female subcircular, weakly convex dorsally, and white.

L. & H.: Sapporo, Hokkaido, on *Prunus Sargentii* (31. V, 1954; 13. X, 1958).

This scale insect is extremely close to *P. pentagona*, and in my previous paper

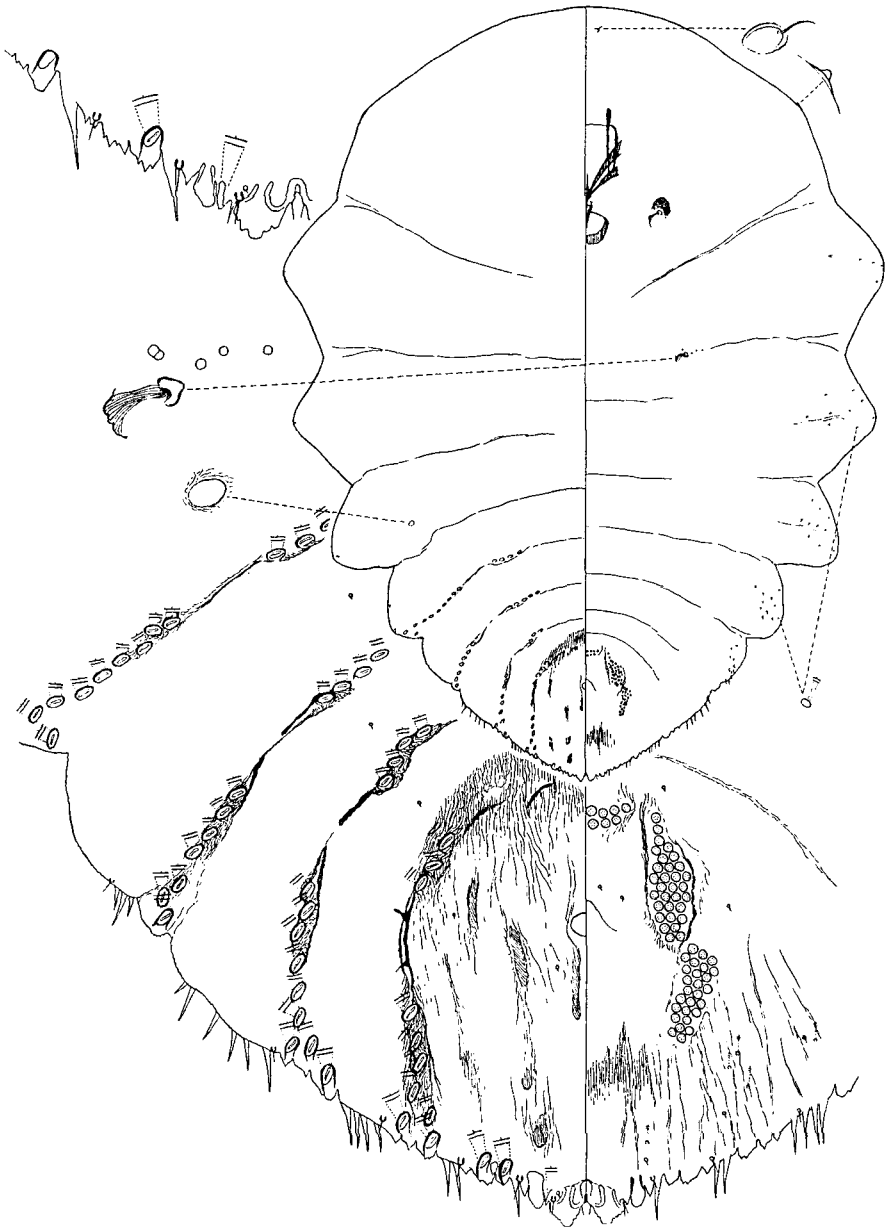

Fig. 48. *Pseudaulacaspis simplex* sp. nov.

Adult female: body (right) and pygidium; second stage female, exuvium: pygidial margin in dorsal aspect (left).

(1956) it is treated as the same species. It is, however, characterized by the following three characters: the presence of accompanying disc pores of the posterior spiracles, the marginal gland spines of the pygidium which are simple in shape and not divided apically, and, in the second stage female, the absence of submarginal macroducts. It resembles *P. biformis* in the last two characters, and also *P. pentagona* in the absence of submedian macroducts on the sixth abdominal segment. It is impossible to determine exactly from the present knowledge whether or not this form may be recognized as a good species. Such being the case, I am much inclined to the opinion that this form may be provisionally regarded as a species until further examinations can be satisfactorily given.

Key to the species

1. Submedian macroducts present on sixth abdominal segment; marginal gland spines of pygidium simple in shape, not divided apically; posterior spiracles without accompanying disc pores; second stage female with five single marginal macroducts on each side, without submarginal ones. . . . . *P. biformis.*
- Submedian macroducts absent on sixth abdominal segment. . . . . 2.
2. Marginal gland spines of pygidium frequently divided apically; posterior spiracles without accompanying disc pores; second stage female with five single marginal macroducts, these belonging probably to third to seventh abdominal segments, one or two submarginal ones on third, and at times also a submarginal one on second. . . . . *P. pentagona.*
- Marginal gland spines of pygidium simple, not divided apically; posterior spiracles each with one to five accompanying disc pores; second stage female with five single marginal macroducts on each side, without submarginal ones. . . . . *P. simplex* sp. nov.

XXIII. Genus ***Takahashiaspis*** novum

Type: *Takahashiaspis macroporana* sp. nov.

Adult female. Body stout, broadly oval; free segments each more or less produced laterally; pygidium broad, subtriangular, well sclerotized. Antennae each with two setae. Anterior spiracles each with a cluster of accompanying disc pores. Dorsal macroducts small, numerous, occurring even on cephalothorax. Marginal macroducts of pygidium practically as large as neighbouring submarginal ones, heavily sclerotized around the orifice, absent between median lobes, one between median and second, two laterad of second lobe on sixth abdominal segment, two on fifth, and one or two on fourth. Gland spines occurring on thorax and abdomen. Anus moderate in size, situated about middle of pygidium. Perivulvar pores in five groups. Pygidium irregularly reticulate on dorsum anterior to anal opening. Median lobes set close, appearing to be confluent through a sclerotized area between them, prominent, projecting, with a pair of short spine-like processes between them. Second lobes bilobulate, smaller than the median. Third lobes represented by low serrations of pygidial margin.

First stage female (exuvium). Broadly oval. Antennae short, five-segmented; terminal segment annulate, slightly shorter than the preceding segments united. A pair of dorsal ducts absent on head.

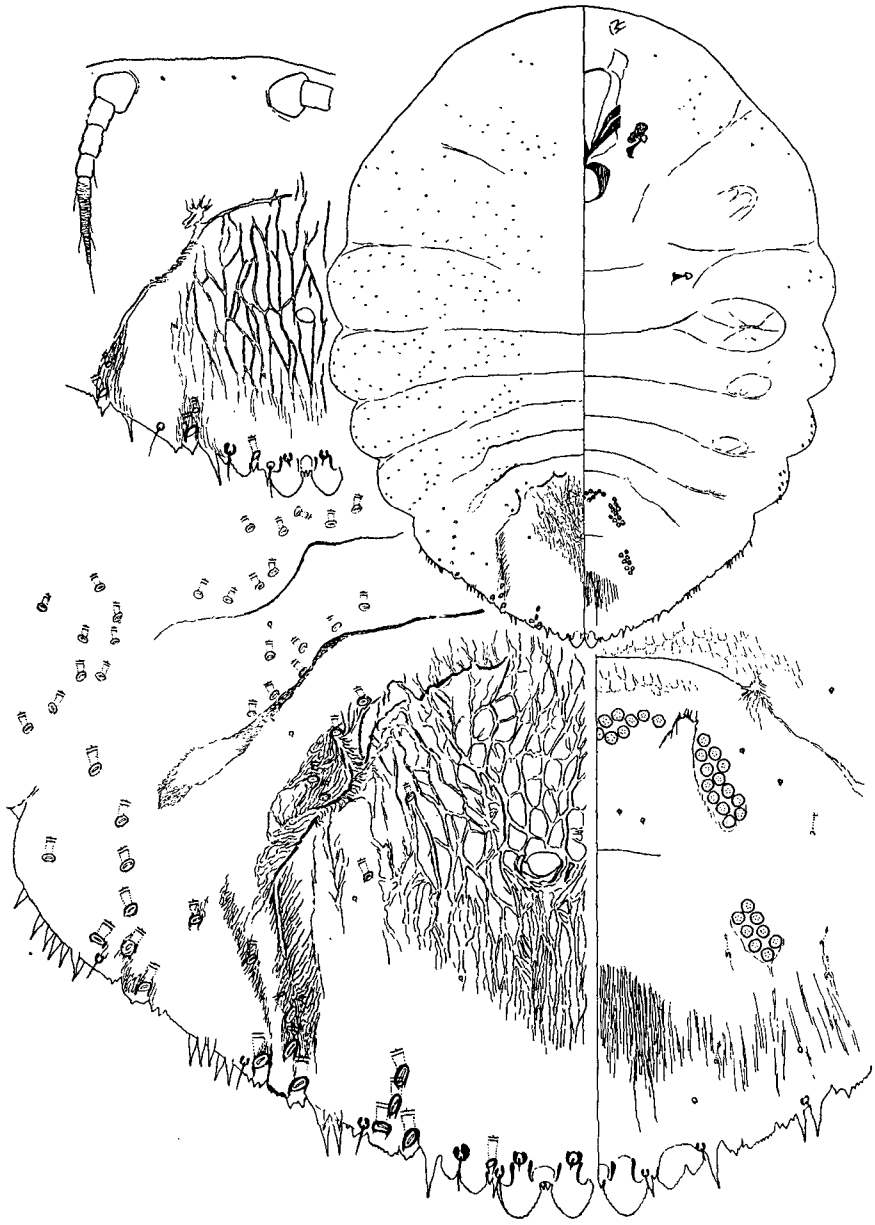

Fig. 49. *Takahashiaspis macroporana* sp. nov.

Adult female: body (right) and pygidium; second stage female, exuvium: pygidium in dorsal aspect (left lower); first stage female, exuvium: antennae (left upper).

This genus may be related to *Neochionaspis* Borchsenius, *Contigaspis* MacGillivray, *Gadaspis* Hall, and *Paragadaspis* Kaussari et Balachowsky, but appears to be a very distinct one as well. The resemblance of this genus to *Neochionaspis*, especially, seems to be fairly close, but may be distinguishable from the latter chiefly by having many dorsal macroducts scattered over the cephalothorax and free abdominal segments in both submedian and submarginal regions. It is my real pleasure to state here that this interesting genus is named after Prof. R. Takahashi.

96. ***Takahashiaspis macroporana*** sp. nov.

Adult female. Body moderate in size, broadest across metathorax or first abdominal segment. Antennae set apart, each composed of a rather robust tubercle and two rather short setae. Anterior spiracles each with a close cluster of numerous disc pores; posterior spiracles without pores. Sixth abdominal segment with one or two submedian macroducts and with one or two submarginal macroducts just cephalad of the marginal ones; a submarginal macroduct at times occurring cephalad of second lobe. A minute, conical gland spine present laterocaudad of each antenna, several similar, but somewhat larger ones laterad of each anterior spiracle, two to six similar submarginal ones laterad of each posterior spiracle and three to six on first abdominal segment, several somewhat elongate ones on second and third abdominal segments each; marginal gland spines of pygidium rather short, fourth to sixth abdominal segments each with a series of spines. Perivulvar pores rather few.

Second exuvium of female. Broadly oval, attaining 0.67 mm. in length. Antennae with two setae. Three marginal macroducts present on either side, belonging probably to fifth to seventh abdominal segments; a few submarginal macroducts present on pygidium and each prepygidial abdominal segment and also often on meso- and metathorax. Pygidium reticulate on dorsal surface.

Scale. In female circular, convex dorsally, and white; in male elongate, felted, and white, with a slight median longitudinal carina.

L. & H.: Abasiri, Hokkaido, on *Acer Mono* (11. VI, 1956).

Isolated genera

The genera *Thysanaspis* and *Megacanthaspis* (gen. nov.) are peculiarly characterized by lacking sclerotized lobes in the adult stage of the female. Although their affinities to any other are uncertain, they appear to belong to the tribe Diaspidini; their macroducts resemble in structure those of many Diaspidini, and, furthermore, there is no distinct reason to exclude them positively from the tribe.

XXIV. Genus ***Thysanaspis*** Ferris

Thysanaspis Ferris (1955 c, p. 30).

Type: *Thysanaspis acalyptus* Ferris.

Adult female. The adult female is found in the sclerotized exuvium of the second stage, elongate, more or less oval, and membraneous throughout. Pygidium with slender

marginal ducts and long marginal setae, lacking any sclerotized marginal processes. Dorsal ducts absent. Gland spines absent. Anus moderate in size, situated about middle of pygidium. A number of disc pores arranged in an almost continuous transverse row cephalad of vulvar opening.

Second stage female (exuvium). The second exuvium is plump, oval in shape, and heavily sclerotized both dorsally and ventrally, and opens on the pygidium by a ventral valve to permit the escape of the young. This valve is rounded along its free margin, and demarked by a furrow just within the margin of the pygidium. Pygidium projecting, rounded apically, its free margin being provided with a series of remarkable, flat, and, except the anteriormost, fimbriate processes. Pygidial lobes lacking. Anus small, close to apex of pygidium.

First stage larva. Newly hatched larva elliptical. Antennae rather short, five-segmented; terminal segment annulate and slightly shorter than the preceding segments united. Many enlarged ducts arranged over dorsum. Posterior extremity with a pair of small, wide, apically fimbriate processes between the apical setae.

This genus was originally erected to accept the peculiar scale insect *Thysanaspis acalyptus* from China. Ferris gave *Radionaspis* Ferris and *Anotaspis* Ferris as its supposed relatives, with some emphasis on *Radionaspis*. It should be noted here that in the present genus the antennae of the first stage larva are five-segmented like *Radionaspis*.*

97. ***Thysanaspis litseae*** sp. nov.

Adult female. Body oval, pygidium approximately triangular. Antennae set rather close, each composed of a robust tubercle and four short setae. Anterior spiracles each with a few accompanying disc pores; some slender ducts occurring in a loose cluster just laterad of each anterior spiracle, with the orifice comparatively large and rounded. Posterior spiracles without accompanying disc pores. Marginal ducts of pygidium three to five in number on each side. Disc pores arranged in an almost continuous transverse row cephalad of vulvar opening, as many as twenty; one or two similar submarginal disc pores present on ultimate, and often one on penultimate, prepygidial segment on each side.

Second exuvium of female. Elongate-oval, attaining 0.74 mm. in length at maximum. Pygidium comparatively small, with as many as twelve fimbriate marginal processes on each side. Five very large ducts present along margin of pygidium, peculiar in shape, each opened through a very prominent, robust, tubercular process. Numerous minute tubercular gland spines arranged in a continuous lateroventral row on either side through thorax and prepygidial region of abdomen.

First stage larva. Newly hatched larva 0.24 mm. in length and 0.14 mm. in width. There are enlarged dorsal ducts arranged on each side of the body as follows: one just caudad of eye, one mesocaudad of and a little apart from the preceding, four in a longitudinal submedian row in central region of body, and as many as eight arranged along

* *Radionaspis indica* (Marlatt), the type of the genus, was studied by Ferris (1938 a, SII–153).

margin of posterior half of body, the ultimate one associated with the fimbriate process mesad of the apical seta.

Scale. Second exuvium of female brown, and loosely covered by white secretionary material, which is composed of curled individual threads. Scale of male elongate, felted, non-carinate, and white in colour.

L. & H.: Naze, Amami-Ôsima, on *Litsea japonica* (21. V, 1957). Through the

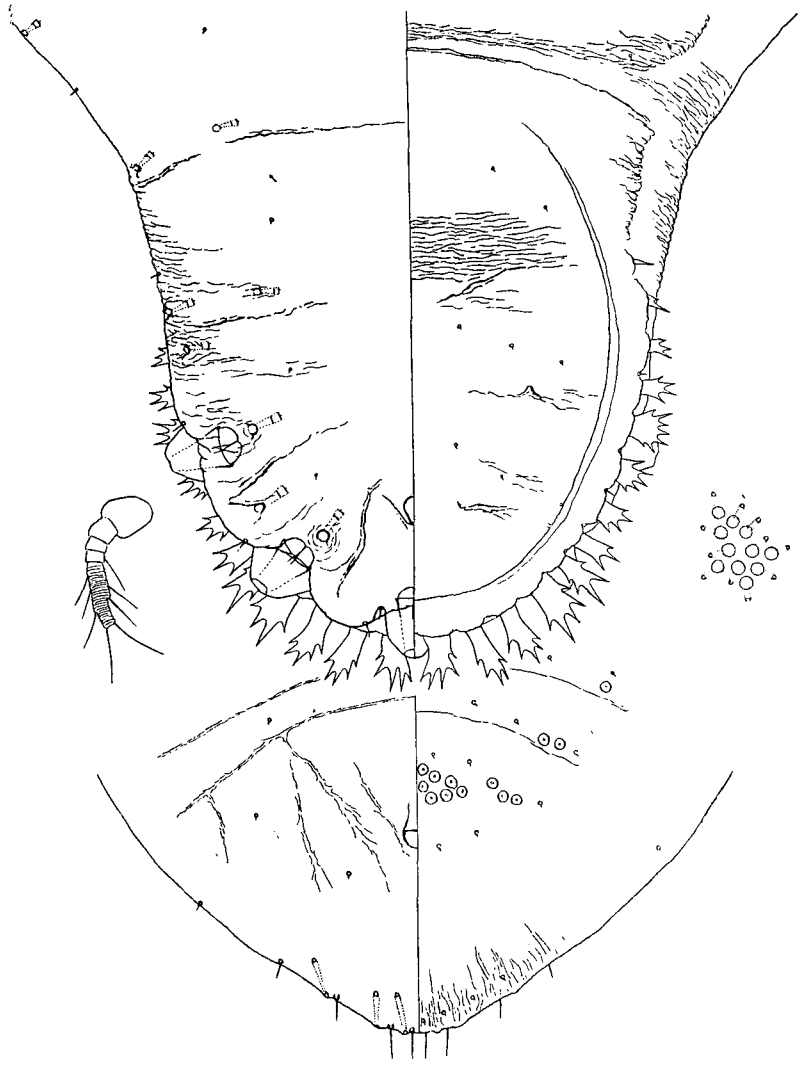

Fig. 50. *Thysanaspis litseae* sp. nov.

Adult female: pygidium (lower) and clustered ducts opposite anterior spiracle (right); second stage female, exuvium: pygidium (upper); first stage larva: antenna (left).

kindness of Prof. R. Takahashi I have also examined specimens collected on 'Akatetu'* at 'Ôgimi, Loochoo' by Mr. K. Iba (10. III, 1959).

As the examined examples of this species are in very bad condition further examinations of good examples are necessary in order to find definite characters of this insect.

This species may be distinguishable from *T. acalyptus* by having accompanying disc pores and a cluster of slender ventral ducts laterad of each anterior spiracle, by lacking a marginal duct between the apical setae of the pygidium, by having five prominent marginal pore prominences on the pygidium in the second stage female, etc.

XXV. Genus ***Megacanthaspis*** novum

Type: *Megacanthaspis actinodaphnes* sp. nov.

Adult female. Body elongate, membraneous throughout; pygidium small, rounded apically. Antennae set apart, with a seta. Macroducts with the orifice elliptical and surrounded by a slender rim, tending to be arranged in segmental rows. Anus circular, moderate in size, situated near base of pygidium. Perivulvar pores arranged in a continuous arch. Pygidium with short, apically fimbriate, membraneous processes arranged along the apical margin, beset with neither sclerotized lobes nor marginal pore prominences. Prominent, conical, glanduliferous processes occurring along margin of abdomen.

Second stage female. Pygidium with short, apically fimbriate processes arranged along the apical margin. Sclerotized lobes lacking. Marginal gland spines rather robust.

First stage female (exuvium). Antennae set close, rather short, five-segmented; terminal segment slightly shorter than the preceding segments united. Enlarged dorsal ducts absent on head. I have failed, in the material at hand, to find any sclerotized lobe-like processes at the posterior extremity of the body, which is truncate for a distinct distance.

This genus is so peculiar that any close affinities can not be suggested. It lacks sclerotized lobe-like processes on the pygidium in all the stages of the female, and is provided with a series of small, membraneous, apically fimbriate processes along the apical margin of the pygidium both in the adult female and in the second stage female.

It is particularly characterized by having very prominent, conical, glanduliferous processes along the margin of the abdomen.

In certain respects this genus resembles *Mercetaspis* Gomez-Menor, from which it is distinct by that the dorsal macroducts occurring along the pygidial margin are not particularly enlarged, that is, the absence of 'mégapores.' As this difference is very striking taxonomically it seems that the resemblance between the two may not always indicate their close relationship. Moreover, in *Mercetaspis* the antennae of the first stage larva are six-segmented (Balachowsky, 1954e, p.126), while in *Megacanthaspis* five-segmented.

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* This plant, so far as identified from the fragments of the leaves at hand, seems to be identical with *Litsea japonica*.

98. ***Megacanthaspis actinodaphnes*** sp. nov.

Adult female. Body slender, without intersegmental constrictions, attaining 0.78 mm. in length. Anterior spiracles each with a few accompanying disc pores. Dorsal macro-

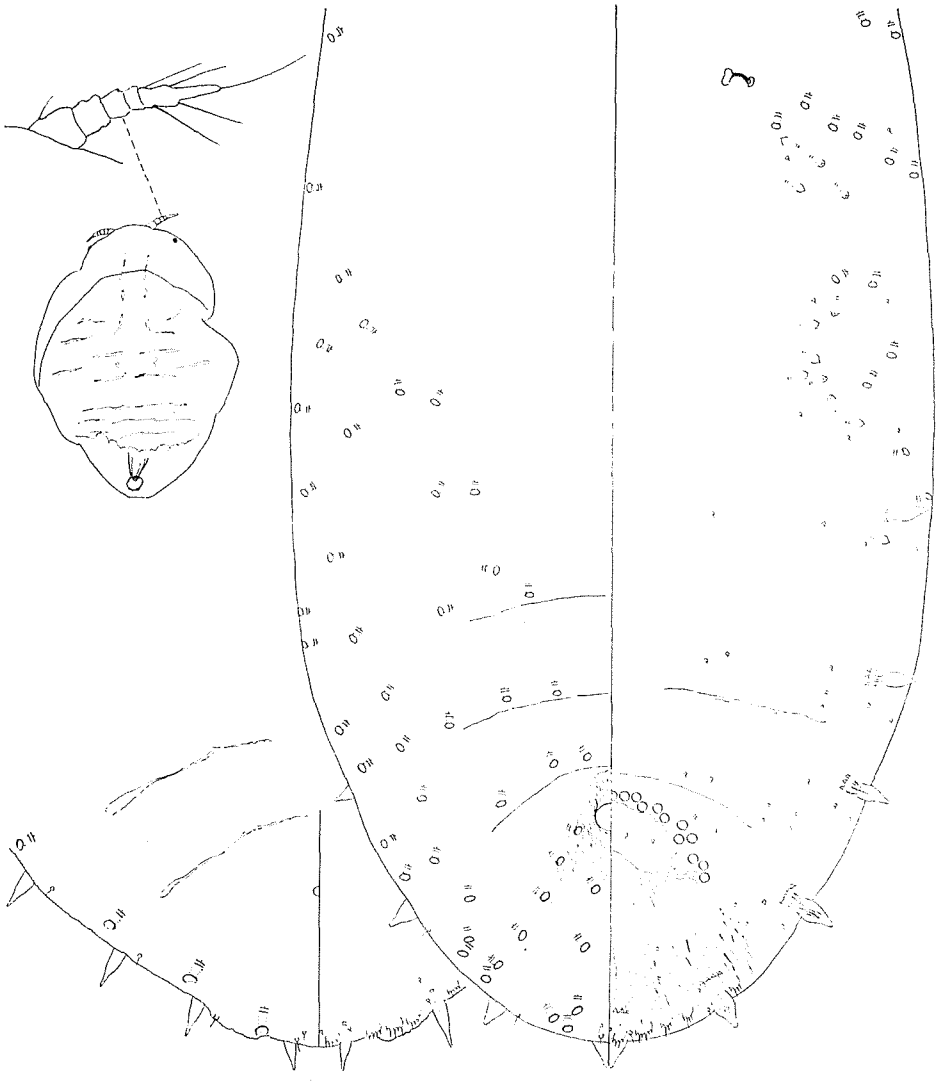

Fig. 51. *Megacanthaspis actinodaphnes* sp. nov.
Adult female: postsoma; second stage female, exuvium: pygidium (left lower); first stage female, exuvium (left upper).

ducts rather sparse; similar ventral macroducts laterad of each of anterior and posterior spiracles. Several submarginal tubercular gland spines occurring in basal region of abdomen, a cluster of fewer similar ones caudad of each of anterior and posterior

spiracles. Perivulvar pores slightly more numerous than twenty. Four fimbriate processes present in a continuous series along apical margin of pygidium on each side, and laterad of the series a similar isolated one. Glanduliferous conical processes occurring in six pairs, the posteriormost pair closely appressed together at apex of pygidium.

Second exuvium of female. About 0.42 mm. in length and 0.29 mm. in width. Pygidium broad, with a pair of fimbriate processes at apex, laterad of this pair three similar processes in a continuous series and then an isolated one. Four macroducts occurring singly in posterior region of abdomen on each side along body margin, belonging probably to fourth to seventh abdominal segments.

Scale. In female elongate, slender, highly convex dorsally, felted, and grayish in colour.

L. & H.: Kagosima, Kyusyu, on *Actinodaphne longifolia* (12. V, 1957).

The examined specimens of this peculiar scale insect is in very poor condition. I believe, however, that the main characters of this species may be essentially described and illustrated herein.

Key to the genera

1. Pygidial lobes present. . . . . 2.
- Pygidial lobes absent. . . . . 24.
2. Two or three pairs of well-developed, sclerotized lobes present on pygidium, all these being unilobed, the median pair non-zygotic; somewhat sclerotized tubercular gland spines often present laterad of anterior spiracles. . . . . (*Parlatoria* group) 3.
- Median lobes zygotic or non-zygotic; second lobes, if present, primarily divided into two to four lobules, if bilobulate the outer lobule well represented or rudimentary or even obsolete; small gland spines usually absent laterad of anterior spiracles. . . . . 8.
3. Body elongate, fusiform; antennae with plural setae; many tubercular gland spines arranged in an almost continuous single row on each side through prepygidial region of body; perivulvar pores present on pygidium cephalad of vulvar opening in five groups which are at times fused to make an almost continuous arch, similar disc pores in a submarginal cluster on the preceding two abdominal segments each; fimbriate marginal spines present on pygidium; two pairs of acute lobes well developed; pupillarial, adult female being entirely covered by second exuvium; first and second exuvia of female very elongate. . . . . *Lopholeucaspis.*
- Body circular or somewhat elongate; antennae with a single seta; perivulvar pores, if present, in four or five groups on pygidium, without similar disc pores on preceding abdominal segments; first exuvium of female broadly oval; second exuvium of female rounded or somewhat elongate. . . . 4.
4. Three pairs of paraphyses present on pygidium, associated with marginal macroducts, the lateral two being prominent and pyriform; median lobes well developed, set close; second lobes similar to, but much smaller than, median lobes; third lobes practically obsolete; marginal spines simple; non-pupillarial. . . . . *Parlatoreopsis.*
- Pyriform paraphyses absent on pygidium; three pairs of lobes well developed. . . . . 5.
5. Marginal macroducts of pygidium with the orifice longitudinal; dorsal submarginal ducts very small, slender; fimbriate spines arranged along apical margin of pygidium, as long as lobes, giving way to a row of very prominent marginal spines occurring laterad of third lobe and extending anteriorly into prepygidial region of abdomen; non-pupillarial. . . . . *Microparlatoria.*
- Marginal macroducts of pygidium with the orifice transverse or nearly so. . . . . 6.

6. Marginal spines of pygidium about as long as lobes, mostly fimbriate apically; non-pupillarial. . . . . *Parlatoria.*
- Marginal spines of pygidium distinctly longer than lobes, simple or bifurcate apically or irregularly fimbriate; pupillarial. . . . . 7.
7. A marginal macroduct present between median lobes; lobes small, conical, and symmetrical; marginal spines of pygidium simple or irregularly divided apically; second exuvium of female with a distinct lateral constriction on either side. . . . . *Cryptoparlatorea.*
- A marginal macroduct absent between median lobes; lobes conical, asymmetrical, with the outer margin more or less longer than the inner; marginal spines of pygidium simple or furcate apically; second exuvium of female not constricted laterally. . . . . *Neoparlatoria.*
8. Marginal macroducts of pygidium particularly enlarged, being distinctly larger than dorsal macroducts; median lobes non-zygotic, with a pair of gland spines between them. . . . . (*Lepidosaphes* group) 9.
- Marginal macroducts of pygidium not particularly enlarged; median lobes zygotic or non-zygotic, without glanduliferous processes between them*. . . . . (*Phenacaspis* group) 12.
9. Median lobes set very close, appearing strongly convergent, and asymmetrical, being of a more or less triangular form with the outer margin much longer than the inner; second lobes present or absent, if present very small, the outer lobule often rudimentary or even obsolete; marginal macroducts of pygidium four to six in number on each side. . . . . *Andaspis.*
- Median lobes symmetrical or nearly so, or at times asymmetrical but never appearing strongly convergent; second lobes well represented. . . . . 10.
10. Marginal macroducts of pygidium normally six in number on each side. . . . . *Lepidosaphes.*
- Marginal macroducts of pygidium four or five in number on each side. . . . . 11.
11. Marginal macroducts of pygidium five in number on each side; perivulvar pores present in five groups; marginal gland spines of pygidium slender, very elongate. . . . . *Acanthomytilus.*
- Marginal macroducts of pygidium four in number on each side, all occurring singly; perivulvar pores absent. . . . . *Pallulaspis.*
12. Median lobes distinctly separated, or set close but never united basally by a distinct, sclerotized yoke. . . . . 13.
- Median lobes zygotic usually through a distinct, sclerotized basal yoke, or at least appearing to be confluent through a sclerotized area between them. . . . . 17.
13. Median lobes widely separated, unilobed or duplex, with one or two fimbriate processes between them; second lobes divided into two to four lobules, all the lobules practically equal in shape and size. . . . . 14.
- Median lobes unilobed, without fimbriate processes between them; second lobes primarily divided into two lobules, the outer lobule at times becoming rudimentary or even obsolete; third lobes present or absent. . . . . 15.
14. Body fusiform and moderately expanded in abdominal region, or very elongate and little expanded in abdominal region. . . . . *Kuwanaspis.*
- Body elongate-pyriform, being broadly expanded in abdominal region; dorsal macroducts small, and numerous. . . . . *Nikkoaspis.*
15. Pygidial lobes represented by very small, more or less conical processes, median lobes widely separated, second lobes bilobulate, third lobes absent; marginal gland spines of pygidium slender, very elongate. . . . . *Unachionaspis.*
- Pygidial lobes usual in size, not represented by small, conical processes, median lobes separated by

* In *Kuwanaspis* and *Nikkoaspis* one or two fimbriate processes, and in *Takahashiaspis* two short spines, occur between the median lobes, but these processes or spines are apparently devoid of microducts.

a space as wide as or narrower than one of them. . . . . 16.

16. Dorsal macroducts present in submedian series on sixth abdominal segment, absent in submarginal region of the segment and mesad of the segment; median lobes divergent, with their inner basal angles set close but not united by a distinct basal yoke. . . . . *Duplachionaspis.*

– Abundant dorsal macroducts scattered on whole surface of pygidium; median lobes divergent or parallel, separated, or their inner basal angles set close; second and third lobes well developed, similar in shape and size. . . . . *Unaspis.*

17. Median lobes very closely appressed together medially or completely fused into a single lobe; second lobes well represented or becoming rudimentary or even obsolete. . . . . *Pinnaspis.*

– Median lobes not closely appressed together medially. . . . . 18.

18. Submedian dorsal macroducts absent, submarginal ones present or absent; pupillarial. . . *Fiorinia.*

– Submedian and submarginal dorsal macroducts present; non-pupillarial. . . . . 19.

19. Prosoma usual, not swollen. . . . . 20.

– Prosoma, at least at full growth, swollen into a prominent mass and more or less exceeding metathorax or whole of postsoma in width. . . . . 23.

20. Body elongate, fusiform, or very slender and subparallel along the lateral margins. . . . . 21.

– Body turbinate, or broadly oval or pyriform. . . . . 22.

21. Body fusiform; first stage female without very prominent marginal setae around body. . . . . *Phenacaspis.*

– Body, at full growth, very slender owing to prolongation of thoracic region, subparallel along the lateral margins; first stage female with very prominent marginal setae around body. . *Greenaspis.*

22. Dorsal macroducts arranged in well-defined, crescentic segmental rows on abdomen, absent on cephalothorax; dorsal surface of pygidium not reticulate; median lobes with a pair of setae between them. . . . . *Pseudaulacaspis.*

– Dorsal macroducts small in size, occurring on both cephalothorax and abdomen; pygidium irregularly reticulate on dorsum anterior to anal opening; median lobes with a pair of spine-like processes between them. . . . . *Takahashiaspis.*

23. Median lobes various in shape but never square, projecting or sunken in various degrees into apex of pygidium; first stage female with the basal antennal segment which is usual in shape and not produced into a conical mass. . . . . *Aulacaspis.*

– Median lobes more or less square in shape, projecting, with the basal zygosis strongly produced anteriorly into apex of pygidium; first stage female with the basal antennal segment which is conical in shape,being strongly produced anteriorly and pointed at the anterior extremity. . . *Miscanthaspis.*

24. Pygidium without any marginal processes, with four pairs of long marginal setae; second exuvium of female oval, pygidium projecting, provided with a series of remarkable, flat, and, except the anteriormost, fimbriate marginal processes; pupillarial, adult female being enclosed in the second exuvium. . . . . *Thysanaspis.*

– Pygidium with short fimbriate processes occurring along its apical margin; prominent, conical, glanduliferous processes occurring along margin of abdomen; non-pupillarial. . . . . *Megacanthaspis.*

LIST OF THE GENERA AND SPECIES IN 'A CONTRIBUTION TO THE KNOWLEDGE OF THE DIASPIDINI OF JAPAN', I–III

		Part of paper	page
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3.	*P. pergandii* Comstock	I	70
4.	*P. theae* Cockerell	I	70
5.	*P. zizyphus* (Lucas)	I	70
II.	*Cryptoparlatorea* Lindinger	I	71
6.	*C. leucaspis* Lindinger	I	71
III.	*Neoparlatoria* Takahashi	I	72
7.	*N. formosana* Takahashi	I	73
IV.	*Microparlatoria* Takahashi	I	74
8.	*M. itabicola* (Kuwana)	I	74
V.	*Parlatoreopsis* Lindinger	I	74
9.	*P. chinensis* (Marlatt)	I	74
VI.	*Lopholeucaspis* Balachowsky	I	74
10.	*L. japonica* (Cockerell)	I	74
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	= *L. atunicola* Siraiwa		
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15.	*L. gloverii* (Packard)	I	79
16.	*L. camelliae* Hoke	I	79
17.	*L. pini* (Maskell)	I	79
18.	*L. conchiformioides* Borchsenius	I	79
	= *L. conchiformis* Kuwana et auct. (nec Gmelin)		
19.	*L. machili* (Maskell)	I	79
	= *L. cymbidicola* Kuwana		
	= *L. cinnamomi* Takahashi		
	= *L. ezokihadae* Kuwana		
20.	*L. kuwacola* Kuwana	I	79
	= *L. ume* Kuwana		
21.	*L. pseudotsugae* Takahashi	I	80
22.	*L. beckii* (Newman)	I	80
23.	*L. kamakurensis* Kuwana	I	80
24.	*L. abdominalis* Takagi	I	80
25.	*L. ulmi* (L.)	I	82
26.	*L. celtis* Kuwana	I	82
27.	*L. salicina* Borchsenius	I	83
28.	*L. piniphilus* Borchsenius	I	84
29.	*L. smilacis* Takagi	I	86
30.	*L. glaucae* Takahashi	I	88
31.	*L. euryae* (Kuwana)	I	90
32.	*L. okitsuensis* Kuwana	I	90
33.	*L. tubulorum* Ferris	I	90
34.	*L. buzenensis* (Kuwana)	I	91
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35.	*A. crawii* (Cockerell)	I	95
36.	*A. kashicola* (Takahashi)	I	95
	= *Lepidosaphes kashicola* Takahashi		
37.	*A. naracola* Takagi	I	96
IX.	*Acanthomytilus* Borchsenius	I	98
38.	*A. imperatae* (Kuwana)	I	98
39.	*A. miscanthi* Takahashi	I	98
X.	*Pallulaspis* Ferris	I	100
40.	*P. quercus* Takahashi	I	100
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41.	*K. hikosani* (Kuwana)	II	5
42.	*K. pseudoleucaspis* (Kuwana)	II	5
43.	*K. takahashii* Takagi	II	5
XII.	*Nikkoaspis* Kuwana	II	7
44.	*N. shiranensis* Kuwana	II	8
XIII.	*Unachionaspis* MacGillivray	II	8
45.	*U. signata* (Maskell)	II	10
	= *Chionaspis colemani* Kuwana		
46.	*U. bambusae* (Cockerell)	II	11
	= *Chionaspis bambusae* Cockerell		
47.	*U. tenuis* (Maskell)	II	13
XIV.	*Unaspis* MacGillivray	II	14
48.	*U. yanonensis* (Kuwana)	II	14
49.	*U. turpiniae* Takahashi	II	14
50.	*U. euonymi* (Comstock)	II	16
51.	*U. aesculi* Takahashi	II	16
XV.	*Duplachionaspis* MacGillivray	II	16
52.	*D. miscantheae* (Kuwana)	II	17
XVI.	*Greenaspis* MacGillivray		
53.	*G. yunnanensis* Ferris	II	18
XVII.	*Phenacaspis* Cooley et Cockerell	II	20
54.	*P. saitamaensis* Kuwana	II	20
55.	*P. alnus* (Kuwana)	II	24
	= *Chionaspis alnicola* Lindinger		

	Part of paper	page
56. *P. enkianthi* (Takahashi)	II	24
57. *P. wistariae* (Cooley)	II	24
=*P. fujicola* Kuwana		
58. *P. linderae* Takahashi	II	26
59. *P. momi* Kuwana	II	28
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61. *P. celtis* (Kuwana)	II	28
62. *P. kuwanai* (Takahashi)	II	29
=*Chionaspis quercus* Kuwana		
63. *P. kiushiuensis* (Kuwana)	II	29
64. *P. cockerelli* (Cooley)	II	29
=*Chionaspis miyakoensis* Kuwana		
=*Chionaspis akebiae* Takahashi		
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66. *F. fioriniae* (Targioni)	II	35
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68. *F. pinicola* Maskell	II	36
69. *F. vacciniae* Kuwana	II	36
=*F. cephalotaxi* Takahashi		
70. *F. theae* Green	II	37
71. *F. euryae* Kuwana	II	37
72. *F. horii* Kuwana	II	39
73. *F. nachiensis* Takahashi	II	40
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74. *M. kuzunoi* (Kuwana et Muramatsu)	III	70
=*Aulacaspis kuzunoi* Kuwana et Muramatsu		
75. *M. wakayamaensis* (Kuwana)	III	71
=*Aulacaspis wakayamaensis* Kuwana		
XX. *Pinnaspis* Cockerell	III	71
76. *P. aspidistrae* (Signoret)	III	71
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77. *P. strachani* (Cooley)	III	71
78. *P. boehmeriae* Takahashi	III	72
79. *P. chamaecyparidis* Takagi	III	72
80. *P. juniperi* Takahashi	III	73
81. *P. hikosana* Takagi	III	73
82. *P. uniloba* (Kuwana)	III	74
XXI. *Aulacaspis* Cockerell	III	75
83. *A. amamiana* Takagi	III	76
84. *A. yabunikkei* Kuwana	III	77
85. *A. latissima* (Cockerell)	III	78
86. *A. distylii* Takahashi	III	79
87. *A. rosae* (Bouché)	III	79
88. *A. ericacearum* Takagi	III	79
89. *A. spinosa* Maskell	III	81
90. *A. difficilis* (Cockerell)	III	81
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92. *A. trifolium* Takagi	III	85
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93. *P. pentagona* (Targioni)	III	88
94. *P. biformis* Takagi	III	88
95. *P. simplex* Takagi	III	90
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CORRECTIONS

Part I, p. 78. line 2 from top, for 'submarginal' read 'submedian'.

Fig. 24 (Part II, p. 25). Although in the figure the mesal one of the two marginal macroducts of the sixth abdominal segment is drawn in the inner lobule of the third lobe, it is, in reality, opened in a small pointed prominence just mesad of the third lobe.