

**APHIDS OF JAVA. PART I: INTRODUCTION, FIVE NEW SPECIES OF  
TAIWANAPHIS TAKAHASHI, 1934, WITH RE-DESCRIPTION OF THE  
GENUS (HOMOPTERA: APHIDIDAE)**

by

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and

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A re-description is given of *Taiwanaphis* including *Sensoriaphis* Cottier, 1953 and *Paracallipterus* Raychaudhuri & A. K. Ghosh, 1964. The following new species are described: *Taiwanaphis atrovirens* spec. nov., presumably from *Syzygium* spec.; *Taiwanaphis atuberculata* spec. nov., from *Syzygium lineatum* (DC.) Merr. & Perry; *Taiwanaphis memecyloni* spec. nov., from *Memecylon laevigatum* Bl. and *M. myrsinoides* Bl.; *Taiwanaphis montanicola* spec. nov., from *Syzygium racemosum* (Bl.) DC., and *Taiwanaphis pseudocaudata* spec. nov., from *Syzygium syzygioides* (Miq.) Amsh. Keys are given to the alatae viviparae and their last larval stages of these species.

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D. Hille Ris Lambers died whilst preparing the manuscript of this publication, on 8-iv-1984.

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## INTRODUCTION

In Java, in about 1950, Ir. F. W. Rappard (The Hague, The Netherlands, formerly forester in Java) collected a large number of aphids in alcohol which, together with notes on colour in life etc., were sent to the second author, whose intention it was to publish a monograph on aphids of Java. This would have been the second in the series after the one written by Van der Goot (1917). The second author was, unfortunately, compelled to abandon these plans because at the time he was not quite certain how to separate some of the genera into species.

The first author also collected aphids in the period between 1975 and 1978 and photographed them alive during different seasons. This made it possible to clearly prove the existence of a variability in size, colour, length of antennae and horns, and the presence or absence of wax glands depending on the age of a colony of aphids.

Van der Goot was at first unaware of the existence of this polymorphism; later, he apparently became aware of it, and we must conclude that this is why he never published, as he was planning (Van der Goot 1917, p. 296), a sequel to his "Aphids of Java", even though he continued to collect many aphids until at least 1921. He later handed what was left of his collection to Dr. C. J. H. Franssen (Franssen, 1932). At present, most of this collection is located in the Laboratory of Entomology in Wageningen, The Netherlands, and some in the private collection of the second author. Van der Goot's slides all contained uncleared aphids which we have remounted.

We sorted out the mounted aphid specimens available to us and concluded that with the species mentioned in the literature, there are about 180 species that have been collected in Java. Of these, 47 are new to science, and in the following pages five of them are described. In future publications the first author is planning to report on all Javan aphids, also adding notes taken from a manuscript left by Van der Goot which is now in tenure of the first author.

Plants, if not properly labelled, were identified by the first author with the help of Mr. M. Nedi (Herbarium Bogoriense) and the names used are adopted from C. A. Backer and R. C. Bakhuizen van den Brink, *Flora of Java*, Vols. I-III, 1963-1968, or from lists published by the Hortus Botanicus, Bogor, Cibodas and Purwodadi.

**Taiwanaphis** Takahashi, 1934

(including *Sensoriaphis* Cottier, 1953, and *Paracallipterus* Raychaudhuri & A. K. Ghosh, 1964)

## Re-description of the genus

Apterous viviparous female (fig. 1). — Colour in life: Body yellow, brown or olive green, legs and antennae sometimes darker. Body often appressed against the substrate.

Macerated specimens: Body length 1.2-2.8 mm. Head with frontal median processus bearing two hairs which are blunt, 3-8  $\mu$  long or capitate, 15-35 $\mu$  long; dorsolaterally near antennal bases a processus 5-30  $\mu$  high, each with one hair of the same type as that on the median processus; in some species these processes are absent. The processes more or less wrinkled. Posterior to each of the frontal hairs one more hair, and 4-9 interocular hairs, all small, blunt or capitate. Antennae with 4-6 segments, the body 1.9-3.3 times as long as the antennae, the processus terminalis 0.3-0.7 times as long as base of the segment; primary rhinaria non-ciliated, ciliated, or intermediate; secondary rhinaria normally absent. Antennal hairs blunt or capitate, on segment III, 3-15  $\mu$  long. Rostrum reaches mid- or hind coxae, stylets 300-650  $\mu$  long, ultimate rostral segment 50-120  $\mu$  long, without accessory hairs, 0.6-1.1 times the length of the second tarsal segment of the hind leg. Eyes compound, each with a considerable number of ommatidia, with a conspicuously separated triommatidium, darkly pigmented. The pale brown pigmentation of the head may continue to the pronotum with or without distinct paler border; pigmentation on the other segments of the body consists of segmentally arranged sclerites, sometimes interrupted in the middle, or of a number of sclerites on each segment; next to these, nine or less intersegmental rows of brown sclerites are present. The segmental sclerites are smooth or somewhat wrinkled or reticulated, the last abdominal segments sometimes with spinulae. Marginal processes which are normally scabrous or spinulose may be present on mesothorax, metathorax and abdominal segments I-IV and VI-VIII, they increase in size caudad and are often re-curved. Next to a lateral process on each side of VIII, one median process which may be split more or less in two separate processes may be present. If processes are lacking, the median process of VIII is the last to show any trace of them. Pleural dorsal hairs usually in single transverse rows, spinal ones may be irregularly arranged. Marginal hairs 1-5, on each side of each segment; the median process or each of the two median processes of VIII with one hair, blunt or capitate. Legs not very elongate, femora not particularly thickened, tibiae without a knee-cap. Tibiae, especially

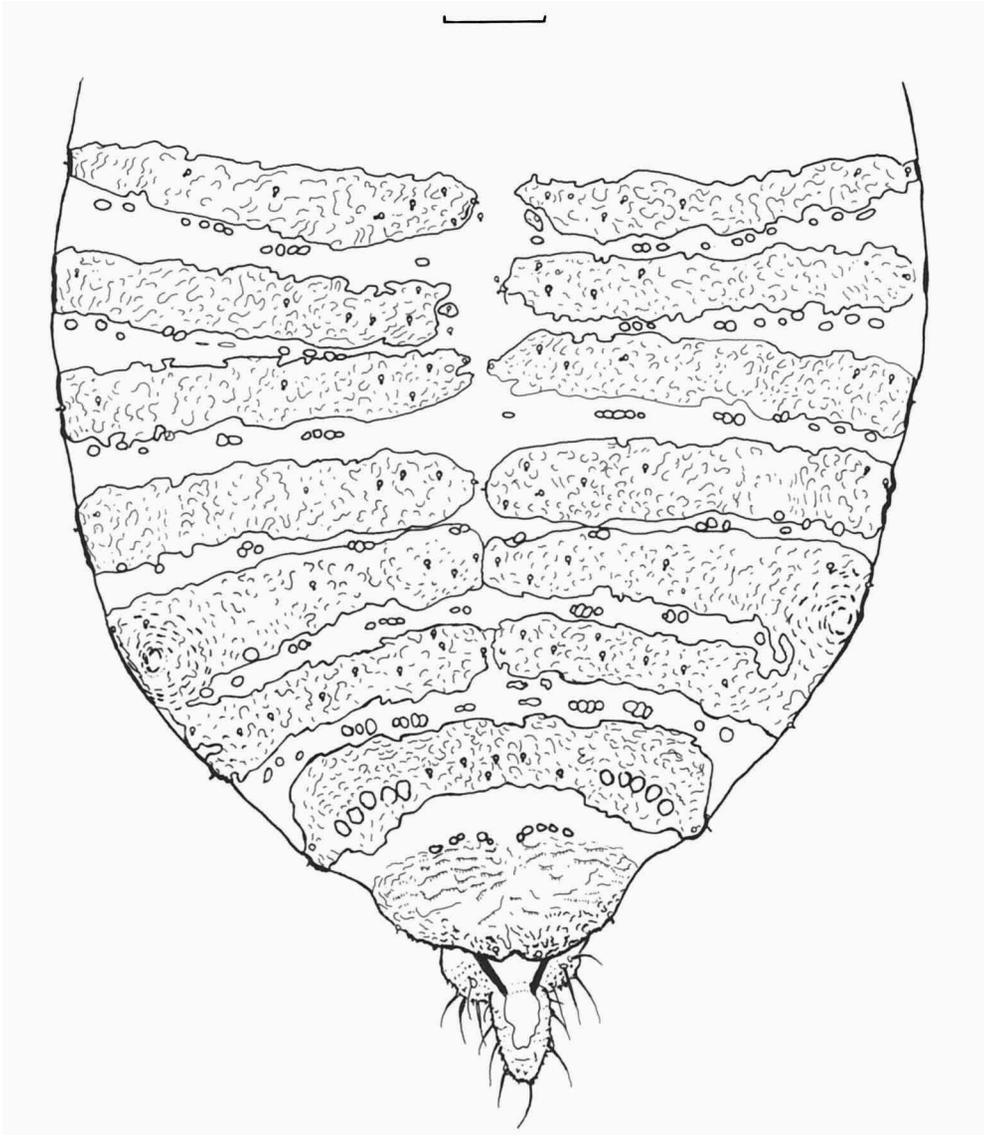


Fig. 1. *Taiwanaphis decaspermi* Takahashi, aptera vivipara, abdomen, dorsal side with siphunculi at the ventral side. The scale represents 0.1 mm.

hind tibiae apically with some spines between normal hairs. Abnormally, tibiae with some pseudosensoriae. First tarsal segments with 3-5 hairs ventrally, one of these distinctly shorter than the others. Second tarsal segment of the hind leg with one or two dorso-apical hairs apically dilated or blunt or acute; Second tarsal segments ventrally lacking very distinct rows of spinulae. Empo-

dial hairs strongly expanded, also in *T. kalipadi* (contrary to Raychaudhuri & A. K. Ghosh, 1964). Siphunculi cone-shaped, 2-8 times wider at base, with very wide rim, close to apex with rings which are sometimes interconnected, 2-5 hairs may be present. Cauda strongly knobbed, the knob globular to elongate with 5-12 hairs. Subanal plate deeply bilobed, each lobe with 5-9 hairs. Subgenital plate usually anteriorly with 4-8 hairs, posteriorly 4-14. Gonapophyses more or less distinct, four.

Alate viviparous female (fig. 2.) — Colour in life: Body yellow, orange, green or olive green, usually with margins of head, thorax and sometimes of abdomens, darker. Frequently, veins of forewing bordered with grey or black, or veins ending at margin in dusky dots.

Macerated specimens (in one species of the genus this morph is unknown): Body length 1.1-2.8 mm. Head with median frontal processus, and dorsolateral processes near antennal bases 3-15  $\mu$  high, indicated only by a few wrinkles or completely absent); dorsal hairs acute, the length of the median frontal hairs 3-35  $\mu$ . Antennae with six segments, the body 1.1-2.3 times as long as the antennae, the processus terminalis 0.3-1.4 times as long as base of the segment. Antennae brown to black, or antennal segments I-III darker than at least the base of the distal segments. Primary rhinaria on antennal segments V and VI ciliated; antennal segment III at ventral, and sometimes also lateral and medial sides, with 7-57 non-ciliated, transversely elliptic rhinaria distributed over the whole length, segments IV and V without secondary rhinaria; segments III-VI heavily imbricated, almost without spinulae. Antennal hairs acute, length on segment III 5-18  $\mu$ . Rostrum as in apterae. Triommatidium distinctly fused with the eyes. Wing veins brown, bordered with brown or only triangular dots at the end of the veins at margin; the curvature of the radial sector varies with species, as does the distance of the radial sector to the median; the median is branched twice. Pterostigma, especially along the posterior margin, black; hind wing not much reduced in size, with two obliques. Legs evenly pale brown, brown or black, but sometimes tibia I brown and especially tibia II paler. Femora I not distinctly thicker than II and III; femora spinosely imbricated, especially ventrally and dorso-apically. Tibiae, in exceptional cases with basal part smooth, usually with imbrications which are mainly conspicuous by the presence of 1-3 spinulae; these spinulae increase in size and are densely distributed towards the apex; larger spinulae 8-12  $\mu$  long; in exceptional cases, two hairs at apex of tibiae are dagger-shaped. First tarsal segments without dorsal hairs; ventral hairs 3-5, and one hair always much shorter than the others. Second tarsal segments imbricated with a few or more small to large spinules on plantar surface; empodial hairs strongly expanded. On pronotum, a low processus in each anterolateral corner, each with two hairs, 4-7

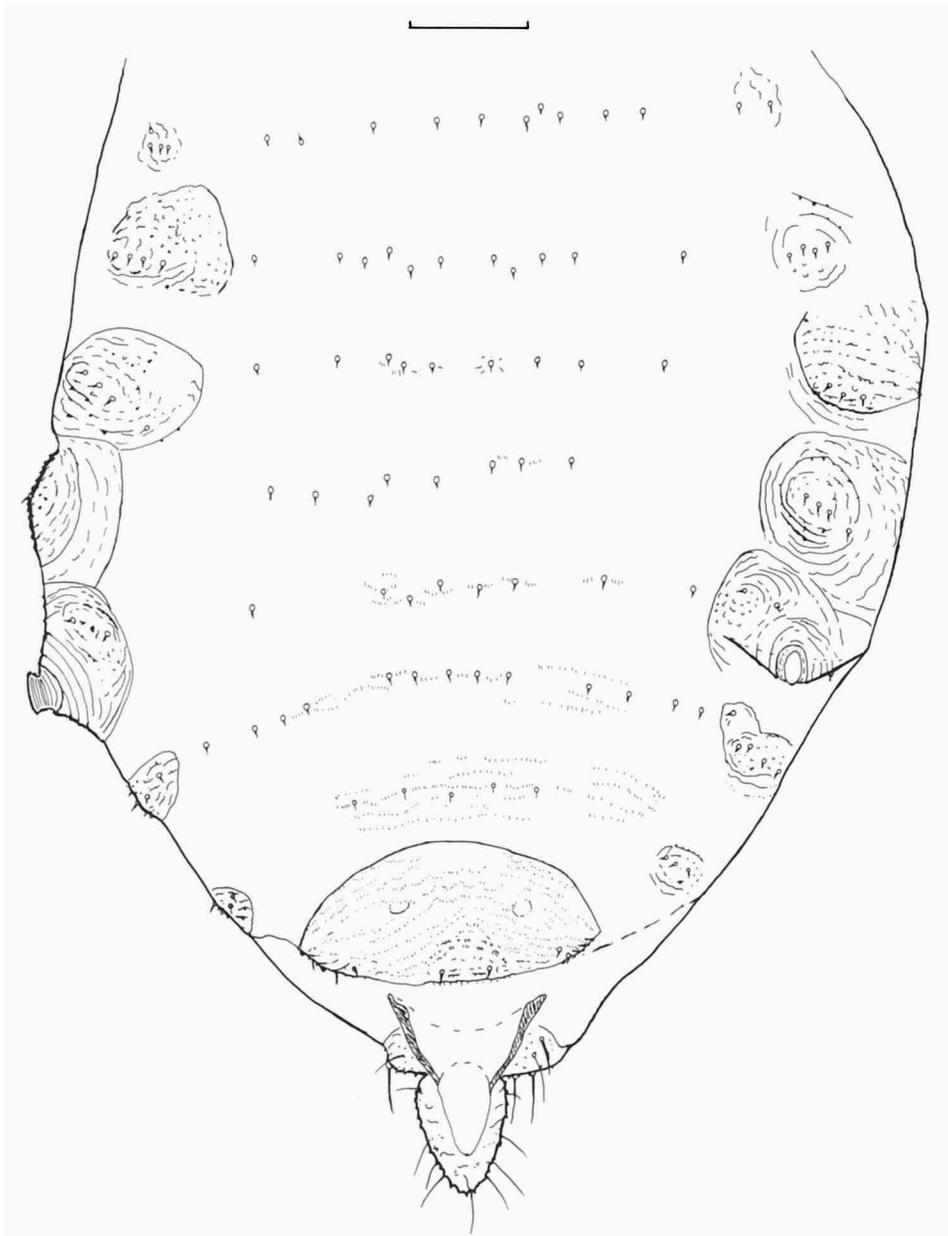


Fig. 2. *Taiwanaphis decaspermi* Takahashi, alata vivipara, abdomen, dorsal side. The scale represents 0.1 mm.

marginal hairs, two anterior spinal hairs, and 2-6 posterior spinal hairs can frequently be observed. On all abdominal segments, marginally a pale or brown spinulose area which continues to the ventral side, flat and spinulose, but to the dorsal side raised to a greater or lesser extent, spinulose or rugose, most strongly developed on segments III, IV, VII or caudospinally on VIII, but always lacking on V; the length of the processes or tubercles varies from 5-180  $\mu$ ; anteromedial to these processes a second processus is usually present, frequently more rugose and less spinulose than the other processes, being present also on V (on the siphunculi), but lacking on VII and VIII; the second processes are 3-35  $\mu$  high and about 50 to more than 100  $\mu$  wide, with usually one or sometimes two hairs; the other processes with usually four, but sometimes more hairs; lateral processes usually with three hairs, the spinal always with one on each top, or one only if one spinal top is present. Cauda as in apterae, with 7-13 hairs. Subanal plate as in apterae. Subgenital plate with anteriorly 2-13 hairs, posteriorly 3-13. Gonapophyses four, the outer each usually with 2-4 hairs, inner usually with one.

Discussion. — Dr. M. Carver, in a letter to D. Hille Ris Lambers, suggested the close relationship of *Sensoriaphis* to *Taiwanaphis*; the latter was not convinced then that the two genera could be united. However, the discovery of the five species described in the following pages suggests that the absence of marginal abdominal processes in the type species of *Taiwanaphis* is not sufficient to keep the two genera apart. Consequently, we consider *Sensoriaphis* Cottier, 1953, type species *Sensoriaphis nothofagi* Cottier, 1953 a junior synonym of *Taiwanaphis* Takahashi, 1934, type species *Taiwanaphis decaspermi* Takahashi, 1934. From the description and figures, *Paracallipterus* of Raychaudhuri and A. K. Ghosh, 1964, type species *Paracallipterus kalipadi* Raychaudhuri and A. K. Ghosh, 1964, it would seem that this genus also is a junior synonym of *Taiwanaphis*. Unfortunately, there are no further records of *T. kalipadi* which is regrettable because the host plant *Annona squamosa* L. mentioned by the authors is, according to edition 8 of J. C. Willis "A Dictionary of flowering plants and ferns", assumed to be native to tropical America.

## KEYS

### KEY TO THE ALATAE VIVIPARAE OF *TAIWANAPHIS* SPECIES

1. Antennal segment III, 1.4-1.5 times as long as IV, and 1.4-1.9 times as long as V, with 11-14 rhinaria. Larvae with lateral tubercles on abdominal segments VI, VII, VIII, and with two tubercles on the middle of VIII (fig.

- 8). — On *Memecylon laevigatum* Bl. and *M. myrsinoides* Bl. ....  
 ..... *Taiwanaphis memecyloni* spec. nov.
- Antennal segment III, 1.8-3.2 times as long as IV, and 2.0-3.4 times as long as V, with 18-39 rhinaria. Larval tubercles on abdominal segments not like above ..... 2
2. Antennal segment III, 2.1-2.8 times as long as the processus terminalis. Processus terminalis 1.2-1.4 times as long as base of the segment. Larvae with a cauda-like processus on abdominal tergite VIII, other processes small or absent (fig. 13). — On *Syzygium syzygioides* (Miq.) Amsh. ....  
 ..... *Taiwanaphis pseudocaudata* spec. nov.
- Antennal segment III, 3.1-5.8 times as long as the processus terminalis. Processus terminalis 0.48-1.1 times as long as the base of the segment. Abdominal processes of the larvae not like above ..... 3
3. Body 2.0-2.1 times as long as the antennae. Head across eyes 0.49-0.51 times as long as the antennae. Adults and larvae without distinct lateral processes (fig. 6). — On *Syzygium lineatum* (DC.) Merr. & Perry .....  
 ..... *Taiwanaphis atuberculata* spec. nov.
- Body 1.2-1.5 times as long as the antennae. Head across eyes 0.29-0.40 times as long as the antennae. Adults and larvae with lateral processes ... 4
4. Processus terminalis 0.53-0.69 times as long as the base of the segment. Antennal segment III, 4.1-5.2 times as long as the processus terminalis. Abdominal tergite VIII with a processus with a median incision. Head dorsally with small tubercles on the medial side of the base of the antennae. Larvae with lateral tubercles on abdominal segments II-IV and VI-VIII (fig. 10). — On *Syzygium racemosum* (Bl.) DC. ....  
 ..... *Taiwanaphis montanicola* spec. nov.
- Processus terminalis 0.8-1.1 times as long as the base of the segment. Antennal segment III, 3.1-3.8 times as long as the processus terminalis. Abdominal tergite VIII with a processus but without a median incision. Head without dorsal tubercles. Larvae with lateral tubercles on abdominal segments VI-VIII, but these are lacking on segments II-IV (fig. 4). — Presumably on *Syzygium* sp. ....  
 ..... *Taiwanaphis atrovirens* spec. nov.

KEY TO THE LAST INSTAR OF LARVAE OF ALATAE VIVIPARAE OF *TAIWANAPHIS* SPECIES

1. Abdomen without lateral or cauda-like processes, at most with minute lumps on segments VI, VII and VIII (fig. 6). In life, yellowish orange, usually found on the midrib of youngest leaf, upper or lower side. — On *Syzygium lineatum* (DC.) Merr. & Perry .....  
 ..... *Taiwanaphis atuberculata* spec. nov.

- Abdomen with a cauda-like processus or with several lateral processes ....2
2. Abdomen next to one cauda-like processus with minute lateral lumps on segments VI to VIII only (fig. 13). In life as *T. atuberculata*. — On *Syzygium syzygioides* (Miq.) Amsh. .... *Taiwanaphis pseudocaudata* spec. nov.
- Abdomen with lateral processes on segments VI-VIII, and in one species also on segments II-IV ..... 3
3. Lateral processes on abdominal segments VI-VIII, and processes of the same type on segments II-IV and a smaller one on segment I (fig. 10). In life dirty brown, found on lower side of leaves. — On *Syzygium racemosum* (Bl.) DC. .... *Taiwanaphis montanicola* spec. nov.
- On abdominal segments II-IV no processes of the type present on segments VI-VIII ..... 4
4. On abdominal segment VIII, two conical processes with many small scales (fig. 8). In life yellowish, found on petiole and midrib of upper side of young developing leaves. — On *Memecylon laevigatum* Bl. and *M. myrsinoides* Bl. .... *Taiwanaphis memecyloni* spec. nov.
- On abdominal segment VIII, one processus with almost parallel sides, split only halfway in two broadly rounded ends (fig. 4). In life, abdomen greenish black with yellowish white margins, found on upper and lower sides of leaves and stem of developing sprouts. — On *Syzygium* sp. (presumably) ..... *Taiwanaphis atrovirens* spec. nov.

## SPECIES ACCOUNTS

***Taiwanaphis atrovirens* spec. nov.**

(figs. 3, 4)

Types. — Holotype: ♀ (alata vivipara) presumably from *Syzygium* sp., Bogor (Kebun Raya), Java, no. 793-2-1, 31.x.1976, leg. D. Noordam. Paratypes: 26 alatae viviparae, 24 larvae of alatae of viviparae of fourth instar, same locality and host plant as holotype, no. 503, 23.ii.1976, no. 793, 31.x.1976, no. 835, 23.xii.1976, leg. D. Noordam. Holotype and paratypes in the collection of the Rijksmuseum van Natuurlijke Historie, Leiden.

Alate viviparous female (fig. 3). — Colour in life: Mesothorax and central part of abdomen dark green; abdominal margins of segments III to VIII yellowish or brownish. Head and prothorax yellowish or brownish. Siphunculi brownish grey, cauda grey. Legs pale brown. Eyes red, triommatidium darker. Antennal segment I, colour as head or darker, II en III almost black, distal part of antennae paler, grey. Pterostigma brownish grey. Veins of forewing bordered with brownish grey.

Macerated specimens (described from 27 specimens): Body length 1.20-1.47 mm. Head across eyes 300-390  $\mu$  wide, some brown colour around me-

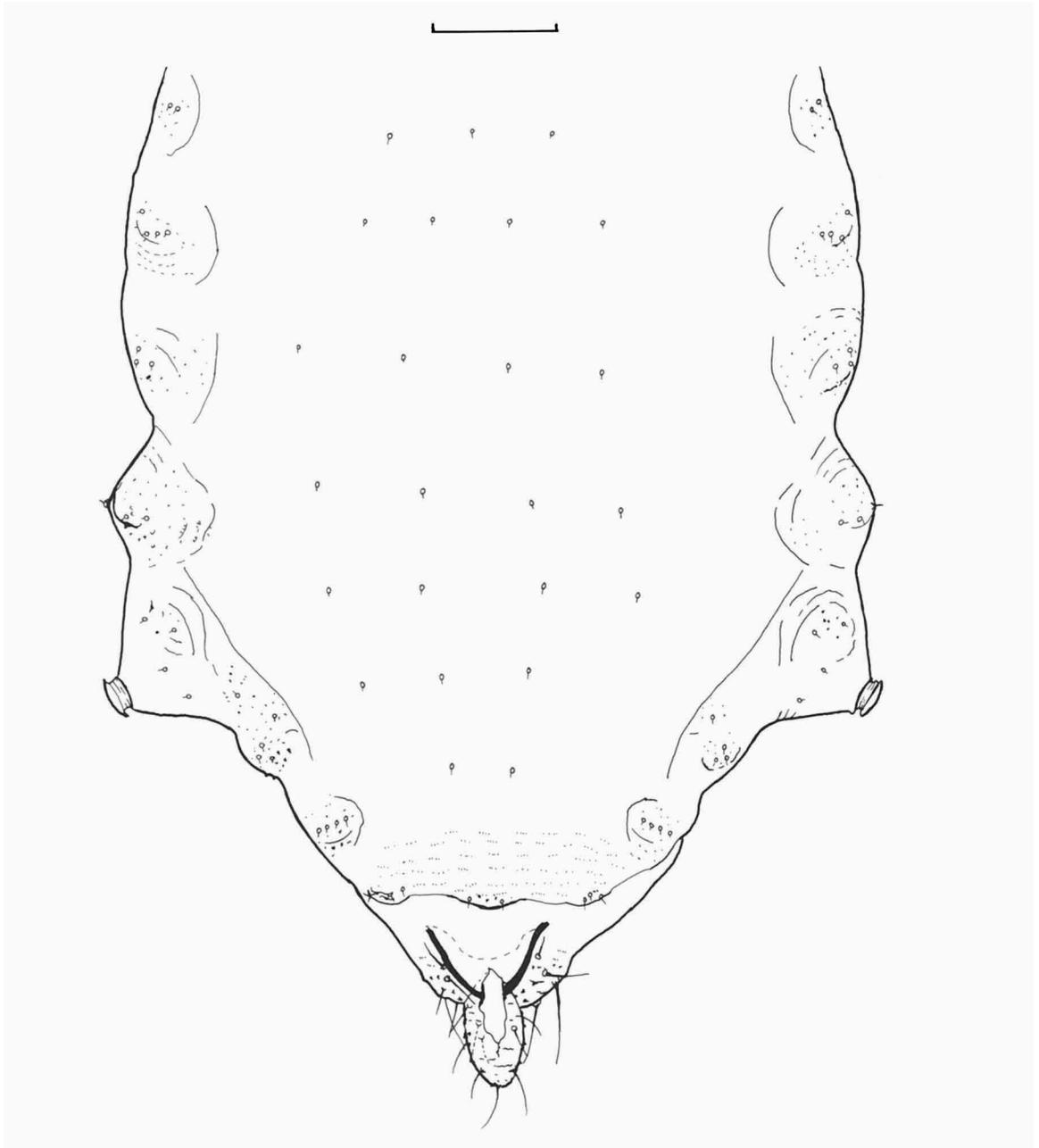


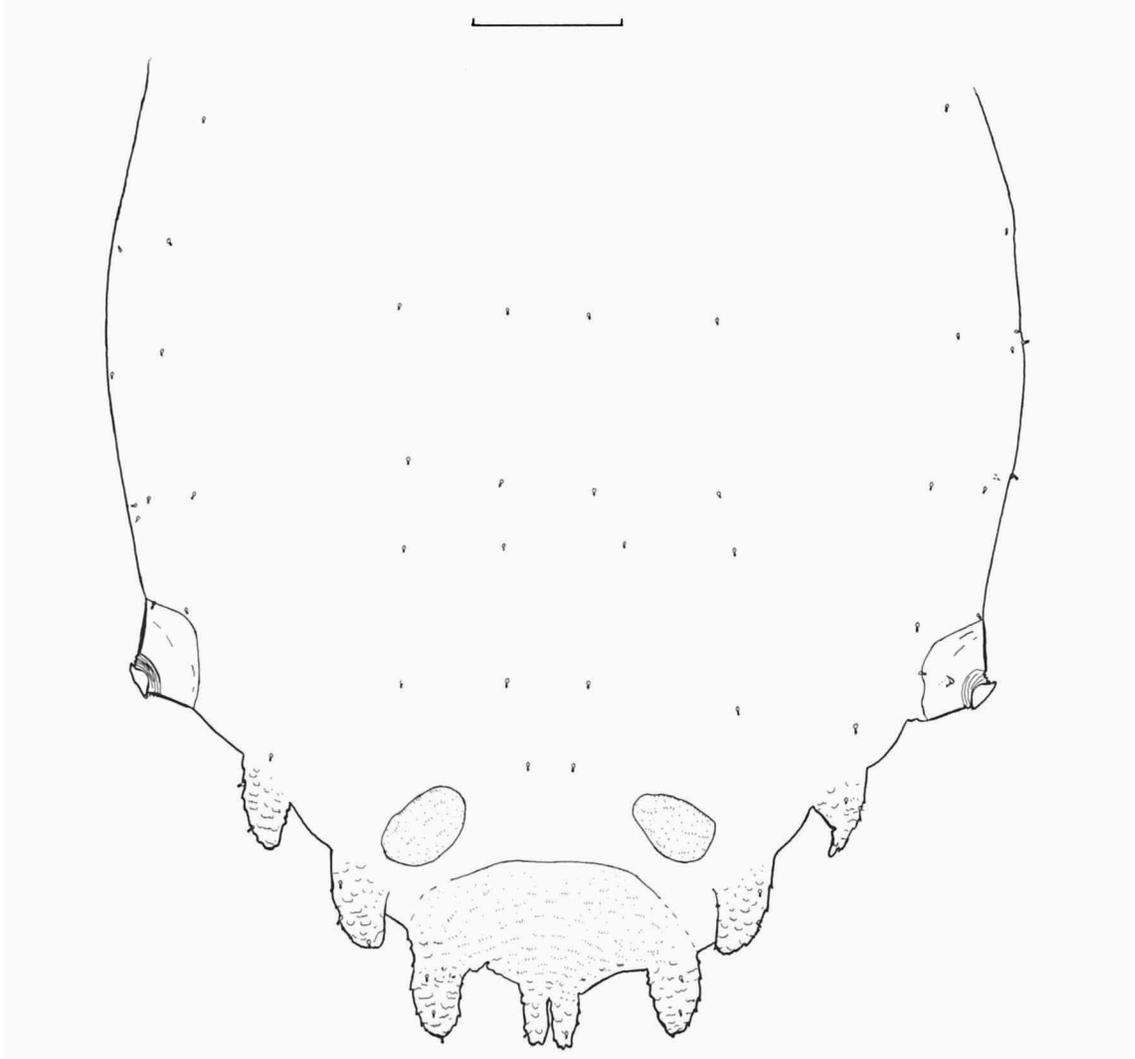
Fig. 3. *Taiwanaphis atrovirens* spec. nov., alata vivipara, abdomen, dorsal side. The scale represents 0.1 mm.

dian ocellus, but more around lateral ocelli and bases of antennae, rest of head colourless; two frontal tubercles indicated only by some wrinkles, and each with one acute hair 5-6  $\mu$  long; dorsally, near antennal bases a tubercle indicated by a brown sclerotic rim and some wrinkles, each with one hair; rest of head smooth, one or two hairs posterior to the frontal tubercles, and four interocular hairs; head, ventrally, with six hairs: two hairs similar to and posterior to the frontal hairs, one at each side of the median ocellus and one at each side more posterior and lateral, 7-10  $\mu$  long, slightly longer than the dorsal hairs. Antennae six-segmented, 0.86-1.03 mm long; body 1.2-1.5, and head across eyes 0.34-0.40 times as long as the antennae; primary rhinaria on antennal segments V and VI ciliated; III at ventral, lateral and medial sides with 18-34 non-ciliated transversely narrowly elliptic rhinaria, distributed over whole length; antennal segments I-III dark brown, IV-VI brown, but processus terminalis paler. Antennal segments III-VI heavily imbricated, I-II finer and, especially I, also with spinulae. Antennal hairs acute, on III, 5-8  $\mu$  long. Length of III 295-403  $\mu$ , of IV 120-167  $\mu$ , of V 110-148  $\mu$ , base of VI 101-125  $\mu$ , and processus terminalis 96-116  $\mu$ . The processus terminalis is 0.84-1.15 times as long as the base of the segment; antennal segment III, 3.1-3.8 times as long as the processus terminalis, 2.5-3.4 times as long as V, and 2.1-2.9 times as long as IV. Rostrum reaches as far as hind-coxae, stylets are 300-350  $\mu$  long; ultimate rostral segment 55-61  $\mu$  long, colourless with brown tip, without accessory hairs, 0.80-0.94 times the length of second tarsal segment of the hind leg; longest hairs 17-23  $\mu$  long. Eyes compound, colourless, triommatidia brown. Prothoracic margins brown, the rest almost colourless; marginal sclerite somewhat wrinkled, anteriorly with a tubercle about 12-15  $\mu$  high, with 4-8 hairs, one or two of which on the tubercle; pronotum spinally with 3-7 hairs, two of which usually anteriorly, all 4-7  $\mu$  long. Mesothorax pale brown, smooth, marginal sclerite with 5-9 hairs, 5-10  $\mu$  long; pleural spinal sclerite with 7-20 hairs, 5-7  $\mu$  long. Fore wing median vein branched twice, hind wing with two oblique veins. Legs pale brown, the basal half of fore and hind leg usually darker; femora spinosely imbricated especially ventrally; imbrications on tibiae mainly on distal half, each imbrication with 1-3 spines, distally the spines increase in size and are always single and densely distributed, up to 12  $\mu$  long; first tarsal segments of legs I and II with five or sometimes four hairs, of hind leg always with four hairs, one of which is about half as long as the others; second tarsal segments imbricated, and with about ten spinulae on the ventral side; empodial hairs expanded, about 17  $\mu$  long. Length of hind leg segments: femur 255-330  $\mu$ , tibia 455-610  $\mu$ , first tarsal segment 24-27  $\mu$ , second 65-68  $\mu$ . Abdominal marginal sclerites pale brown or almost colourless, I 0-2  $\mu$  high, a spinulose plate, II raised 3-15  $\mu$ , III 8-23  $\mu$ , IV 25-43  $\mu$  and about

120  $\mu$  wide at base, VI raised 10-20  $\mu$  with at the anterior medial side a second tubercle raised about 8  $\mu$ , VII raised 5-15  $\mu$ ; sclerite I with 2-3 hairs, II-IV with 3-4, VI with 3-4 hairs, one or two of which on the second anterior tubercle, VII with 3-4 hairs, all acute, 5-8  $\mu$  long; submarginal hairs absent; pleurospinal dorsum colourless, I-V with four hairs or sometimes one or, in exceptional cases, two more, VI with 3-4, VII with 1-3, acute and on IV 5-8  $\mu$  long. Abdominal tergite VIII spinosely imbricated with, on posterior margin, three more coarsely imbricated pale brown patches, the middle patch with two hairs, the lateral each with 3-4 or sometimes two or five hairs, acute, 7-10  $\mu$  long. Ventral abdominal hairs acute, on segment IV 15-20  $\mu$  long. Stigmal plates pale brown or colourless. Siphunculi on segment V cone-shaped, brown, anteriorly with a spinulose patch (similar to sclerites of other segments) with two hairs, rest of siphunculi smooth with one or two hairs; flange of siphunculi with about ten concentric rings; basal diameter of siphunculus 100-160  $\mu$ , diameter of flange 30-33  $\mu$ , smallest diameter below flange about 20  $\mu$ . Cauda constricted, the knob 1.5-2.4 times as long as wide, pale brown, spinosely imbricated except for 3/4 of the dorsal basal part which is smooth and colourless. Knob with 9-11 hairs. Length of cauda 106-146  $\mu$ , the knob 68-96  $\mu$ , longest hairs 40-45  $\mu$ , the shortest 23-32  $\mu$ . Subanal plate brown, spinosely imbricated, indented to form two well-defined lobes, each lobe with 5-6 hairs, the longest 43-55  $\mu$ , the shortest 28-42  $\mu$ . Subgenital plate colourless with 2-10 anterior hairs and 7-13 posterior hairs; longest hairs 18-20  $\mu$ , shortest 13-15  $\mu$ . Gonapophyses usually four, the inner each with one, the outer with 2-3 hairs, longest hairs 13-18  $\mu$ , shortest 10-13  $\mu$ .

Larva of alate viviparous female, fourth instar (fig. 4). — Colour in life: Yellowish white, margins of body the same but central part of body greenish black.

Macerated specimens (described from 24 specimens): Body length 0.96-1.39 mm. Head across eyes 330-360  $\mu$  wide, almost colourless; two frontal tubercles or one divided by a suture in two halves, about 8  $\mu$  high, 20  $\mu$  diameter, wrinkled and each with one hair, blunt, slightly wider at top than at base, 3-5  $\mu$  long; dorsally, near antennal bases with a tubercle similar to the frontal tubercles, with one hair; rest of head, dorsally almost smooth with two hairs posterior to the frontal tubercle and four interocular hairs; all as the hairs on frontal tubercles; ventrally, usually three pairs of hairs, the anterior pair just posterior to the frontal hairs, similar to them and only slightly longer, the second pair posterior to the first, longer and sometimes acute; posterior to these the third pair, more laterally placed, acute, 8-12  $\mu$  long. Antennae three-segmented, 540-660  $\mu$  long, the body 1.6-2.4, the head across eyes 0.53-0.65 times as long as the antennae; antennal segment III, 5.2-6.2 times the length of the



Figs. 4. *Taiwanaphis atrovirens* spec. nov., alata vivipara fourth (last) instar larva, abdomen, dorsal side. The scale represents 0.1 mm.

processus terminalis; primary rhinaria non-ciliated; antennae imbricated, pale brown, hairs on basal half of III, blunt, 4-5  $\mu$  long. Ultimate rostral segment 52-57  $\mu$  long, 0.73-0.84 times the length of the second tarsal segment of the hind leg, longest hairs 13-17  $\mu$  long, without accessory hairs; stylets 315-350  $\mu$  long. Eyes compound, colourless, with a brown triommatidium. Prothorax colourless, marginal sclerites wrinkled, without tubercles, with 3-5

hairs which as all marginal and dorsal hairs are blunt, slightly wider at tip than at base, spinal hairs 2-5; mesothorax, metathorax and abdominal segments I-IV marginally and spinally colourless, at most indistinctly wrinkled, without spinulae; mesothorax with three marginal hairs on each side and 4-11 spinal hairs; metathorax with three marginal hairs on each side and 4-5 spinal hairs. Legs pale brown, the tarsi slightly darker. Femora imbricated dorsoapically, and of leg I also ventrally. Tibiae of legs I and II dorsally faintly imbricated, distally mainly with spinulae, basal half of hind leg tibiae dorsally with imbrications, distal half ventrally with some spinulae up to 3  $\mu$  long. Dorsal hairs of femora and tibiae may be blunt or acute, all ventral hairs acute and about 6-18  $\mu$  long, tibiae of hind leg distally at dorsal side with six enlarged hairs up to 50  $\mu$  long. First tarsal segments of the legs I and II with four or five hairs, of hind leg with four hairs, in exceptional cases with three or five; one central hair shorter than the others. Second tarsal segments of the legs I and II with smooth imbrications and normal hairs, of hind leg imbrications less distinct and dorsally with six enlarged acute hairs, 30-45  $\mu$  long; empodial hairs expanded, about 15-18  $\mu$  long. Length of hind leg segments: femur 210-255  $\mu$ , tibia 315-370  $\mu$ , first tarsal segment 24-29  $\mu$ , second 68-73  $\mu$ . Abdominal segment I on each side with 2-3 marginal hairs and 4-6 spinal hairs, abdominal segments II-IV with 3-4 marginal hairs on each side and 3-4 spinal hairs, 3  $\mu$  long; abdominal segment V colourless with pale brown siphunculi; on each side 3-5 hairs, one of which not on the siphunculi, and four spinal hairs; siphunculi cone-shaped somewhat wrinkled without spinulose patch, with flange and about ten concentric rings. Marginal tubercles on abdominal segments VI and VII nipple-shaped, slightly curved backwards, tapering, pale brown, ventrally and dorsally coarsely with more or less spinulose imbrications, bases dorsally slightly less imbricated; tubercle VI 35-50  $\mu$  long, with 3-5 hairs; tubercle VII 45-55  $\mu$  long, with 2-4 hairs. Abdominal tergite VIII on slightly rounded posterior margin with three tubercles. The lateral tubercles nipple-shaped, tapering but with a broader tip than in *T. memecyloni* spec.nov., pale brown, spinulosely imbricated, 50-65  $\mu$  long, with three hairs ventrally and at the tip. Spinal tubercle divided into two 10-20  $\mu$  above base, with almost parallel outer sides, each with one hair at tip, pale brown, spinulosely imbricated, length 35-45  $\mu$ ; length of hairs on abdominal VIII tubercles 5-8  $\mu$ . Ventral abdominal hairs acute, on segment IV 7-8  $\mu$  long. Pleurally, on sternite V, a colourless spinulose patch with 2-4 hairs. Thoracic and abdominal stigmal plates colourless. Cauda with 7-9 hairs, 18-22  $\mu$  long, subanal plate with 6-9 hairs, and genital plate posteriorly with 4-6, and anteriorly with 5-8 hairs, 8-15  $\mu$  long.

Alatae viviparae with larvae were the only morphs collected from upper

and lower side of new leaves and developing shoots of presumably *Syzygium* sp. by D. Noordam in three samples.

Etymology. — In reference to the blackish green colour the name *atrovirens* was selected.

***Taiwanaphis atuberculata* spec. nov.**

(figs. 5, 6)

Types. — Holotype: ♀ (alata vivipara) from *Syzygium lineatum* (DC.) Merr. & Perry, Bogor (Kebun Raya), Java, no. 777-1-2, 3.x.1976, leg. D. Noordam. Paratypes: 12 alatae viviparae and 19 larvae of alatae viviparae of fourth instar, same locality and host plant as holotype, no. 777. 3.x.1976, no. 972, 3.vii.1977, leg. D. Noordam; on unknown host plant, Daro, Java, 15.viii.1919, leg. V.d. Goot. Holotype and paratypes in the collection of the Rijksmuseum van Natuurlijke Historie, Leiden and paratypes, leg. V.d. Goot in the British Museum (Natural History), London, and in the Laboratorium voor Entomologie, Wageningen.

Alate viviparous female (fig. 5). — Colour in life: Head, thorax and abdomen orange, margins of thorax and abdomen, with segments I-V, grey. Antennal segment III black, IV, V and VI basal part of base white, distally black, processus terminalis grey. Legs, also leg I, yellowish. Eyes bright red, triommatidium darker. Pterostigma black, veins of forewing bordered with black. Cauda grey.

Macerated specimens (described from 13 specimens): Body length 1.53-1.63 mm. Head across eyes 370-390  $\mu$  wide; some brown colour mainly between lateral ocelli and bases of antennae, rest of head colourless. A frontal tubercle raised at most 5  $\mu$ , and is about 60  $\mu$  wide, with some wrinkles, two frontal hairs and, anteriorly, also bearing two ventral hairs; except for some wrinkles close to ocelli and antennal bases, head dorsally smooth, with two interocellar hairs posterior to the frontal hairs, 4-6 interocular hairs, and one hair at base of the antennae, all hairs acute, 6-8  $\mu$  long; head ventrally with eight hairs: one hair posterior to each frontal hair, one hair at each side of the median ocellus and two posterior to each antennal base, all acute, 12-15  $\mu$  long. Antennae six-segmented, 760-770  $\mu$  long; body 2.0-2.1, and head across eyes 0.49-0.51 times as long as the antennae; primary rhinaria on antennal segments V and VI ciliated; III at ventral, lateral and medial sides with 21-30 non-ciliated transversely narrowly elliptic rhinaria, distributed over whole length; I-III brown, IV-VI colourless except the distal ends of IV and V which are pale brown. Antennal segments I and II with spinulose imbrications; III narrowly ovate, widest basal diameter 1.5 times wider than distal diameter, imbrications extending to lateral and medial side about 1  $\mu$  and in the distal half of the segment frequently with one or two acute spinulae; IV-VI with

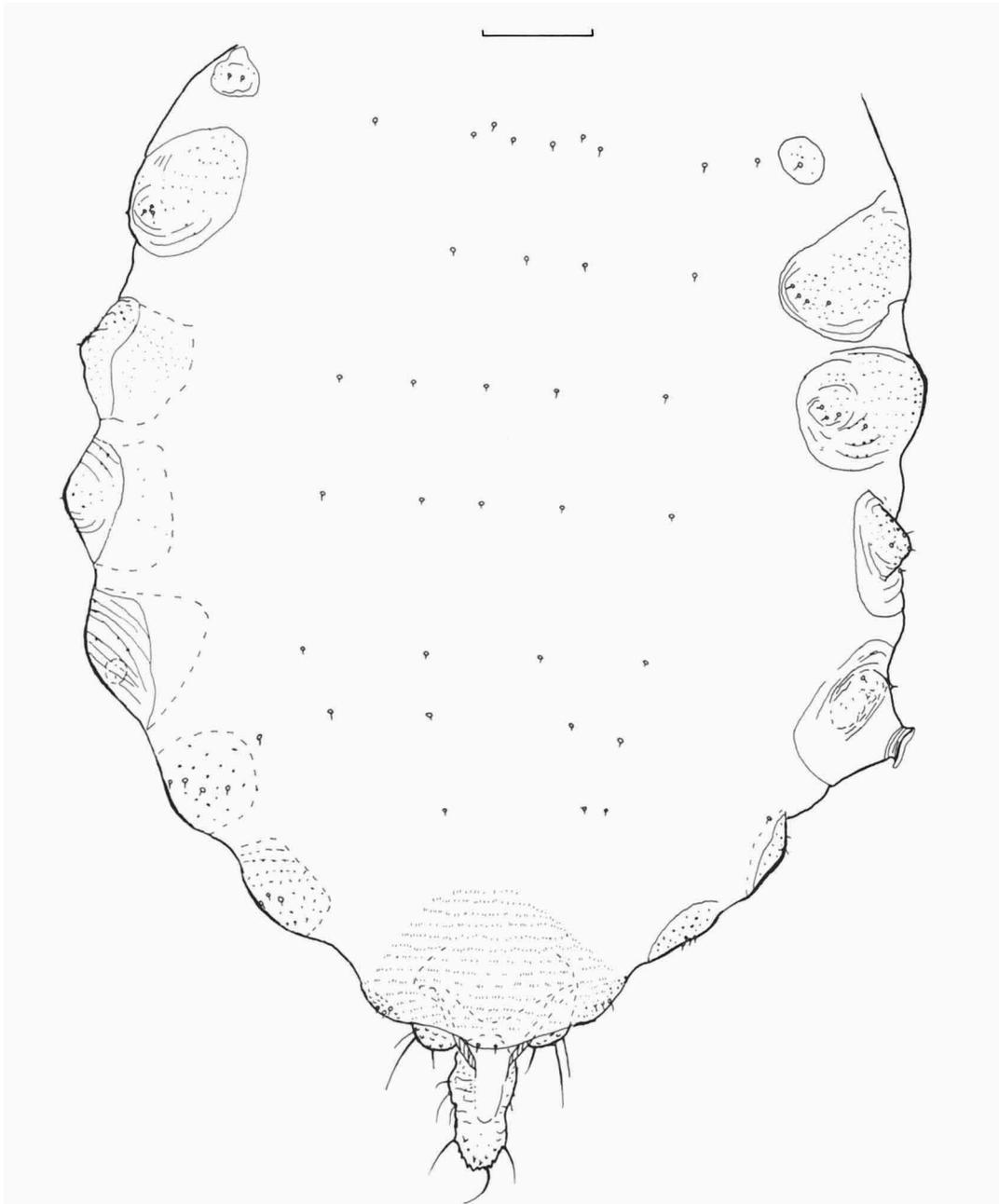


Fig. 5. *Taiwanaphis atuberculata* spec. nov., alata vivipara, abdomen, dorsal side. The scale represents 0.1 mm.

imbrications extending to lateral and medial sides, about half a  $\mu$ . Antennal hairs acute, on segment III, 6-10  $\mu$  long, Length of III 255-272  $\mu$ , of IV 123-143  $\mu$ , of V 125-130  $\mu$ , base of VI 92-96  $\mu$ , and processus terminalis 45-48  $\mu$ . The processus terminalis is 0.48-0.52 times as long as the base of the segment, III 5.3-5.8 times as long as the processus terminalis, 2.0-2.1 times as long as V, and 1.8-2.2 times as long as IV. Rostrum does not even reach mid-coxae, stylets are 305-340  $\mu$  long; ultimate rostral segment 55-58  $\mu$  long, colourless with brown tip, without accessory hairs, 0.75-0.84 times the length of second tarsal segment of the hind leg, longer hairs 17  $\mu$  long. Eyes compound, colourless, triommatidia brown. Prothoracic margins brown, the rest almost colourless; marginal sclerite somewhat wrinkled, anteriorly with a tubercle about 12  $\mu$  high, with 7-11 hairs, two of which on the tubercle; pronotum spinally with six hairs, two of which anteriorly, all about 7  $\mu$  long. Mesothorax pale brown, smooth, marginal sclerites with 8-14 hairs, 7-15  $\mu$  long; spinopleural sclerite with 13-28 hairs, 6-7  $\mu$  long. Forewing media branched twice, hind wing with two oblique veins. Legs evenly very pale brown: femora imbricated, ventrally more spinose; tibiae imbrications on distal half consisting mainly of spines which towards the distal end are distributed densely and increased in size, up to 10  $\mu$  long; first tarsal segments of legs I and II with three or four hairs, of hind leg always with three hairs, the middle about half the length of the others; second tarsal segments dorsally with distinct imbrications, ventrally imbrications and about 20 spinulae, one dorso-apical hair of legs I and II enlarged, of leg III all six dorsal hairs enlarged, the two dorsoapical hairs largest, 20-25  $\mu$  long; empodial hairs expanded, about 17  $\mu$  long. Length of hind leg segments: femur 280-295  $\mu$ , tibia 465-485  $\mu$ , tarsus I 30-32  $\mu$ , tarsus II 69-73  $\mu$ . Abdominal marginal sclerites very pale brown, spinulose, with almost flat tubercles, the largest on segment IV about 15  $\mu$  raised, 80  $\mu$  wide at its base; sclerite I with 1-3 hairs, II-IV with 3-4, VI with 2-4, and VII with 3-4, all acute, 3-7  $\mu$  long, submarginal hairs absent. Abdominal dorsum without sclerites, colourless, segment I with 5-8 spinopleural hairs, II-VI with 4-5 or six and VII with 3-4, all acute, on IV 6-7  $\mu$  long. Abdominal tergite VIII almost colourless, finely spinulose with three more coarsely spinulose patches, about 70  $\mu$  wide and 10  $\mu$  raised, the lateral each with 2-4, the middle with two hairs, 6-10  $\mu$  long. Ventral abdominal hairs acute, on segment IV 15-25  $\mu$  long. Stigmal plates colourless. Siphunculi on segment V cone-shaped, brown, anteriorly with a slightly raised spinulose patch (similar to the marginal abdominal sclerites) about 90  $\mu$  wide, with two or three hairs, rest of siphunculi smooth with 0-1 hair; flange of siphunculi with about ten concentric rings; basal diameter of siphunculus about 140  $\mu$ , of flange 30  $\mu$ . Cauda constricted, the knob 1.6-1.7 times as long as it is wide, pale brown, spinosely imbricated, except for 0.6 of

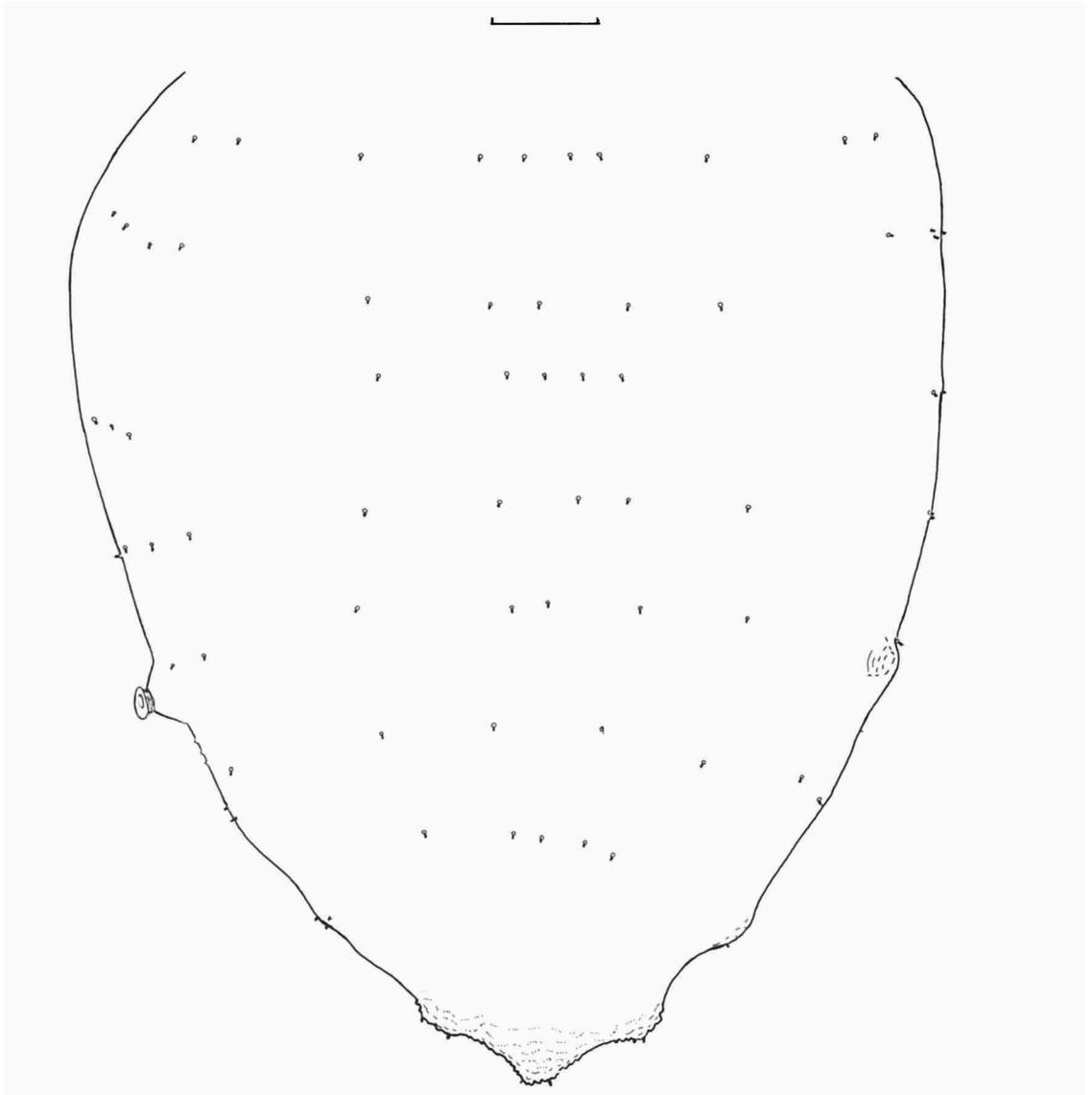


Fig. 6. *Taiwanaphis atuberculata* spec. nov., alata vivipara fourth (last) instar larva, abdomen, dorsal side. The scale represents 0.1 mm.

the dorsal basal part which is smooth and colourless. Knob with 9-10 hairs. Length of cauda 126-128  $\mu$ , of the knob 83-86  $\mu$ , longest hairs 42-47  $\mu$ , the shortest 22-27  $\mu$ . Subanal plate pale brown, spinosely imbricated, indented to form two well-defined lobes, each lobe with six hairs, the longest 48  $\mu$ , the

shortest 22-33  $\mu$ . Subgenital plate colourless with 2-9 anterior hairs and 8-11 posterior hairs; longest hairs 28-30  $\mu$ , shortest 12-15  $\mu$ . Gonapophyses four, the inner each with one hair, the outer with two hairs, longest hairs 15-20  $\mu$ , shortest 12  $\mu$ .

Larva of alate viviparous female, fourth instar (fig. 6). — Colour in life: Yellowish orange, slightly glossy, antennae and legs pale with darker tarsi.

Macerated specimens (described from 19 specimens): Body length 1.18-1.54 mm. Head across eyes 320-390  $\mu$  wide, almost colourless; one frontal tubercle 8-10  $\mu$  high and about 60  $\mu$  wide with wrinkles, interrupted by the median suture, and on each side of the suture with one blunt hair, 3-4  $\mu$  long; the frontal tubercle continues to the ventral side bearing two hairs; dorsally posterior to the frontal hairs, two hairs; anteriorly, near the antennal bases, one dorsal hair on a slightly wrinkled patch; all these hairs similar to the frontal hairs, but the two ventral hairs sometimes acute and longer; head ventrally with one hair, posterior to each of the two ventral frontal hairs, and lateral to the posterior part of the antennal base, two hairs on each side, ventral hairs acute, 8-13  $\mu$  long. Antennae three-segmented, 480-555  $\mu$  long, the body 2.4-2.8, the head across eyes 0.63-0.73 times as long as the antennae; antennal segment III, 8.6-10.2 times the length of the processus terminalis; primary rhinaria non-ciliated; antennae imbricated, II and basal part of III with some spinulae, almost colourless, hairs on basal half of III blunt, 3-5  $\mu$  long. Ultimate rostral segment 50-58  $\mu$  long, 0.70-0.79 times the length of the second tarsal segment of the hind leg, longest hairs 12-14  $\mu$  long, without accessory hairs; stylets 335-355  $\mu$  long. Eyes compound, colourless, each with a colourless triommatidium. Prothorax colourless, marginal sclerite wrinkled, without tubercles, with 5-6 hairs, which, like all marginal and dorsal hairs, are blunt, slightly wider at tip than at base, spinal hairs 3-4; mesothorax, metathorax and abdominal segments I-IV marginally and spinally colourless, without spinulae; mesothorax with three marginal hairs on each side and 5-14 spinal hairs; metathorax with three marginal hairs on each side and 4-8 spinal hairs. Legs very pale brown, the tarsi slightly darker. Femora, dorsoapically, with some imbrications and of leg I ventrally with some spinulae. Tibiae of legs I and II dorsally faintly imbricated, distally with some spinulae; tibiae of hind leg almost smooth with ventrally some spinulae, at most 3  $\mu$  long. Dorsal hairs of femora and tibiae blunt, ventral hairs blunt or acute, the acute hairs up to 13  $\mu$  long, tibiae of hind leg distally at dorsal side with enlarged hairs, up to 50  $\mu$  long. First tarsal segments of legs I and II each with 3-4 hairs, of hind leg with three; the central hair is 0.2-0.5 times the length of the other hairs. Second tarsal segment with smooth imbrications, one apical dorsal hair enlarged with slightly widened tip, blunt or capitate, 13-18  $\mu$  long; second tarsal seg-

ment of the hind leg with less distinct imbrications, dorsally with six enlarged hairs, which are acute and 40-50  $\mu$  long; empodial hairs expanded, about 15-18  $\mu$  long. Length of hind leg segments: femur 225-270  $\mu$ , tibia 305-365  $\mu$ , tarsus I 31-37  $\mu$ , tarsus II 71-78  $\mu$ . Abdominal segment I with 1-2 marginal hairs on each side and 5-6 spinal hairs, abdominal segments II-IV with 3-4 marginal hairs on each side and 5-7 spinal hairs, 3  $\mu$  long; abdominal segment V colourless, with 4-6 spinal hairs, siphunculi cone-shaped, somewhat wrinkled, without spinulose patch, anterior to the flange with about eight rings, almost colourless, each with 2-5 hairs, one or two of which are not on the siphunculi. Marginal tubercles on abdominal segments VI and VII absent, VI with 2-6 marginal and 5-10 spinal hairs, VII with 2-3 marginal and 2-6 spinal hairs. Abdominal tergite VIII colourless with coarsely imbricated posterior margin which has two lateral patches about 50  $\mu$  wide and 10  $\mu$  high, each with 2-4 hairs; the margin between these two patches about 125  $\mu$  wide, broadly rounded posteriorly, with two hairs; length of hairs on abdominal tergite VIII 4-10  $\mu$ . Ventral abdominal hairs acute, on segment IV 6-7  $\mu$  long. Pleurally, on sternite V, a colourless spinulose patch with 2-4 hairs sometimes discernable. Thoracic and abdominal stigmal plates colourless. Cauda with 7-9 hairs longest 25-30  $\mu$ , shortest 12-22  $\mu$  long, subanal plate with 6-9 hairs, the longest 27-35  $\mu$ , the shortest 10-25  $\mu$  long, and genital plate posteriorly with 2, anteriorly with 4-7 hairs, the longest 17-22  $\mu$ , the shortest 10-18  $\mu$  long.

Alatae viviparae with larvae were the only morphs collected from the upper and lower sides of new leaves and sometimes from developing shoots of *Syzygium lineatum* (DC.) Merr. & Perry by D. Noordam in two samples.

Etymology. — The specific name *atuberculata* refers to the absence of tubercles.

#### **Taiwanaphis memecyloni spec. nov.**

(figs. 7, 8)

Types. — Holotype: ♀ (alata vivipara) on *Memecylon laevigatum* Bl., Bogor (Kebun Raya), Java, no. 774-2-1, 30.ix.1976, leg. D. Noordam. Paratypes: four alatae viviparae and seven larvae of alatae viviparae of fourth instar on *M. laevigatum* Bl. and *M. myrsinoides* Bl., Bogor (Kebun Raya), Java, no. 774, 30.ix.1976, no. 778, 3.x.1976, no. 961, 2.v.1977, leg. D. Noordam. Holotype and paratypes in the collection of the Rijksmuseum van Natuurlijke Historie, Leiden.

Alate viviparous female (fig. 7) — Colour in life: Yellow, but margin of prothorax black. Antennal segment I yellowish grey, II and III black, IV, V and VI grey. Eyes red, triommatidia black. Cauda grey. Veins of forewing bordered with grey, pterostigma grey.

Macerated specimens (described from five specimens): Body length 0.98-

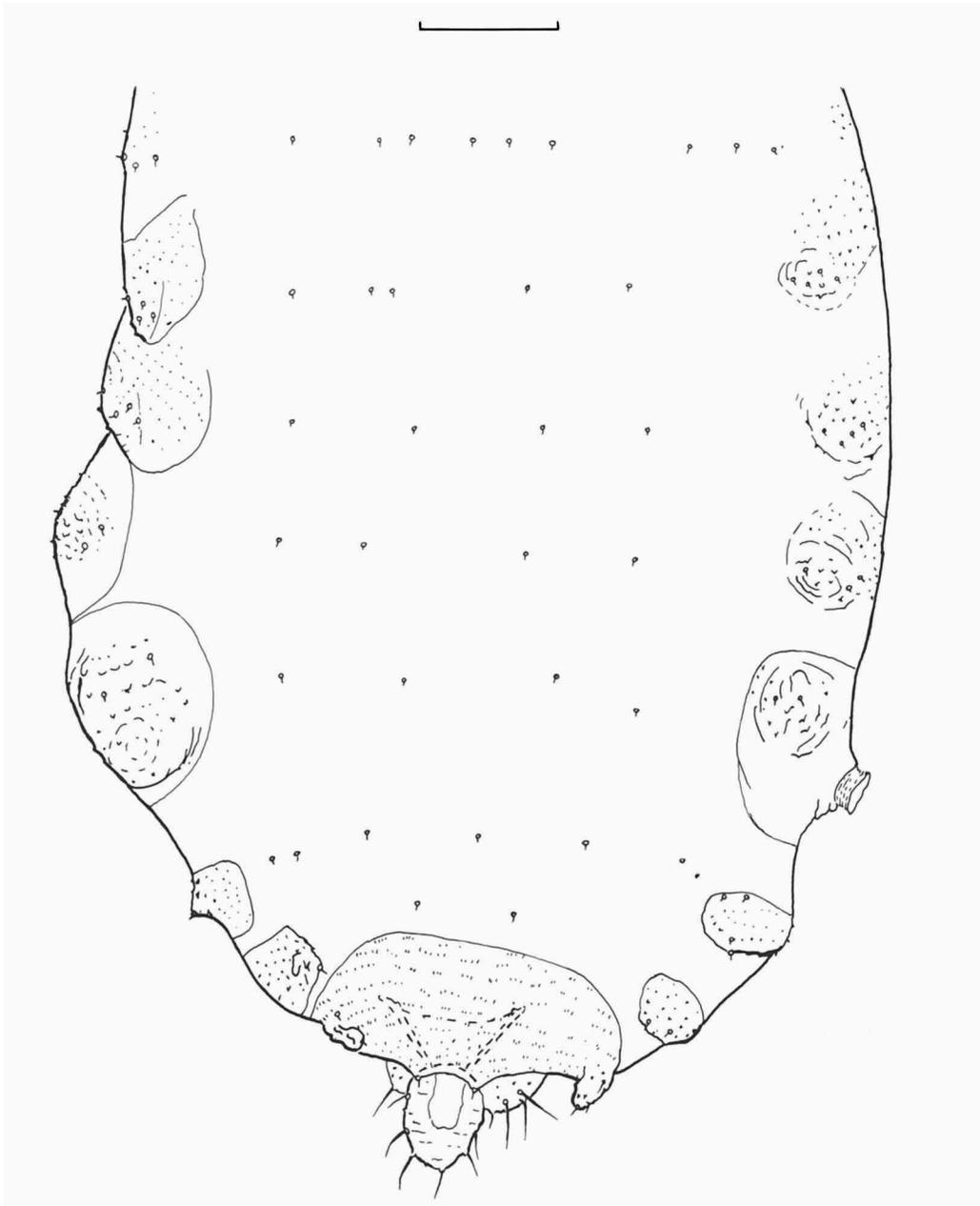


Fig. 7. *Taiwanaphis memecyloni* spec. nov., alata vivipara, abdomen, dorsal side. The scale represents 0.1 mm.

1.50 mm. Head across eyes 265-340  $\mu$  wide. Dorsum of head at base of antennae, and around and posteriorly to lateral ocelli brown, rest of head colourless or very pale brown. A frontal tubercle raised about 6  $\mu$  and 50  $\mu$  wide, with some wrinkles, on each side 1 acute hair, 5-6  $\mu$  long; the tubercle continues to the ventral side and bears two hairs similar to the frontal hairs. Close to the anterior side of each antennal base is a somewhat wrinkled patch, 20  $\mu$  wide, each with one hair; rest of head dorsally smooth and usually with one hair posterior to each frontal hair, and four interocular hairs, all acute, 6  $\mu$  long; head ventrally with one hair posterior to the two ventral frontal hairs, and two or three posterior or lateral to each antennal base. Antennae six-segmented, 760-810  $\mu$  long, body 1.8 times, head across eyes 0.41-0.43 times as long as the antennae; primary rhinaria on antennal segments V and VI ciliated; III on medial and ventral sides with 11-14 non-ciliated, transversely narrowly elliptic rhinaria, distributed over the whole length; I-III brown, IV-VI pale brown, base and distal ends of IV and V indistinctly darker. Antennal segment I dorsally and ventrally with spinulose imbrications, II imbricated without spinulae; III narrowly ovate, widest basal diameter 1.6-1.7 times wider than the diameter distally; imbrications on III-VI extending to medial and lateral sides about 1  $\mu$ , almost without spinulae; antennal hairs acute, on III 4-7  $\mu$  long. Length of III 213-240  $\mu$ , of IV 143-157  $\mu$ , of V 125-127  $\mu$ , base of VI 106-115  $\mu$ , and processus terminalis 55-68  $\mu$ . The processus terminalis is 0.49-0.60 times as long as the base of the segment, antennal segment III, 3.3-3.9 times as long as the processus terminalis, 1.5-1.9 times as long as V, and 1.4-1.5 times as long as IV. Rostrum reaches hind-coxae, stylets are 325-335  $\mu$  long, ultimate rostral segment 59-63  $\mu$  long, colourless with brown tip, without accessory hairs, 0.88-0.93 times the length of the second tarsal segment of hind leg, longer hairs, 12-20  $\mu$  long. Eyes compound, colourless, triommatidia brown. Prothorax with brown marginal sclerites, almost smooth, with anteromedially with a tubercle, which is at most 10  $\mu$  high, wrinkled, with two hairs next to the 5-6 other hairs of each of the marginal sclerites; pronotum almost colourless with two anterior and 2-5 posterior hairs; all hairs acute, 5-6  $\mu$  long. Marginal sclerites of mesothorax almost colourless, smooth, with 8-9 hairs, 7-9  $\mu$  long; mesonotum pale brown, smooth with 10-21 acute hairs, 3-5  $\mu$  long. Forewing media branched twice, hind wing with two oblique veins. Legs, including the tarsi, evenly pale brown, but tibiae and tarsi of leg I slightly darker; femora imbricated, ventrally more spinose; imbrications on tibiae mainly on distal half, each imbrication with 1-3 spines which distally increase in size and are always single and densely distributed, up to 10  $\mu$  long; first tarsal segments of legs I and II with five or four ventral hairs, of hind leg always with four hairs, one of them about half the length of the others; second

tarsal segments imbricated on the ventral side with about ten spinulae; dorsoapically, usually one hair of legs I and II, and two hairs of hind leg are enlarged, 18-22  $\mu$  long; empodial hairs expanded, about 15  $\mu$  long. Lengths of hind leg segments: femur 265-270  $\mu$ , tibia 460-480  $\mu$ , first tarsal segments 24-26  $\mu$ , second 65-68  $\mu$ . Abdominal marginal sclerites almost colourless, spinulose, those of segments I and II flat, with 3-4 acute hairs; III and IV distinctly with concentric imbrications and 3-4 acute hairs, 4-6  $\mu$  long, III raised 8-12  $\mu$ , IV 20-47  $\mu$ , VI raised 13-17  $\mu$ , and apart, anteromedially some spinulae and about two hairs, VII raised 13-15  $\mu$ . Abdominal tergites I-VII colourless, I with 5-7 hairs, II-V with four hairs, VI with 3-5, and VII with two hairs, all acute and 5-7  $\mu$  long. Siphunculi on segment V cone-shaped, smooth, with a few wrinkles, flange fairly narrow, with about eight rings with interconnections anteriorly; on anterodorsal side of siphunculi a prominence as imbricated and spinulose as the one on IV, about 10  $\mu$  high, 60-80  $\mu$  wide, with two hairs, and 0-2 hairs on each siphunculus, hairs acute, 5-7  $\mu$  long, diameter of siphunculi 120-150  $\mu$ , flange 30  $\mu$ . Broadly rounded posterior margin of abdominal tergite VIII with four tubercles which are pale brown and have coarser spinulae and imbrications than the rest of the tergite; the lateral tubercles 10-38  $\mu$  high, each with three hairs, the two spinal tubercles about 8  $\mu$  high, each with one or, in exceptional cases, no hairs. All hairs acute, the lateral 7-10  $\mu$  long, the spinal 5-7  $\mu$ . Ventral abdominal hairs acute, on segment IV longest, 22-25  $\mu$ , shortest 12-17  $\mu$  long. Stigmal plates colourless. Cauda constricted to form an oval-shaped knob; the knob 1.3-1.4 times the greatest width, dorsally at base in the middle a colourless smooth area, the rest pale brown with wide imbrications; ventrally with spinulose imbrications; knob with 11 hairs, acute, 25-38  $\mu$  long; length of cauda 115  $\mu$ , length of caudal knob 71-76  $\mu$ . Subanal plate pale brown, spinosely imbricated, indented to form two well-defined lobes, each lobe with 5-7 acute hairs, the longest 43-48  $\mu$  long. Subgenital plate oval, colourless, with 5-7 anterior hairs and 9-10 posterior hairs, the longest 20-22  $\mu$ , the shortest 12-15  $\mu$  long. Gonapophyses four, the inner two each with one, the outer two each with 2-3 hairs, longest hairs 13-17  $\mu$ , shortest 12  $\mu$ .

Larva of alate viviparous female, fourth instar (fig. 8). — Colour in life: Yellow, tarsi and processus terminalis only slightly grey, eyes red, triommatidia black.

Macerated specimens (described from seven specimens): Body length 0.98-1.50 mm. Head across eyes 265-340  $\mu$  wide. Head almost colourless, with frontal tubercle, 5-8  $\mu$  about 45  $\mu$  wide and more or less divided by the median suture, coarsely wrinkled, with two blunt hairs, 3  $\mu$  long; dorsally, close to the anterior part of each antennal base, a tubercle hardly raised, about 25  $\mu$  wide, wrinkled and each with one hair similar to the frontal hairs; rest of head dor-

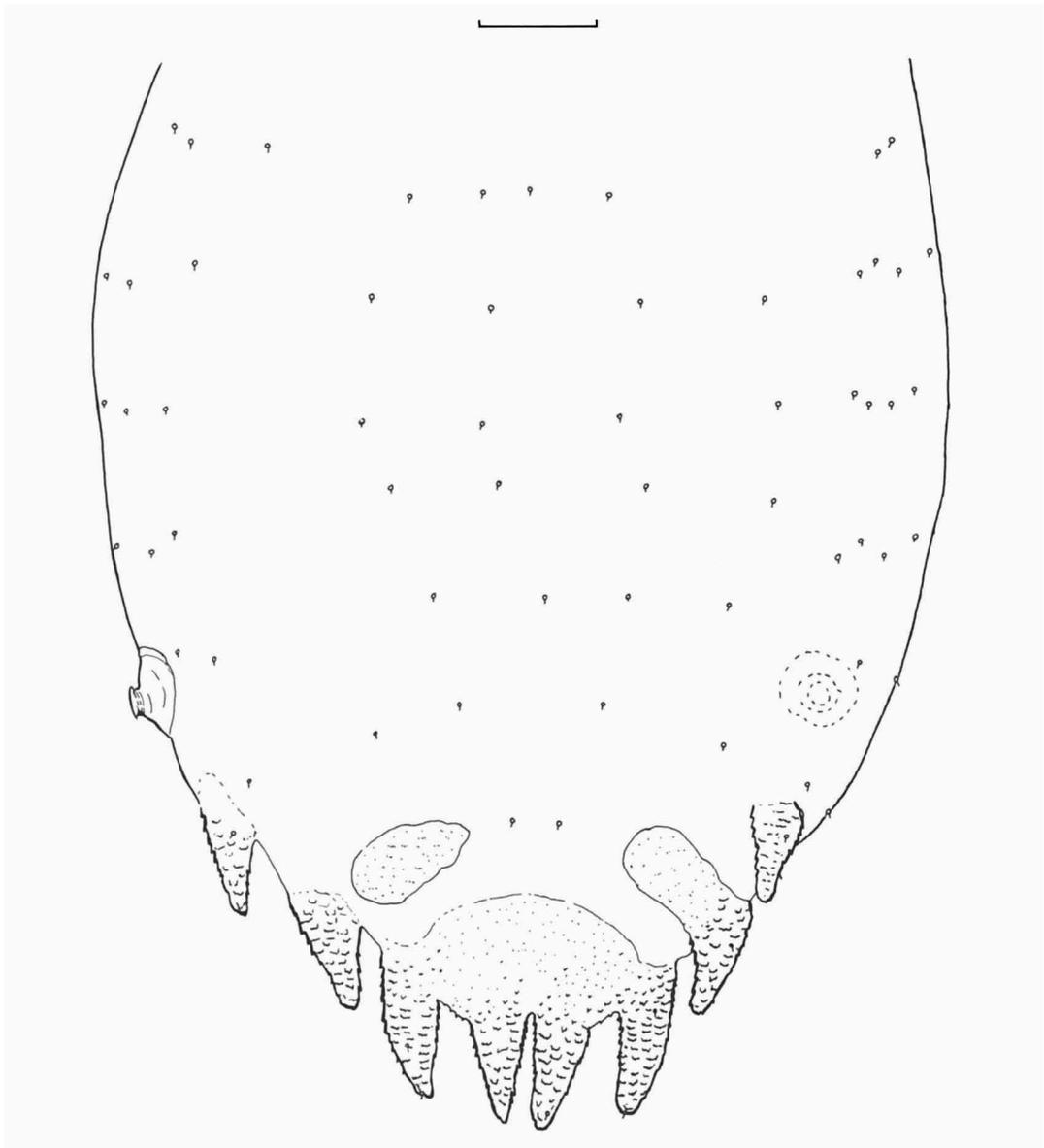


Fig. 8. *Taiwanaphis memecyloni* spec. nov., alata vivipara fourth (last) instar larva, abdomen, dorsal side. The scale represents 0.1 mm.

sally slightly wrinkled, with one hair posterior to each of the frontal hairs, and four or five interocular hairs, all of the same shape, at most  $1 \mu$  longer than frontal hairs. The frontal tubercle proceeds to the ventral side, with a pair of

blunt hairs just posterior to the frontal hairs and of the same length, one pair of acute or blunt hairs, more posterior, and closer to the antennal base, on each side, one or two acute hairs. Antennae three-segmented, 450-500  $\mu$  long, body 2.1-2.5 times as long as the antennae; head across eyes 0.58-0.69 times as long; antennal segment III 7.0-7.8 times the length of the processus terminalis; primary rhinaria non-ciliated; antennae imbricated without distinct spinulae, pale brown, slightly darker towards the ends; antennal hairs blunt, 2-3  $\mu$  long. Ultimate rostral segment 60-65  $\mu$  long, 0.84-0.91 times the length of the second tarsal segment of the hind leg, without accessory hairs; longest hairs 13-15  $\mu$ ; stylets 330-355  $\mu$  long. Eyes compound, colourless, with pale brown triommatidium. Prothorax colourless; marginal sclerites wrinkled, without tubercles with 5-7 hairs, one of these medial to the triommatidia; hairs like all marginal and dorsal hairs, blunt, slightly wider at tip than at base; two anterior spinal hairs and 3-4 posterior; mesothorax, metathorax and abdominal segments I-IV marginally and spinally colourless, without spinulae; mesothorax with three marginal hairs on each side and 9-13 spinal hairs; metathorax with three marginal hairs on each side and 5-6 spinal hairs. Legs very pale brown, tarsi slightly darker. Femora dorsoapically imbricated, ventrally almost smooth with a few spinulae, dorsal hairs blunt, most ventral hairs acute; tibiae I and II faintly imbricated, dorsally with spinulae; tibia of hind leg also with a few ventral spinulae; proximal and dorsal hairs of tibiae blunt, 3-6  $\mu$  long, ventral and distal hairs acute, 5-13  $\mu$  long, but six dorsal hairs at distal end of hind tibiae enlarged, up to 50  $\mu$  long. First tarsal segment of legs I and II with 4-5 ventral hairs, of hind leg with four, one of which less than half the length of the others. Second tarsal segment of the legs I and II with smooth imbrications, one apical dorsal hair enlarged with slightly widened tip, blunt or capitate, 10-17  $\mu$  long; imbrications of the second tarsal segment of the hind leg less distinct, dorsally with six enlarged acute hairs, up to about 45  $\mu$  long; empodial hairs expanded, about 17  $\mu$  long. Length of hind leg segments: femur 195-225  $\mu$ , tibia 280-315  $\mu$ , first tarsal segment 28-30  $\mu$ , second 68-71  $\mu$ . Abdominal segment I with 2-4 marginal hairs on each side, one of which is distinctly submarginal, which also applies to segments II-VII; segment I with 4-7 spinal hairs; segments II-IV each with 3-4 marginal hairs, and four or sometimes five spinal hairs, 3  $\mu$  long; abdominal segment V colourless, the siphunculi very pale brown, 2-3 hairs on each side, one or none of these on each siphunculus, spinally 4-6 hairs; siphunculi cone-shaped, wrinkled, anterior to the flange with about ten rings, siphunculi about 70  $\mu$  wide, the flange 30-32  $\mu$ , and the narrowest diameter anterior to the flange 20  $\mu$ . Marginal tubercles on abdominal segments VI and VII nipple-shaped, slightly curved backwards, tapering, very pale brown, almost smooth dorsally

at base, but the rest with coarse, somewhat spinulose imbrications; each tubercle 70-80  $\mu$  long, with two or three blunt hairs, about 4  $\mu$  long; segment VI with 1-3 submarginal hairs on each side, and 4-7 spinal hairs; segment VII with 0-1 submarginal hair and 2-4 spinal hairs; on each side of tergite VII a pleural area, elliptic, with a diameter of about 100  $\mu$ , and 60  $\mu$  wide, very pale brown, spinulosely imbricated with coarser spinulae than the rest of tergite VII; abdominal tergite VIII very pale brown, spinulosely imbricated with, on slightly rounded posterior margin, four nipple-shaped, tapering tubercles; the two spinal tubercles symmetric, the lateral ones with inwardly curved tips, all pale brown, spinulosely imbricated with coarsest spines ventrally at base of the tubercle, at most 2  $\mu$  long; spinal tubercles each with one hair, lateral with three; length of lateral tubercles VIII 85-100  $\mu$ , spinal 70-90  $\mu$ , length of hairs 5-8  $\mu$ . Ventral abdominal hairs acute, on abdominal segment IV 5-10  $\mu$  long; sternite V pleurally with an oval area more coarsely imbricated than the surrounding area, with 3-4 hairs. Thoracic and abdominal stigmal plates colourless. Cauda with 9 or 8 hairs, longest 17-23  $\mu$ , the shortest 12-17  $\mu$  long, subanal plate with 7-9 hairs, the longest 25-28  $\mu$ , the shortest 12-15  $\mu$  long, and the genital plate posteriorly with 5-6, anteriorly with 5-7 hairs, the longest 17-22  $\mu$ , the shortest 12-15  $\mu$  long.

Alatae viviparae and larvae were the only morphs collected by D. Noordam in three samples from the upper side of youngest leaves, the larvae appressed against the main vein, of *Memecylon laevigatum* Bl. and *M. myrsinoides* Bl.

Etymology. — The specific name *memecyloni* is in reference to the host plant *Memecylon*.

#### **Taiwanaphis montanicola** spec.nov.

(figs. 9-11)

Types. — Holotype: ♀ (alata vivipara) from *Syzygium racemosum* (Bl.) DC., Tangkuban Prah, 1800 m, Java, no. 693-4-1, 19.vii.1976, leg. D. Noordam. Paratypes: 37 alatae viviparae, one aptera vivipara, and 16 larvae of alatae viviparae of fourth instar, same host plant and locality as holotype, no. 693, 19.vii.1976, no. 969, 5.vi.1977, no. 1246, 4.ii.1978, leg. D.Noordam. Holotype and paratypes in the collection of the Rijksmuseum van Natuurlijke Historie, Leiden.

Alate viviparous female (fig. 9). — Colour in life: Body brown. Veins of forewing bordered with black.

Macerated specimens (described from 38 specimens): Body 1.78-2.23 mm. Head across eyes 425-500  $\mu$  wide. Dorsum of head brown, around lateral ocelli and bases of antennae darker. Frontal tubercle raised about 10  $\mu$  and 50  $\mu$  wide, wrinkled, one hair on each side, acute, 3-8  $\mu$  long. A pair of tubercles

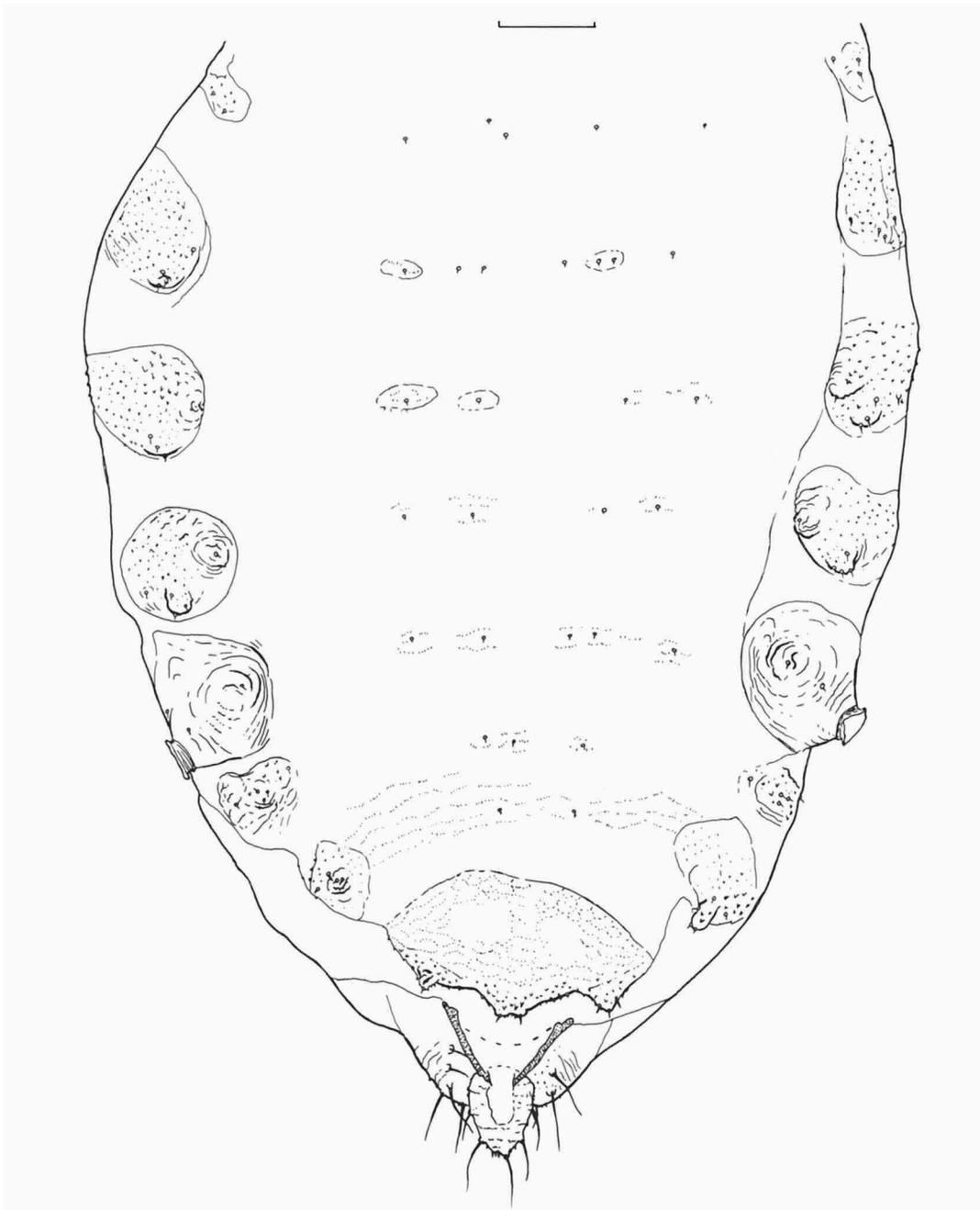


Fig. 9. *Taiwanaphis montanicola* spec. nov., alata vivipara, abdomen, dorsal side. The scale represents 0.1 mm.

close to the antennal bases and slightly posterior to the frontal tubercle, 10-15  $\mu$  high, 25  $\mu$  wide, wrinkled, with a blunt hair, 5-10  $\mu$  long; rest of head dorsally smooth with 2-3 interocellar hairs posterior to the frontal hairs, and 3-5 interocular hairs, all blunt, 5-7  $\mu$  long. Head ventrally brown, darker around the median ocellus and at the antennal bases, smooth, except for the frontal tubercle, an extension of the dorsal tubercle, which is wrinkled, and the wrinkled area posterior to the median ocellus. Ventral hairs of head: one pair ventral to the frontal hairs on the frontal tubercle; a second pair posterior to these, slightly anterior to the median ocellus; lateral and posterior to the antennal bases 1-5 hairs on each side, acute, 12-25  $\mu$  long; at base of rostrum 4-8 hairs, acute, 25-35  $\mu$  long. Antennae six-segmented, 1.28-1.58 mm long; body 1.2-1.4 times as long as antennae, and head across eyes 0.29-0.34 times; primary rhinaria on antennal segments V and VI ciliated; on III, on lateral and ventral side 19-30 non-ciliated, transversely narrowly elliptic rhinaria, distributed over the whole length. Antennal segments I-III brown to black, IV-VI paler brown, with processus terminalis pale brown, I imbricated, especially dorsally with spinulae, II imbricated, but with very few spinulae; III ovate, but indistinctly owing to great length, imbrications extending to medial and lateral sides about 3  $\mu$ , almost without spinulae; imbrications on IV extending about 1  $\mu$ , on V and VI up to 2  $\mu$ ; most antennal hairs acute, on III 10-15  $\mu$  long. Length of antennal segments III 475-575  $\mu$ , IV 240-295  $\mu$ , V 185-230  $\mu$ , base of VI 170-210  $\mu$ , and of processus terminalis 100-130  $\mu$ . The processus terminalis is 0.53-0.69 times as long as the base of the segment, III 4.1-5.2 times as long as the processus terminalis, 2.2-2.6 times as long as V, and 1.8-2.0 times as long as IV. Rostrum hardly reaches mid-coxae, stylets are 440-495  $\mu$  long, ultimate rostral segment 76-84  $\mu$  long, brown, black at tip, without accessory hairs, 0.86-0.95 times the length of the second tarsal segment of the hind leg, longer hairs 27-42  $\mu$  long. Eyes compound, triommatidia brown. Prothoracic marginal sclerites brown, almost smooth, with an anteromedial tubercle, about 20  $\mu$  high, 50  $\mu$  wide, wrinkled, and a wrinkled posterior tubercle about 8  $\mu$  high, 60  $\mu$  wide; marginal sclerites with 6-10 hairs, one or two of which on anterior tubercle and 3-5 on posterior tubercle; dorsum almost colourless with 4-8 hairs, 0-2 of which in the anterior part; all prothorax dorsal hairs acute or blunt, 5-7  $\mu$  long. Mesothoracic marginal sclerites brown, smooth, with 7-11 hairs, acute or slightly blunt, 8-13  $\mu$  long; mesonotum brown, smooth with 17-31 hairs, acute or blunt, 3-7  $\mu$  long. Forewing, media branched twice, hind wing with two oblique veins. Legs evenly brown, at most distal part of tibiae slightly darker; femora ventrally and dorsoapically spinosely imbricated; tibiae basal 1/3 smooth, more distally with imbrications (with 1-3 spinulae) which increase in size towards the distal end and are al-

ways single, and densely distributed, up to 13  $\mu$  long; first tarsal segments with five ventral hairs, the middle hair about half the length of the others; second tarsal segments imbricated and, of legs I and II, with 3-8 spinulae, of leg III with 15-25 spinulae; apical dorsal hairs of tarsus II of legs I and II distinctly longer than the other dorsal hairs, of leg III dorsal hairs of the same type, the distal 20-25  $\mu$  long; empodial hairs expanded, about 20  $\mu$  long. Length of hind leg segments: femur 415-510  $\mu$ , tibia 725-880  $\mu$ , first tarsal segment 33-38  $\mu$ , second 83-91  $\mu$ . Abdominal marginal sclerites pale brown, spinulose, segments III, IV and VI each with two tubercles which are largest on IV; on IV one tubercle raised about 13  $\mu$  with spinulae only and 2-5 hairs, the other about 25  $\mu$  high, coarsely wrinkled, with one hair (the submarginal hair in larvae); on other segments the height of the tubercle and the wrinkling decrease, but on each side of segments I-IV and VI one hair can be recognized as submarginal; number of other marginal hairs on these segments : I 1-3, I 2-4, III and IV 2-5, VI 2-6; marginal sclerite VII with or without a tubercle, up to 50  $\mu$  high, 30  $\mu$  wide at base, with 2-6 hairs, but without submarginal hairs. Siphunculi cone-shaped, smooth, at most with some wrinkles, but with a wrinkled marginal tubercle, about 80  $\mu$  wide, corresponding to the wrinkled marginal tubercle IV, with 1 hair, and 1-5 hairs on the cone of the siphunculus; anterior to the flange 8-10 rings with interconnections, diameter of siphunculi at base 125  $\mu$ , flange 35  $\mu$ . Abdominal tergites colourless, I with 4-11 hairs, II 4-8, III and IV 4-7, V 4-6, VI 3-7, VII 2-4; hairs usually blunt, on IV 5-8  $\mu$  long. Broadly rounded posterior margin of abdominal tergite VIII with three tubercles, which are brown with coarser spinulae and imbrications than rest of the tergite; the lateral tubercles 8-50  $\mu$  high, each usually with 2-3 hairs, blunt or acute; the spinal tubercle with two tips and a dip in between, 8-25  $\mu$  high, each tip with one hair, blunt or acute; length of hair on VIII 6-14  $\mu$ . Ventral abdominal hairs acute, on segment IV longest hairs 28-40  $\mu$ , shortest 17-30  $\mu$ . Stigmal plates almost colourless. Cauda constricted to form an oval-shaped knob; length of knob 1.3-1.5 times greatest width, proximally with a medio-dorsal smooth and colourless area, rest pale brown with imbrications and some small spinulae in distal half, ventrally imbrications, and basally with rounded spinulae, distally acute spinulae; knob with 11-13 hairs, the longest 43-57  $\mu$  long, the shortest 28-42  $\mu$ ; length of cauda 131-161  $\mu$ , of caudal knob 86-96  $\mu$ . Subanal plate pale brown, spinosely imbricated, indented to form two well-defined lobes, each lobe with 6-7 hairs, the longest 52-65  $\mu$  long. Subgenital plate colourless, with 6-10 anterior hairs and 4-12 posterior hairs, the longest 32-45  $\mu$  long, the shortest 17-33  $\mu$ . Gonapophyses four, the inner two each with one, the outer two with 2-3 or, in exceptional cases, one or four hairs, longest 13-22  $\mu$ , shortest 12-18  $\mu$  long.

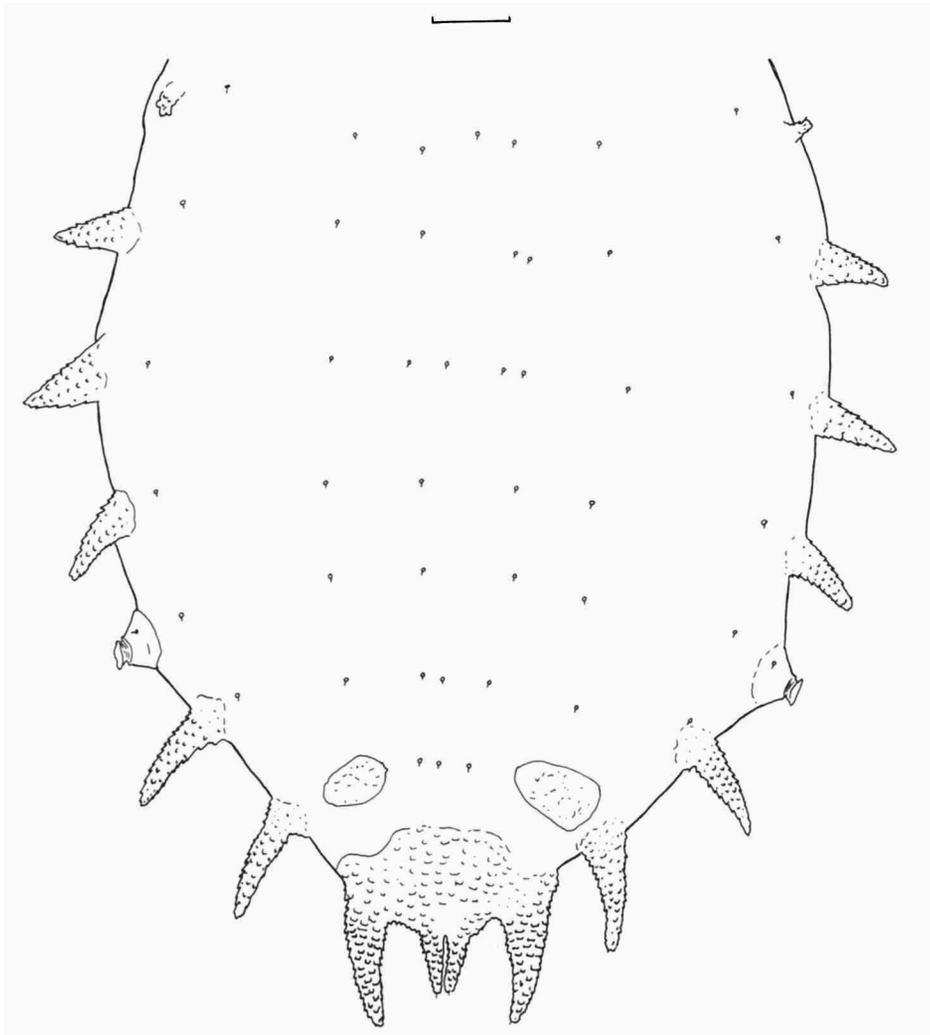


Fig. 10. *Taiwanaphis montanicola* spec. nov., alata vivipara fourth (last) instar larva, abdomen, dorsal side. The scale represents 0.1 mm.

Larva of alate viviparous female, fourth instar (fig. 10). — Colour in life: Body dusky brown, antennae pale brown, darker towards the ends. Siphunculi and marginal tubercles black or dark grey.

Macerated specimens (described from 27 specimens): Body length 1.59-2.10 mm. Head across eyes 420-475  $\mu$  wide. Dorsum of head pale brown but posterior to antennal bases and medial to the eyes colourless. Median frontal tubercle produced 8  $\mu$ , about 45  $\mu$  wide and more or less divided by the medi-

an suture, coarsely wrinkled, with two blunt hairs of 2-7  $\mu$  long; dorsally, close to the anterior part of each antennal base, a tubercle, 15-30  $\mu$  high, 30  $\mu$  wide, brown, wrinkled and each with one blunt hair; rest of head dorsally slightly wrinkled, with one hair posterior to each of the frontal hairs, and four or five, in exceptional cases, three or six interocular hairs, all like the frontal hairs. The frontal tubercle extends to the ventral side, with one pair of blunt hairs just posterior to the frontal hairs and of the same length, one pair of hairs more posteriorly and longer, and closer to the antennal bases, on each side one or two acute hairs, the longest medial, and 20-25  $\mu$  long. Antennae three-segmented, 780-850  $\mu$  long; body 2.0-2.6 times, head across eyes 0.51-0.59 times as long as the antennae; antennal segment III 6.9-8.2 times the length of the processus terminalis; primary rhinaria non-ciliated; antennae imbricated without distinct spinulae, brown, slightly darker towards the ends; antennal hairs blunt, 3-8  $\mu$  long. Ultimate rostral segment 70-77  $\mu$  long, 0.76-0.87 times the length of the second tarsal segment of the hind leg, without accessory hairs, longest hairs 28-35  $\mu$  long, stylets 405-495  $\mu$  long. Eyes compound, pale brown, with brown triommatidium. Prothorax pale brown, wrinkled; marginal sclerites without tubercles, with 6-10 hairs, one of these medial to the triommatidia; hairs like all marginal and dorsal hairs blunt, slightly wider at tip than at base; 4-8 spinal hairs one or two of which anteriorly; mesothorax and metathorax colourless, without spinulae, mesothorax with three marginal hairs on each side and 8-17 spinal hairs, metathorax with three marginal hairs on each side and 7-10 spinal hairs. Legs brown, femur dorsoapically, tibia dorsally, and the tarsi darker. Femora dorsoapically spinulosely imbricated, ventrally almost smooth with a few spinulae; dorsally spinulosely imbricated but distal part of tibia III smooth, tibiae smooth ventrally with some distal spinulae especially on tibia III, at most 5  $\mu$  long; most dorsal hairs blunt except six distal hairs of hind tibiae, which are enlarged, acute, up to 60-70  $\mu$  long; ventral hairs of femora blunt or acute, of tibiae acute. First tarsal segment, also of the hind leg, with five hairs, four of which are three or four times longer than the middle hair. Second tarsal segments of the legs I and II with smooth imbrications, ventrally almost without spinulae, one dorsoapical hair enlarged with tip slightly widened, blunt or capitate, 16-18  $\mu$  long; second tarsal segment of hind leg with less distinct imbrications, dorsally with six enlarged hairs, these acute, up to 62-68  $\mu$  long; empodial hairs expanded, about 20-23  $\mu$  long. Length of hind segments: femur 345-375  $\mu$ , tibia 455-500  $\mu$ , first tarsal segment 37-41  $\mu$ , second 87-96  $\mu$ . Abdominal segments I-IV, VI and VII with marginal nipple-shaped tubercles, slightly curved backwards, tapering, brown, coarsely imbricated with blunt or acute spinulae; tubercle of segment I 10-38  $\mu$  long, with 1-2, in exceptional cases three, hairs; of II 91-113  $\mu$  long,

with 2-3, in exceptional cases four hairs; of III 98-121  $\mu$  long with 3-4 hairs; of IV 101-123  $\mu$  long with 2-4, in exceptional cases five, hairs; of VI 123-146  $\mu$  long, with 3-5 hairs; of VII 144-169  $\mu$  long, with 3-5 hairs; the lateral tubercles of VIII 144-169  $\mu$  long, each with 2-3, in exceptional cases one hair, the spinal 78-93  $\mu$  long, each with one hair; segments I-IV each with one submarginal hair on each side, VII without; number of spinal hairs on segment I 4-9, II 4-7, III 4-7, IV 4-6, V 4-6, VI 3-6, VII 2-4. Siphunculi on V, brown, cone-shaped, somewhat imbricated, anterior to the flange with about ten rings, at base about 90  $\mu$  wide, the flange 35  $\mu$ , narrowest diameter anterior to the flange 25  $\mu$ ; 1-3 hairs on the cone of the siphunculi; VII pleurally with a pale brown area, elliptic, about 90  $\mu$  long and 60  $\mu$  wide. Abdominal tergite VIII pale brown, spinulosely imbricated, slightly rounded posterior margin with four nipple-shaped, tapering, brown tubercles. The two lateral ones with inwardly curved tips, imbrications dorsally usually with blunt spinulae, ventrally with more acute spinulae, which are less than 1  $\mu$  long; each tubercle with 2-3, in exceptional cases one, hair. The spinal tubercles symmetrical, in the middle touching each other over some distance, at base even fused over a distance of 0-15  $\mu$ , dorsal imbrications smooth or with a single spinula, ventral imbrications crenate or with fine spinulae, at tip each tubercle with one hair; length of lateral tubercles 144-169  $\mu$ , spinal 78-93  $\mu$ , lengths of hairs 3-12  $\mu$ . Ventral abdominal hairs acute, on IV 8-13  $\mu$  long; sternite V pleurally with an oval area, coarsest imbricated with spines, the longest at medial side, 3-8  $\mu$  long, with three hairs. Thoracic and abdominal stigmal plates almost colourless. Cauda with 9-10 hairs, longest 33-48  $\mu$ , shortest 20-32  $\mu$ , subanal plate with 8-10 hairs, the longest 42-52  $\mu$ , the shortest 21-32  $\mu$ , and the genital plate posteriorly with 5-9, anteriorly with 5-9 hairs, the longest 23-33  $\mu$ , the shortest 10-23  $\mu$ .

Apterous viviparous female (fig. 11). — Colour in life: Body dusky brown. Antennae pale brown, darker towards the ends. Siphunculi and marginal tubercles black or dark grey.

Macerated specimen (described from one specimen): Body length 1.73 mm. Head across eyes 390  $\mu$  wide. Dorsum of head pale brown. Frontal tubercle produced 10  $\mu$ , 55  $\mu$  wide, somewhat indented in the middle, coarsely wrinkled, with two blunt hairs of 5  $\mu$  long; dorsally, close to the anterior part of each antennal base with a tubercle, 25  $\mu$  high, 35  $\mu$  wide, brown, wrinkled and each with one blunt hair, 8  $\mu$  long; rest of head slightly wrinkled, one hair posterior to each of the frontal hairs, and five interocular hairs, all similar to the frontal hairs. The frontal tubercle proceeds to the ventral side, with a pair of blunt hairs just posterior to the frontal hairs and of the same length, one pair of hairs more posteriorly, 17  $\mu$  long, and closer to the antennal bases, two

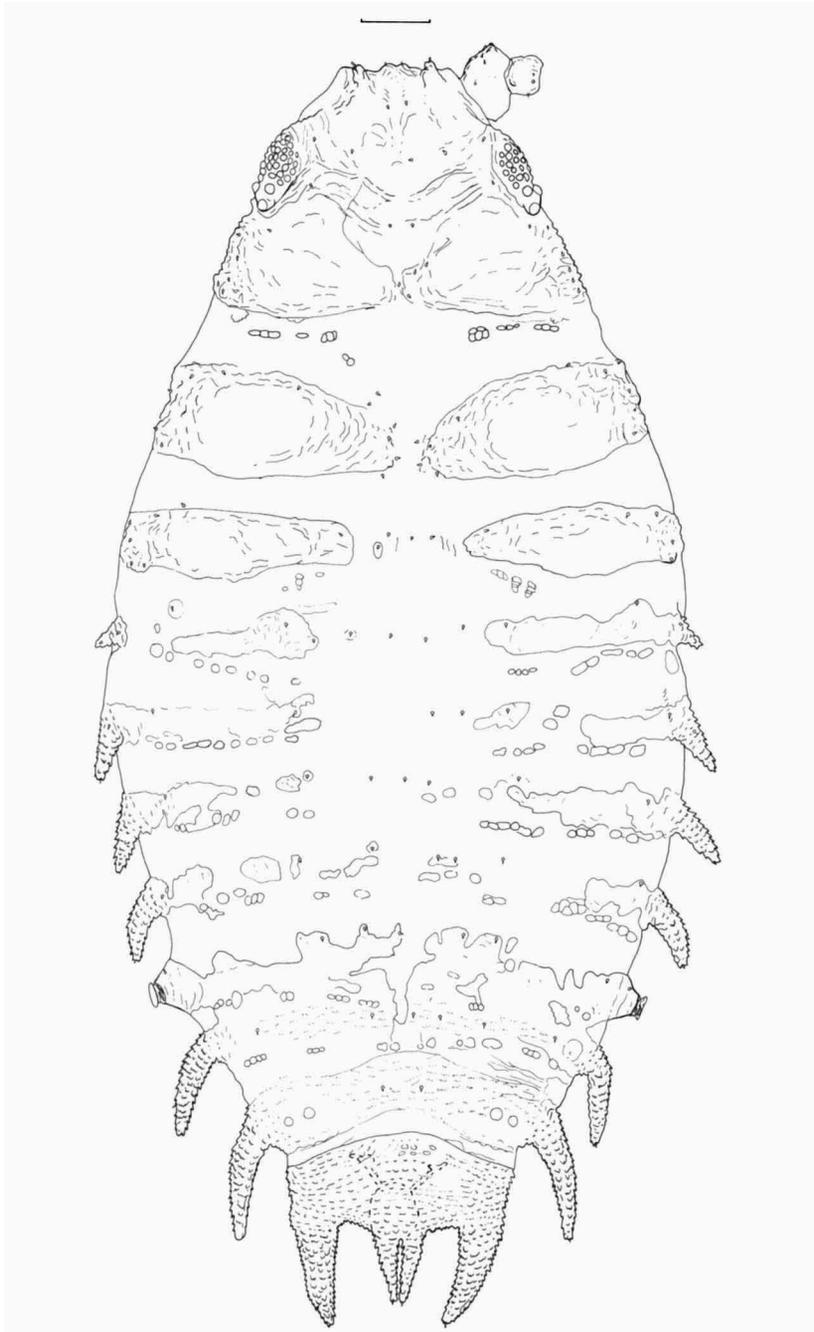


Fig. 11. *Taiwanaphis montanicola* spec. nov., aptera vivipara, body, dorsal side. The scale represents 0.1 mm.

blunt or acute hairs on each side, the longest  $18\ \mu$  long. Antennae incompletely divided into six segments,  $660\ \mu$  long; body 2.6 times and head across eyes 0.59 times as long as the antennae; primary rhinaria on antennal segments V and VI non-ciliated, III without rhinaria; I and II slightly imbricated with some spinulae especially on the anterior side, III imbricated, ventrally with many spinulae, IV-VI imbricated without spinulae. Antennae brown, IV-VI darker; hairs blunt, on III  $4\text{--}5\ \mu$  long. Length of antennal segment III  $204\ \mu$ , of IV  $81\ \mu$ , of V  $98\ \mu$ , base of VI  $116\ \mu$ , processus terminalis  $78\ \mu$ . The processus terminalis is 0.67 times as long as the base of the segment, III 2.6 times as long as the processus terminalis, 2.1 times as long as V, and 2.5 times as long as IV. Rostrum reaches mid-coxae, stylets are  $455\ \mu$  long, ultimate rostral segment  $78\ \mu$  long, brown, black at tip, without accessory hairs, 0.89 times the length of the second tarsal segment of the hind leg, longest hairs  $50\ \mu$  long. Eyes compound, brown, each with a darker triommatidium. Prothoracic marginal sclerites brown, wrinkled, without tubercles, with eight hairs on each side, one of which medial to the triommatidium; dorsum pale brown, slightly wrinkled, with six hairs, two of which in the anterior part; hairs like all marginal and dorsal hairs of the body blunt, slightly wider at tip than at base. Mesothorax and metathorax marginally and dorsally brown, except for a colourless median area, wrinkled; mesothorax with 6-7 marginal hairs on each side, and ten spinopleural hairs; metathorax with 4-6 marginal hairs on each side, and seven spinopleural hairs. Legs brown, femur dorsoapically, tibia dorsally, and tarsi darker. Femur I with imbrications on all sides, dorsoapically with coarse spinulae, on ventral and rostral sides with many small spinulae; femora II and III dorsoapically with coarse spinulae, rostrad with spinulose imbrications; tibiae spinulosely imbricated dorsally, and ventrally in the distal part with some imbrications with spinulae up to  $8\ \mu$  long on hind tibiae; dorsal hairs usually blunt, except for six hairs distally on hind tibiae, which are acute and slightly enlarged, up to  $32\ \mu$  long; ventral hairs of femora blunt or acute, those of tibiae acute. First tarsal segment with five or four hairs, one of these about three times shorter than the others. Second tarsal segment of the legs I and II with smooth imbrications, ventrally almost without spinulae, one dorsoapical hair enlarged, somewhat acute,  $13\text{--}17\ \mu$  long; second tarsal segment of the hind leg with less imbrications but more spinulae than the other tarsi, dorsal hairs elongated, up to  $23\ \mu$  long; empodial hairs expanded,  $23\ \mu$  long. Length of hind leg segments: femur  $335\ \mu$ , tibia  $490\ \mu$ , first tarsal segment  $41\ \mu$ , second  $88\ \mu$ . Abdominal segments I-IV, VI and VII with marginal tubercles, nipple-shaped, slightly curved backwards, tapering, brown, with coarse imbrications with blunt or acute spinulae; tubercle of segment I  $48\ \mu$  long, with one or two hairs; of II  $95\ \mu$  long, with 1-3

hairs, of III 100  $\mu$  long, with three hairs, of IV 100  $\mu$  long, with 3-4 hairs, of VI 120-140  $\mu$  long, with four hairs, of VII 165  $\mu$  long, with four hairs; segments I-VI with one submarginal hair on each side, VII without; number of spinal hairs on segments I 7, II 4, III and IV 5, V 4, VII 2. Siphunculi on V, brown, cone-shaped, somewhat imbricated, anterior to the flange with about ten rings with interconnections, at base about 90  $\mu$  wide, the flange 33  $\mu$ , narrowest diameter anterior to the flange 23  $\mu$ ; 1-2 hairs on the cone of the siphunculi; abdominal segments I-VII dorsally colourless with a pale brown pattern of sclerotic bands and spots, and intersegmental muscle sclerites; segments I-IV with irregular transverse sclerotic bands from base of marginal tubercles extending mediad, but widely separated, the spinal part with only a few isolated small sclerites; the sclerotic bands of V-VII united, VI and VII imbricated, without membranous intersegmental tissue; hairs on I-IV also on non-sclerotic parts. Tergite VIII separated by membranous tissue from VII, imbricated, pale brown but the tubercles brown; broadly rounded posterior margin of VIII with four nipple-shaped, tapering tubercles, the two lateral ones with inwardly curved tips, imbrications dorsally with blunt spinulae but distally some spinulae acute, ventral imbrications with finer acute spinulae, less than 1  $\mu$  long, each tubercle with 2-3 hairs; spinal tubercles symmetrical in the middle touching each other over some distance, at base even fused over a distance of 23  $\mu$ , dorsal imbrications coarse, at most each with one spinule, ventral imbrications finer, crenate or, especially at base, with acute spinulae, at tip each tubercle with one hair; length of lateral tubercles 175  $\mu$ , spinal 98  $\mu$ , length of hairs 7-10  $\mu$ . Ventral abdominal hairs acute, 10-12  $\mu$  long; sternite V pleurally with an oval area, 50  $\mu$  wide, with spines, the longest 3-5  $\mu$ , and each with two acute hairs. Thoracic and abdominal stigmal plates very pale brown. Cauda constricted to form an oval-shaped knob; length of knob 1.1 times of greatest width, dorsally in the middle with a colourless smooth area, the rest brown with imbrications and spinulae in distal half, ventrally imbrications with mainly acute spinulae; knob with 11 hairs, the longest 48  $\mu$ , the shortest 32  $\mu$ ; length of cauda 116  $\mu$ , of caudal knob 78  $\mu$ . Subanal plate brown, spinosely imbricated, indented to form two well-defined lobes, each lobe with 6-7 hairs, the longest 58  $\mu$ , the shortest 40  $\mu$ . Subgenital plate pale brown, spinosely imbricated with seven anterior and six posterior hairs, the longest 30  $\mu$ , the shortest 22  $\mu$ . Gonapophyses four, the inner two each with one hair, the outer two each with 3-4 hairs, longest hair about 20  $\mu$ .

Alatae viviparae, one aptera vivipara and larvae were the morphs collected from the lower side of leaves of *Syzygium racemosum* (Bl.) DC. by D. Noordam in three samples.

Etymology. — The specific name *montanicola* refers to the fact that this species is living in mountains.

**Taiwanaphis pseudocaudata** spec. nov.  
(figs 12, 13)

Types. — Holotype: ♀ (alata vivipara) from *Syzygium syzygioides* (Miq.) Amsh., Bogor (Kebun Raya), Java, no. 1099-1-1, 6.xi.1977, leg. D. Noordam. Paratypes: 34 alatae viviparae, and 16 larvae of alatae viviparae of fourth instar, same locality and host plant as holotype, no. 775, 30.ix.1976, no. 796, 9.xi.1976, no. 834, 23.xii.1976, no. 1099, 6.xi.1977, no. 1169-2, 12. xii.1977, leg. D. Noordam. Holotype and paratypes in the collection of the Rijksmuseum van Natuurlijke Historie, Leiden.

Alate viviparous female (fig. 12). — Colour in life: Head and prothorax yellow; mesothorax and abdomen orange, margins grey. Eyes red, triommatidia black. Antennal segment III black, IV-VI white, but distal ends of IV and V black and processus terminalis grey, VI sometimes completely black. Legs grey to yellow, tarsi black. Cauda and siphunculi grey. Veins of forewing bordered with grey or black, pterostigma black. Brown patch at distal end of cubitus-1 vein of forewing asymmetrical, only present on basal side.

Macerated specimens (described from 35 specimens): Body length 1.07-1.60 mm. Head across eyes 285-385  $\mu$  wide. Dorsum of head posterior to antennal bases, around lateral ocelli and the area between the eyes and the triommatidia brown, the rest colourless. Frons projecting about 3  $\mu$ , and 100  $\mu$  wide, slightly wrinkled, in the middle with two acute hairs, 4-8  $\mu$  long. Medial to the antennal bases and posterior to the frontal hairs, one acute hair on a slightly wrinkled area. Posterior to the frontal hairs 2-3 interocellar hairs and 4-5, in exceptional cases three or six, acute, interocular hairs, 5-8  $\mu$  long. Head ventrally marginally anterior and posterior to eyes, and anterior to median ocellus with some brown, rest colourless, with wrinkles around median ocellus and posterior to antennal bases, rest smooth; one pair of hairs ventral to the frontal hairs, a second pair posterior to them, lateral to the median ocellus; posterior to each of the antennal bases 1-3 hairs, acute, 8-18  $\mu$  long. Antennae six-segmented, 0.85-1.13 mm long; body 1.2-1.5 times and head across eyes 0.30-0.37 times as long as the antennae; primary rhinaria on antennal segments V and VI ciliated; III on ventral, lateral and dorsal sides with 20-39 non-ciliated, transverse or narrowly transverse, elliptic rhinaria, distributed over the whole length. Antennal segments I-III, distal 1/3 of IV and V and considerable part of base of VI black to brown; base of IV, V and VI colourless, processus terminalis paler brown. Antennal segment I spinulosely imbricated, dorsal spinulae blunt, ventral somewhat acute; II imbricated dorsally and ventrally with few spinulae; III ovate but imbrications indistinct owing to great length, extending to medial and lateral sides for about 2  $\mu$ , almost without spinulae; imbrications on IV-VI extending for about 2  $\mu$ ; antennal hairs acute, on III 5-10  $\mu$  long. Length of III 297-420  $\mu$ , IV 109-160  $\mu$ , V 113-150  $\mu$ ,

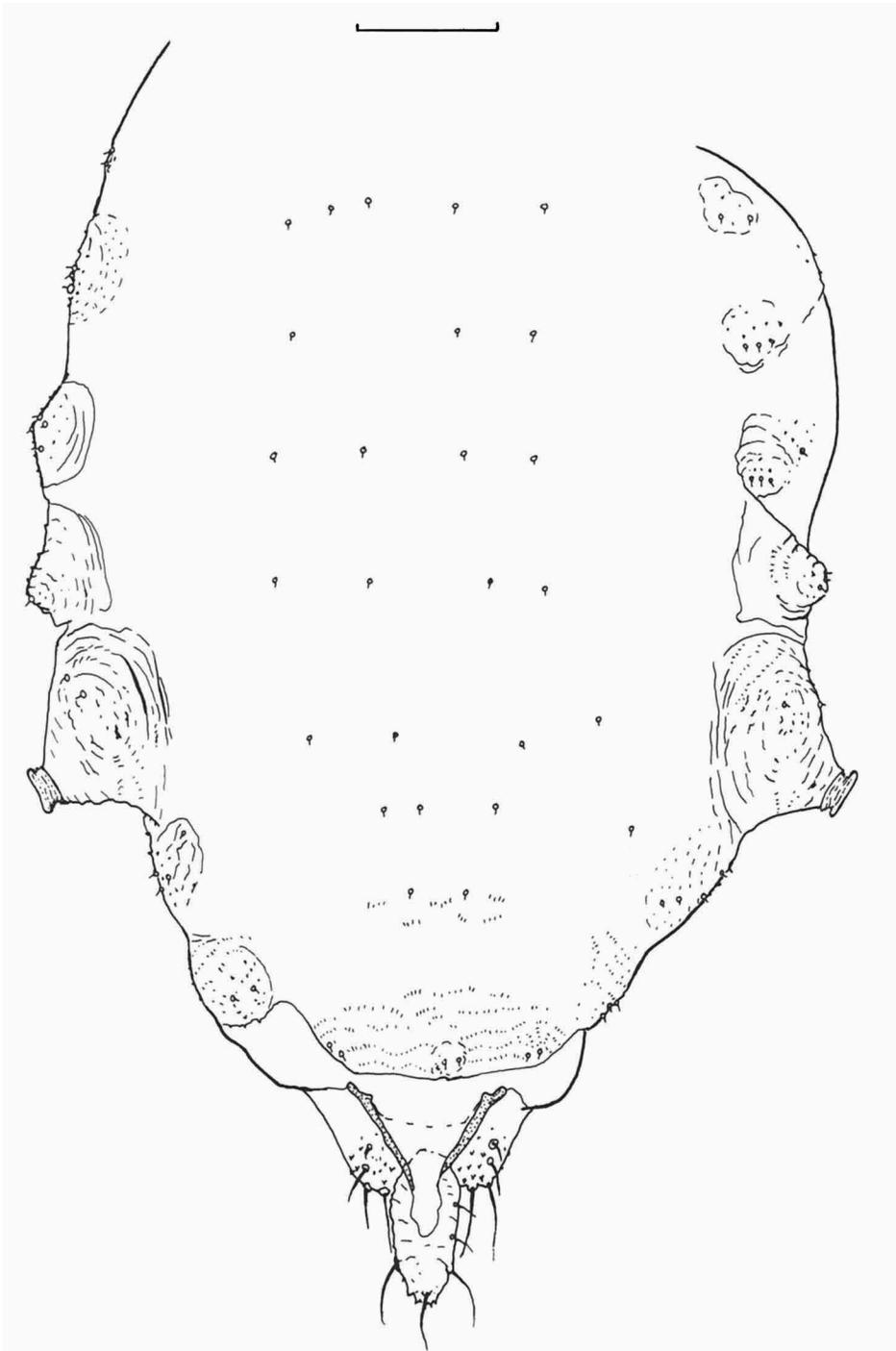


Fig. 12. *Taiwanaphis pseudocaudata* spec. nov., alata vivipara, abdomen, dorsal side. The scale represents 0.1 mm.

base of VI 104-150  $\mu$ , and processus terminalis 121-185  $\mu$ . The processus terminalis is 1.2-1.4 times as long as the base of the segment, III is 2.1-2.8 times as long as the processus terminalis, 2.3-3.0 times as long as V, and 2.1-3.2 times as long as IV. Rostrum does not reach mid-coxae, stylets are 340-395  $\mu$  long, ultimate rostral segment 55-68  $\mu$  long, colourless, brown at tip, without accessory hairs, 0.76-0.91 times the length of the second tarsal segment of the hind leg, longest hairs 15-22  $\mu$ . Eyes compound, triommatidia brown. Prothoracic marginal sclerites brown, anterior tubercle 10-15  $\mu$  high, 40  $\mu$  wide, and a posterior tubercle 5-10  $\mu$  high, 50  $\mu$  wide, both strongly wrinkled, in the middle area sometimes with some spines 1-7  $\mu$  long; marginal sclerite with 5-9 hairs on each side, two of which on the anterior tubercle; dorsum colourless with 3-8 hairs, of which 0-2, usually two, on the anterior part; all prothoracic marginal and dorsal hairs acute, 3-7  $\mu$  long. Mesothoracic marginal sclerites colourless, smooth, with 7-11 hairs, acute, 5-12  $\mu$  long; mesonotum pale brown with 10-24 acute hairs, 5-7  $\mu$  long. Forewing media branched twice, hind wing with two oblique veins. Leg I with femora dorsally and tibiae brown, basal half of tibia darker; legs II and III evenly very pale brown, the tarsi distally slightly darker; femora ventrally and dorsoapically spinosely imbricated; tibiae of leg I dorsally at base usually with some imbrications with 10-15 spinulae which are 0.5-2  $\mu$  long; other tibiae have basal part smooth and imbrications more distally with 1-3 spinulae which increase in size to the distal end and are always single, and densely distributed, up to 13  $\mu$  long; first tarsal segment of leg I with 4-5 hairs, of legs II and III with four and, in exceptional cases, with three or of leg II with five hairs, one hair about half the length of the others; second tarsal segments of all legs distinctly imbricated with 10-20 spinulae; one dorsoapical hair of second tarsal segments of the legs I and II larger than the other dorsal hairs, of leg III all dorsal hairs of the same type, the apical 15-20  $\mu$  long; empodial hairs expanded, about 17  $\mu$  long. Length of hind leg segments: femur 240-330  $\mu$ , tibia 425-555  $\mu$ , first tarsal segment 25-31  $\mu$ , second 66-78  $\mu$ . Abdominal marginal sclerites pale brown, but of IV and V (with the siphunculi) brown, I with an almost flat spinulose plate, II raised about 8  $\mu$ , III 10-25  $\mu$ , IV 20-40  $\mu$  and about 60  $\mu$  wide at base, VI 8  $\mu$ , VII almost flat, all spinulosely imbricated, I on each side with 1-3 hairs, II-IV with 3-5, VI 3-6, VII 2-4, no submarginal hairs, but on I one hair frequently beside the sclerite. Siphunculi cone-shaped, smooth, at most with some wrinkles, but on the anterior side with a spinulose, wrinkled tubercle 10-20  $\mu$  high, 60-100  $\mu$  wide, corresponding to marginal tubercles on other segments, 1-2 hairs on the tubercle, usually 2-3 on the cone of the siphunculus; anterior to the flange about ten rings with few interconnections, diameter of siphunculus at base 120-200  $\mu$ , flange 30  $\mu$ , smallest diameter anterior to flange 20  $\mu$ . Abdominal

tergites colourless, usually I with 4-6 hairs, II and III with 4-5, IV with 3-5, V 4-5, VI 2-5, VII two acute hairs, on IV 5-9  $\mu$  long. Abdominal tergite VIII with a more or less straight posterior margin with, on each side, an area about 10  $\mu$  high, 50  $\mu$  wide, more distinctly spinulose, each with 2-3 hairs, spinally a tubercle 4-20  $\mu$  high, the lower tubercles pointing upwards, higher tubercles caudad or rostrad, with two hairs; on VIII hairs acute, 5-12  $\mu$  long. Ventral abdominal hairs acute, on segment IV longest 20-30  $\mu$  long, shortest 9-18  $\mu$ . Sternite V with indistinct spinulose patches. Stigmal plates pale brown. Cauda constricted to form an oval-shaped knob; length of knob 1.5-2.4 times of greatest width, dorsally at base in the middle a colourless smooth area which also covers the whole dorsal side of the base of the cauda, rest of knob dorsally brown with smooth imbrications and some spinulae at apex; ventral imbrications mostly with acute spinulae, largest at apex; knob with 7-9 hairs, the longest 42-56  $\mu$  long, the shortest 17-27  $\mu$ ; length of cauda 111-160  $\mu$ , of caudal knob 73-103  $\mu$ . Subanal plate brown, spinosely imbricated, indented medially to form two well-defined lobes, each lobe with 5-7 hairs, the longest 42-55  $\mu$  long. Subgenital plate pale brown with 2-4 anterior hairs and 3-9 posterior hairs, the longest 17-37  $\mu$ , the shortest 10-23  $\mu$ . Gonapophyses four, the inner two each with one or, in exceptional cases, no hairs, the outer two each with 2-3 hairs, longest 17-22  $\mu$ , shortest 10-17  $\mu$ .

Larva of alate viviparous female, fourth instar (fig. 13). — Colour in life: Yellow, tarsi and distal parts of antennae grey. Macerated specimens (described from 16 specimens): Body length 0.92-1.47 mm. Head across eyes 275-342  $\mu$  wide. Dorsum of head almost colourless. Median frontal tubercle produced 5-10  $\mu$ , about 50  $\mu$  wide and more or less divided by the median suture, wrinkled, with two blunt hairs which are 3-4  $\mu$  long; dorsally near the anterior part of each antennal base a tubercle, 7-13  $\mu$  high, 20-25  $\mu$  wide, pale brown, wrinkled and each with one blunt hair; rest of head dorsally smooth, with one hair posterior to each of the frontal hairs, and four interocular hairs. The frontal tubercle proceeds to the ventral side, with a pair of blunt hairs just posterior to the frontal hairs and of the same length, one pair of hairs more posterior and longer and, closer to the antennal bases, one hair, about 15  $\mu$  long on each side. Antennae three-segmented, 640-780  $\mu$  long; body 1.3-1.9 times, head across eyes 0.37-0.49 times as long as the antennae; antennal segment III 4.1-4.8 times the length of the processus terminalis; primary rhinaria non-ciliated; antennae imbricated without distinct spinulae, at base almost colourless but brown in the distal half; antennal hairs usually blunt, 4-7  $\mu$  long. Ultimate rostral segment 53-60  $\mu$  long, 0.74-0.82 times the length of the second tarsal segment of the hind leg, without accessory hairs; longest hairs 13-25  $\mu$  long; stylets 340-395  $\mu$  long. Eyes compound, with pale brown triommatidium. Pro-

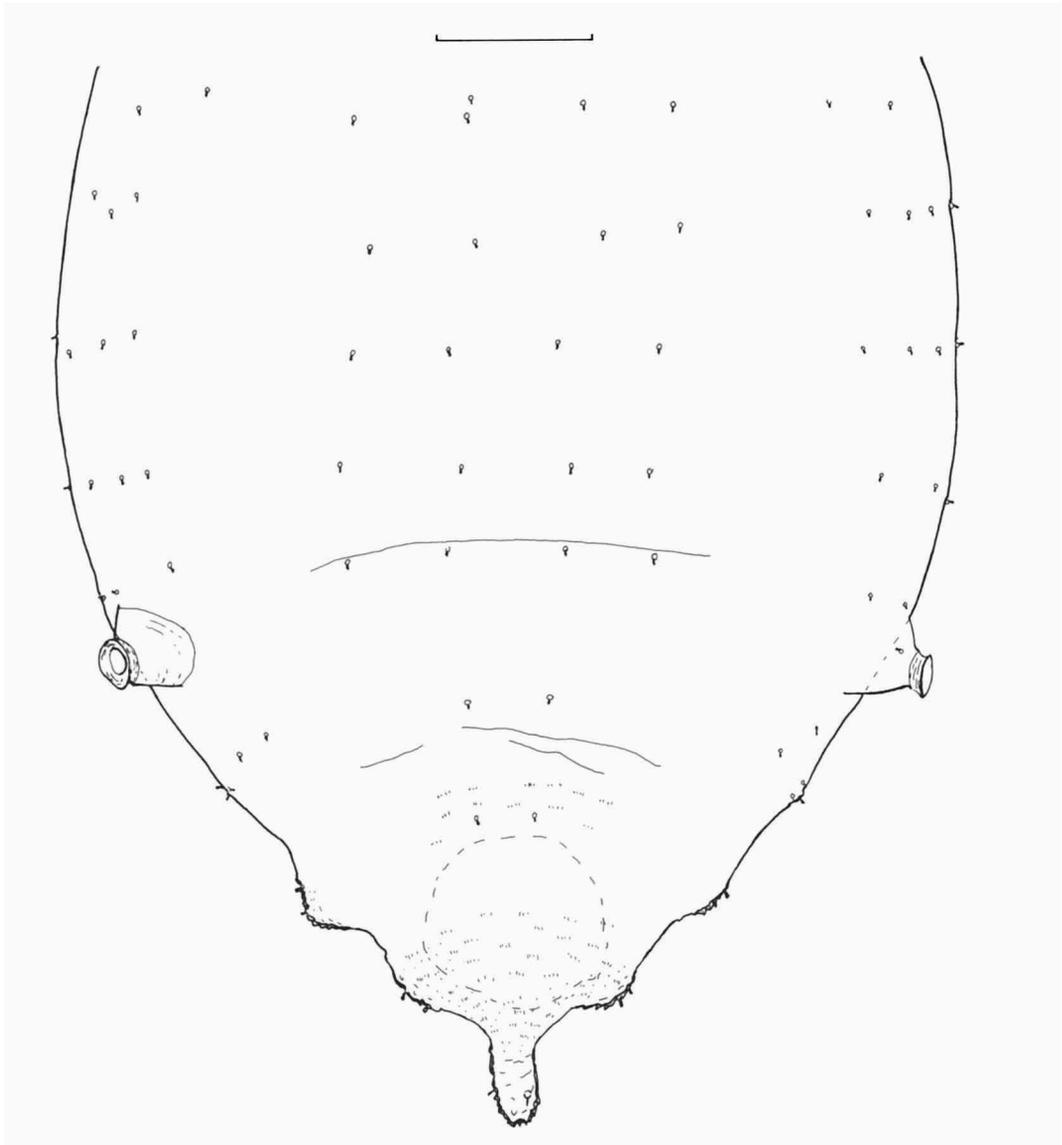


Fig. 13. *Taiwanaphis pseudocaudata* spec. nov., alata vivipara fourth (last) instar larva, abdomen, dorsal side. The scale represents 0.1 mm.

thorax colourless, wrinkled; marginal sclerites without tubercles, with 5-7 hairs, one of these medial to the triommatidium, hairs like all marginal and dorsal hairs blunt, slightly wider at tip than at base; 3-7 spinal hairs, one or two of which are anterior; mesothorax and metathorax colourless, without

spinulae, mesothorax with three marginal hairs on each side and 6-10 spinal hairs, methathorax with three marginal hairs on each side and 4-6 spinal hairs. Legs almost colourless, the tarsi distally pale brown; femora dorsoapically and ventrally finely spinosely imbricated; hairs blunt or acute, tibiae of leg I dorsally at base with some spinulae, distally with imbrications and spinulae; bases of other tibiae smooth, distally with some spinulae up to about  $3\ \mu$  long; hairs dorsally at base of tibiae blunt, all other hairs acute, distal part of tibiae III dorsally with six enlarged acute hairs which are up to  $45\text{-}50\ \mu$  long; first tarsal segment of leg I with 4-5 hairs, of leg II with four or, in exceptional cases, five hairs, and of leg III with four or, very occasionally, three hairs, one hair two or three times shorter than the others; second tarsal segments of all legs imbricated with a few spinulae; one dorsoapical hair of legs I and II enlarged,  $11\text{-}17\ \mu$  long; second tarsal segment of the hind leg dorsally with six enlarged acute hairs, up to  $43\text{-}50\ \mu$  long; empodial hairs expanded, about  $18\ \mu$  long. Length of hind leg segments: femur  $210\text{-}260\ \mu$ , tibia  $300\text{-}380\ \mu$ , first tarsal segment  $27\text{-}30\ \mu$ , second  $68\text{-}78\ \mu$ . Abdominal segments I-IV without marginal tubercles, imbrications or spinulae, segment VI with marginal tubercle, at most  $5\ \mu$  high,  $25\ \mu$  wide with some wrinkles, tubercle of VII  $18\ \mu$  high,  $40\ \mu$  wide, spinulosely imbricated; segment I with 2-3 marginal hairs, 4-6 spinal hairs, II-IV 3-4 marginal and 4-5 spinal hairs, VI 3-5 marginal, 2-4 spinal hairs, VII 2-3 marginal, two spinal hairs. Siphunculi on V, pale brown, cone-shaped, somewhat wrinkled, without a tubercle, anterior to the flange with about ten rings, about  $80\ \mu$  wide at base, the flange  $27\ \mu$ , narrowest diameter anterior to the flange  $18\ \mu$ , 3-5 hairs on the cone of the siphunculi, spinally on V four hairs. Abdominal tergite VIII colourless with, on rounded posterior margin, three pale brown tubercles; the two lateral ones  $8\ \mu$  high,  $50\ \mu$  wide, with imbrications and spinulae, each with 2-3 hairs; spinal tubercle  $52\text{-}63\ \mu$  long,  $25\ \mu$  wide, but distally usually  $2\text{-}4\ \mu$  wider, the base gradually merging into the posterior margin of the segment, dorsally with fine imbrications and spinulae at base, more distinct apically; ventral imbrications more distinct and with coarse, blunt or acute spinulae at apex, about  $5\ \mu$  long, the tubercle with two hairs in the apical part; length of hairs on VIII  $5\text{-}13\ \mu$ . Ventral abdominal hairs acute, on IV  $7\text{-}10\ \mu$  long; sternite V pleurally with an oval area with spinulae at most  $2\ \mu$  long and with 2-4 hairs. Thoracic and abdominal stigmal plates colourless. Cauda with 5-7 hairs, longest  $22\text{-}30\ \mu$ , shortest  $10\text{-}17\ \mu$ ; subanal plate without lobes, with 6-10 hairs, the longest  $20\text{-}30\ \mu$ , the shortest  $10\text{-}15\ \mu$ , and the genital plate posteriorly with 1-4, anteriorly with 1-6 hairs, the longest  $12\text{-}15\ \mu$ , the shortest  $6\text{-}10\ \mu$ .

Alatae viviparae and larvae were the only morphs collected from main and marginal veins of the upper and lower sides of new leaves, and from develop-

ing sprouts of *Syzygium syzygioides* (Miq.) Amsh. by D. Noordam in five samples. One sample collected by Van der Goot was dated 20.viii.1918, from leaves of *Ficus*, but a mistake in host plant does not seem to have been excluded.

**Etymology.** — The specific name *pseudocaudata* was given because the larvae have a cauda-like processus.

## DISCUSSION

The alatae viviparae of the *Taiwanaphis* species frequently show only minor differences which enable the species to be distinguished from one another. In contrast, the apterae exhibit an enormous variety of lateral tubercles which allows one to distinguish several species at a glance. In five species of the genus, however, this morph is unknown. Of the five Javan species, only one aptera is known, and even this specimen may show larval characters in, for example, the antennae. But in all five species, larvae of alatae viviparae are present and of these, especially the last (fourth) instars are very similar to apterae as far as the lateral tubercles are concerned. A description of the last larval stage of the alatae viviparae is therefore given in this paper, together with a key. Apterae of *T. decaspermi* conform to the last instar larvae of alatae viviparae of *T. atuberculata* in that lateral tubercles are almost lacking in both species.

All other species of *Taiwanaphis* (only *T. randiae* Ghosh, Banerjee & Raychaudhuri is not known to us) have distinct lateral tubercles or a caudospinal tubercle on tergite VIII of the abdomen. The specimens of *T. decaspermi* Takahashi located in the collection of the second author, differ from *T. atuberculata*; for example: the first tarsal segment of the hind leg has four hairs, in *T. atuberculata* three; stylets measure 450-515  $\mu$ , in *T. atuberculata* 300-350  $\mu$ ; abdominal tergite VI in alatae viviparae has 11-13 hairs, in *T. atuberculata* 5-6; antennal segment III has 11-18 rhinaria, in *T. atuberculata* 21-39. *T. kalipadi* (Raychaudhuri & Ghosh) was described from India (Raychaudhuri & Ghosh, 1964); the apterae have lateral tubercles on abdominal segments VI-VIII, and one conical caudospinal tubercle, on VIII, which distinguishes this species from all others. *T. randiae* from India (Ghosh et al., 1971) could be characterized more accurately if the collected nymphs next to the alatae viviparae were also described. *Taiwanaphis dineni* Mandal, Agarwala & Raychaudhuri was described from India (Mandal et al., 1979), and is said to have marginal tuberculate sclerites on abdominal segments I-IV. All other specimens were originally described in *Sensoriaphis*: *S. nothofagi* Cottier (Cottier, 1953), *S. tasmaniae* Carver & Martin (Carver & Martin, 1962,

1965), *S. furcifera* Carver & White (Carver & White, 1974) and *S. niuginii* Carver (Carver, 1978). We transfer these species to *Taiwanaphis*. These four species, in the apterous viviparous and larval morphs, all have caudospinal tubercles on tergite VIII and frequently lateral abdominal tubercles on several segments, or lateral tubercles even on thoracic segments; there is a variation in shape and length of the tubercles in apterae viviparae; and in alatae viviparae, hairs are usually longer and stouter than in the species from Java: hairs on abdominal tergite VIII are 15-35  $\mu$ , on IV 15-28  $\mu$ , while in the Javan species they are 5-14  $\mu$  and 5-9  $\mu$  respectively. The length of stylets measured in some specimens of *T. furcifera* was 570-620  $\mu$ , in *T. niuginii* 650  $\mu$ , in *T. tasmaniae* 450-535  $\mu$ , in *T. nothofagi* 400-450  $\mu$ , while in the Javan species the stylets are shorter than 400  $\mu$ , except in *T. montanicola* with length of 405-510  $\mu$ .

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#### REFERENCES

- Carver, M., 1978. A new species of *Sensoriaphis* from New Guinea (Homoptera, Aphididae). — Pacific Insects 19: 31-38.
- Carver, M. & D. Hales (née White), 1974. A new species of *Sensoriaphis* Cottier, 1953 (Homoptera, Aphididae) from New South Wales. — J. Ent. (B) 42: 113-125.
- Carver, M. & E. J. Martin, 1962. A new species of *Sensoriaphis* Cottier (Homoptera; Aphididae). — Proc. R. Ent. Soc. Lond. (B) 31: 95-98.
- Carver, M. & E. J. Martin, 1965. Description of a new aphid genus from Australia and of the alate viviparous female of *Sensoriaphis tasmaniae* Carver & Martin, 1962 (Homoptera, Aphididae). — Proc. R. Ent. Soc. Lond. (B) 34: 38-47.
- Cottier, W., 1953. Aphids of New Zealand. — N. Z. Dept. Sci. Industr. Res. Bull. 106: 1-382.
- Franssen, C. J. H., 1932. Die Lachninen Javas. — Natuurhist. Maandbl., Maastricht 21(7): 89-91.
- Ghosh, A. K., H. Banerjee & D. N. Raychaudhuri, 1971. Studies on the aphids (Homoptera, Aphididae) from Eastern India. V. New species, new subspecies, new records and sexual forms of some species of aphids from Nefa and Assam. — Oriental Insects 5(1): 103-110.
- Goot, P. van der, 1917. Zur Kenntnis der Blattläuse Javas. — Contrib. Faune Indes Néerl. 1(3): 1-301.
- Mandal, P. K., B. K. Agarwala & D. N. Raychaudhuri, 1979. New aphids (Homoptera, Aphididae) from Sikkim, Northeast India. — Entomon 4 (2): 189-195.
- Raychaudhuri, D. N. & A. K. Ghosh, 1964. Additions to the aphid fauna of North East India. — Zool. Med. Leiden 39: 257-262.
- Takahashi, R., 1934. Two new genera of Aphididae (Hemiptera). — Stylopus 3 (3): 54-58.