

SYNOPTIC REVISIONS OF I. *LINDINGASPIS* AND II. *ANDASPIS* WITH TWO NEW ALLIED GENERA (HEMIPTERA : COCCOIDEA)

By D. J. WILLIAMS

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SYNOPSIS

Two new species of *Lindingaspis* MacGillivray are described and one redescribed together with notes on some other species. A key is given to 23 out of the total of 24 species now assigned to the genus.

Five species at present placed in *Lepidosaphes* Shimer are transferred to the genus *Andaspis* MacGillivray and four of these are redescribed. Descriptions of two new species are included and a key is given to all the species known at present. Two closely related genera are described as new, one of which is monotypic and the other containing two species.

INTRODUCTION

ALL references prior to 1956 are to be found in Morrison & Renk, 1957 : 734.

The lettering used in the figures is as follows :—A. Adult female, general aspect.
B. Pygidium. C. Dorsal margin of pygidium.

I. THE GENUS *LINDINGASPIS* MACGILLIVRAY (ASPIDIOTINI)

An excellent account was given by McKenzie (1950) of the genus *Lindingaspis* which then contained sixteen species. This number included the type species, *L. samoana* (Lindinger), which is still known only from a meagre description.

Balachowsky (1953c, 1958) has since described three new species from Africa and illustrated two others which were not available to McKenzie. Yet another has been described from Kenya by De Lotto (1957). In the present paper, descriptions of two new species are given, one from Kenya and the other from Ceylon, and opportunity is taken to redescribe *L. buxtoni* (Laing), a species not discussed by McKenzie (1950) but tentatively assigned to the genus earlier by McKenzie (1939). The latter species, known only from Samoa, probably comes closest to the type species, also from Samoa.

A total of twenty-four species is now known in *Lindingaspis* and a key to twenty-three of these is given on p. 10.

The writer wishes to express his gratitude to Professor H. L. McKenzie, of the University of California, Davis, California, for kindly examining the three main species discussed and for giving his valued opinions.

GEOGRAPHICAL DISTRIBUTION

There has been no further evidence of an extension in distribution since McKenzie's discussion. All that can be stated is that the genus is not of new world origin. In the Palaearctic Region it is represented only in Japan by *L. setiger* (Maskell). Apart from *L. rossi* (Maskell), which is now almost a cosmopolitan species, eleven are known from the Ethiopian Region, five from the Oriental Region and two from Australasia. In the Pacific area only Samoa is known to possess its own species of which two seem to be most closely related to *L. setiger* from Japan. If it is assumed that the latter species represents an extension of the genus from the Oriental Region, there is possible evidence here, in common with many other groups of insects, that the Pacific species of *Lindingaspis* are an off-shoot of those from the Oriental Region.

It seems obvious that many more species remain to be discovered. The Ethiopian Region will yield a good proportion of these but it is interesting that none has been discovered in the Malagasian area despite extensive collecting recently. Not a single species has been discovered in Indonesia or New Guinea but this is due probably to a lack of collecting as there are no ecological factors to exclude the group from these areas. The accompanying map (Text-fig. 4) shows the distribution based on holotype data. The known distribution of each species is given in the key.

LINDINGASPIS MacGillivray

Lindingaspis buxtoni (Laing)

(Text-fig. 1)

Chrysomphalus buxtoni Laing, 1927 : 40, 41.

Lindingaspis buxtoni (Laing) McKenzie, 1939 : 53.

Described originally from SAMOA : Malololelei, on the bark of a shrub, July, 1924. Laing has described the scale as " deep brown to black, subcircular to elliptical, flattish around the marginal area gradually rising to a very low nipple-like deep black excentric larval exuvium ; surface somewhat irregular and deposited in concentric layers. Size 4.5 mm. by 3 mm. in elliptical specimens, 3 mm. diameter in subcircular ones ". It is possible that the latter smaller scales are of the males.

Adult female as mounted on the slide, rather large and attaining a length of 2.5 mm., slightly longer than wide, becoming sclerotized at maturity. Prosoma without lateral tubercles. Pygidium wide, with distinctive pattern of sclerotization as shown in the accompanying illustration. Perivulvar pores in four groups, each anterior lateral group with 9-14 pores, posterior lateral groups each with 8-11 pores, occasionally a single pore between the anterior groups. Vulva situated about one third length of pygidium from base. Anal opening smaller in diameter than a median lobe situated at centre of pygidium. Lobes well developed, there being three

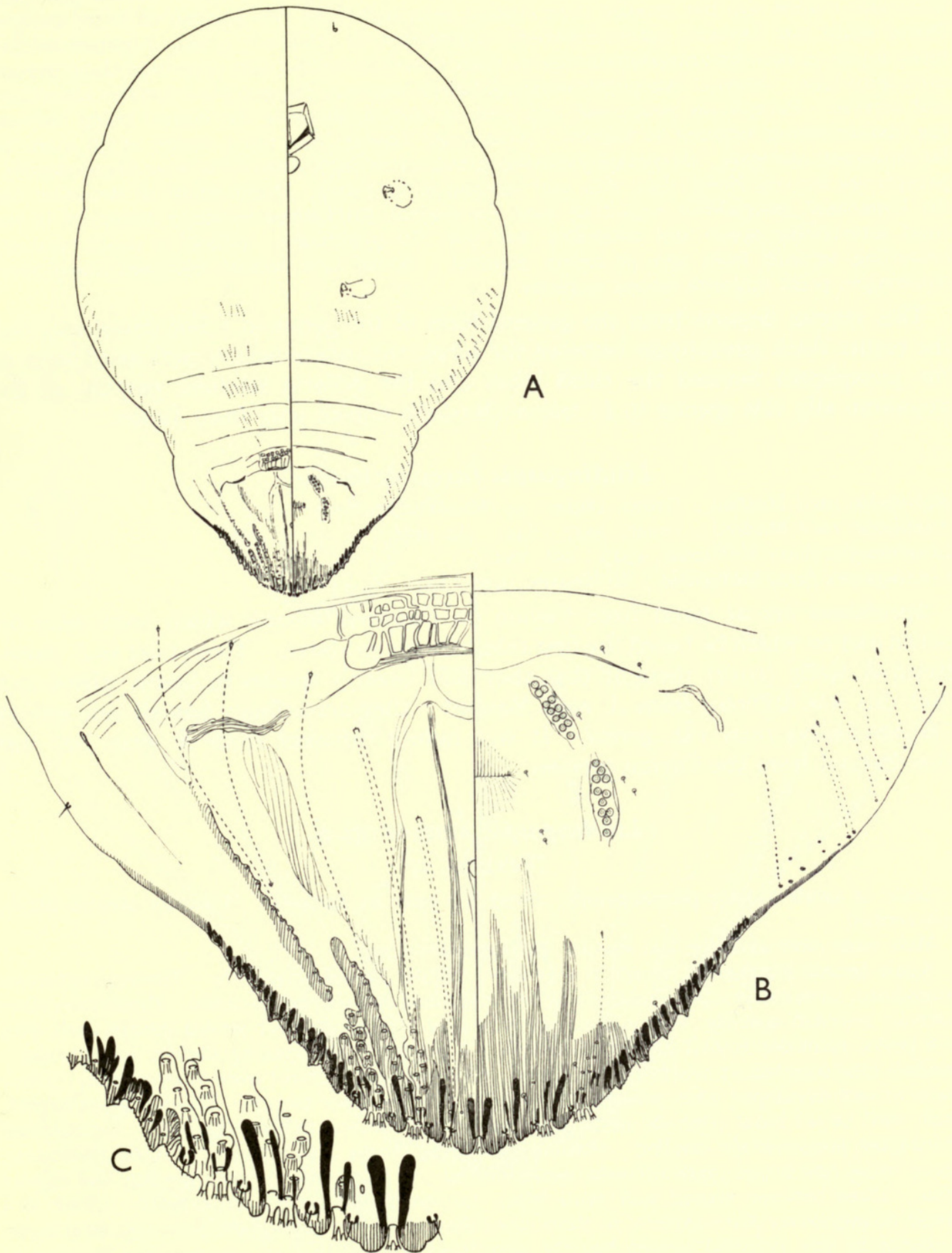


FIG. 1. *Lindingaspis buxtoni* (Laing)

pairs present, median pair longest, each with single notch on outer margin ; second and third lobes about same size but smaller than median pair, each with two notches on outer margin. Plates small but distinct, apices fimbriate, distributed as follows : a pair between median lobes, a pair in each first interlobular space, three in second interlobular space and three beyond each third lobe. Beyond this point to seta of fourth segment, the margin is heavily sclerotized and serrate. Paraphyses prominent and well developed, some of the largest being clavate, the distinguishing features as follows : paraphyses arising from inner angles of all lobes by far the largest and wide ; the paraphyses arising from outer angle of second lobe small and slender ; paraphyses beyond third lobes wide and tending to be fused. Dorsal ducts of two sizes but the large-sized macroducts departing from the normal distribution in being numerous in the third interlobular space and extending well into the pygidium ; without a series of ducts extending forward from seta of fourth segment ; dorsal and ventral marginal macroducts reaching to point opposite second spiracles.

This species departs from the general form of the genus in a few characters but the rather thick paraphyses between the lobes, the indeterminate and fused form of the paraphyses beyond the third lobes and the general sclerotic pattern of the pygidium ally this species to *L. setiger* (Maskell) known only from Japan.

Lindingaspis fusca McKenzie

Aspidiotus rossi Maskell ; Green, 1896e : 45 (Misidentification).

Aspidiotus rossi Maskell ; Green, 1937 : 831. (In part.)

Lindingaspis fusca McKenzie, 1943 : 151, 152.

Lindingaspis fusca McKenzie ; McKenzie, 1950 : 101.

Specimens are at hand from Ceylon on *Capparis moonii* which were seen by Green and on which he based the first reference given above. These refer to *L. fusca*. Brain & Kelly (1917) thought that they had Green's species in South Africa and that this was different from *A. rossi* Maskell ; they accordingly named this species *Chrysomphalus rossi* var. *greeni*. It was indeed different from *A. rossi* but was also distinct from the Ceylon species.

Lindingaspis kenya sp. n.

(Text-fig. 2)

Scale of adult female purple-brown, about 2.0 mm. in diameter. Exuviae almost black, sub-central.

Male scale more elongate but smaller, light purple-brown.

Adult female attaining a length of 1.25 mm., slightly longer than wide. Thoracic tubercles prominent, situated at a point midway between the first and second spiracles. Pygidium rather narrow, rounded apically. Perivulvar pores in four groups, anterior lateral groups each with 5-8 pores, posterior lateral groups each with 3-6 pores. Anal opening slightly longer than a median lobe situated at centre of pygidium. Vulva situated nearer base of pygidium. Three pairs of well developed lobes present, all notched once on outer margin. Median lobes largest, each with broad basal sclerosis extending forward and as long as the lobe itself. Second and third lobes progressively smaller. Plates only slightly longer than lobes, with apices fimbriate ; there being one broad plate between median lobes ; a pair between each median and second lobe ; three between second and third lobes, the inner plate being quite small. There is a single membranous plate anterior to third lobe followed by two sclerotized plate-like structures. Anterior to this, pygidial margin heavily sclerotized and serrated to seta marking position of fourth segment. Paraphyses short as in accompanying diagram and with the following important characteristics : paraphyses arising from inner angle of median lobes slender and shorter

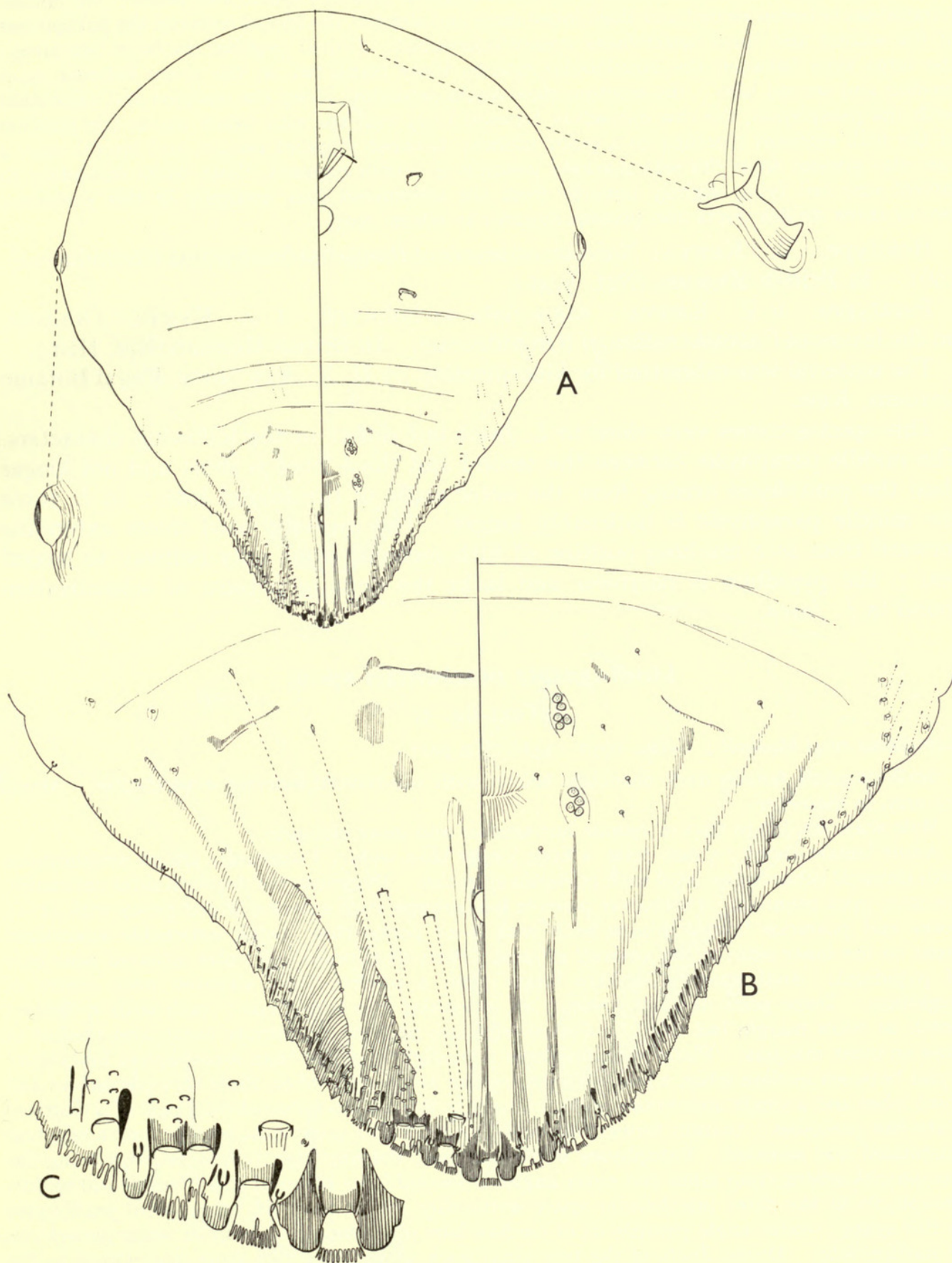


FIG. 2. *Lindingaspis kenyae* sp. n.

than basal scleroses ; those arising from outer angle of second lobes in two parts ; the middle paraphyses between second and third lobes short and slender, the spaces between the paraphyses of the second and third interlobular spaces sclerotized. Dorsal pygidial ducts of two sizes ; the large type between the interlobular spaces, there being two in the space between each median and second lobe ; the medium sized ducts extending along the margins and associated with the paraphyses, the row extending forward from near the seta which marks the position of the fifth segment reaching to a point midway between pygidial margin and lateral scar, a row also present from the seta marking position of fourth segment, these ducts extending to lateral scar but lying slightly inwards from the sclerotized area normally in this position ; two or three similar ducts also present anterior to lateral scar.

Holotype. ♀. KENYA: Nairobi, on leaves of *Rangaëris brachyceras* (Orchidaceae), 1961. In British Museum (Nat. Hist.).

Paratypes. 6 ♀. KENYA: same data as holotype. 1 ♀. KENYA: Nairobi, on the leaves of *Calanthe volkensii* (Orchidaceae). In British Museum (Nat. Hist.).

The material was submitted for identification by H. K. Airy Shaw, Royal Botanic Gardens, Kew.

This species comes very close to *L. fusca* but differs in the following characters. The middle paraphysis between the second and third lobes is short and not longer than the paraphysis arising from the outer angle of the second lobe ; in *L. fusca* the middle paraphysis is noticeably longer. The medium sized ducts extending forward from seta marking position of fifth segment reach only halfway to lateral scar ; the pygidium is narrower and lacks the definite pattern of sclerotization found in *L. fusca*.

Lindingaspis mackenziei sp. n.

(Text-fig. 3)

Aspidiotus rossi Maskell ; Green 1937 : 331. (In part.)

Scale of adult female dark chocolate-brown with sub-central exuviae even darker. About 2.5 mm. in diameter.

Male scale similar to that of female but smaller and more elongate.

Adult female about 1.5 mm. long, a little longer than wide. Prosomatic region membranous with thoracic tubercles on level with posterior spiracles. Pygidium narrow with sides noticeably concave, apex rounded. Perivulvar pores in four groups, each anterior lateral group with 11-16 pores and posterior lateral groups each with 5-11 pores, there being noticeable sclerotized areas on the inner sides of the anterior groups. Perivulvar pores and vulva situated near base of pygidium. Anal opening slightly larger than a median lobe, situated near centre of pygidium. Three pairs of lobes present, all of similar size and shape ; each with a distinct notch on outer margin but third lobe often with two notches ; a minute notch also present at base on inner margins. Plates well developed and slightly longer than lobes, apices fimbriate ; a pair between median lobes, a pair between median and second lobes, three between second and third lobes and a single membranous plate lateral to third lobes followed by a pair of sclerotized plate-like processes ; margin forward from these plates to a point near seta of fourth segment sclerotized and serrated. Paraphyses well developed, the important characteristics being the paraphyses arising from inner and outer angles of second lobes being of equal length and middle paraphysis in the third interlobular space noticeably longer than the two lateral paraphyses in this space ; outer angle paraphysis of median lobe much longer than inner angle paraphysis of median lobe. Dorsal ducts of the two usual sizes, there being two large macroducts in the second interlobular space ; a row of medium sized ducts extending forward from seta on fourth segment and row extending forward from near seta of fifth segment reaching a point about

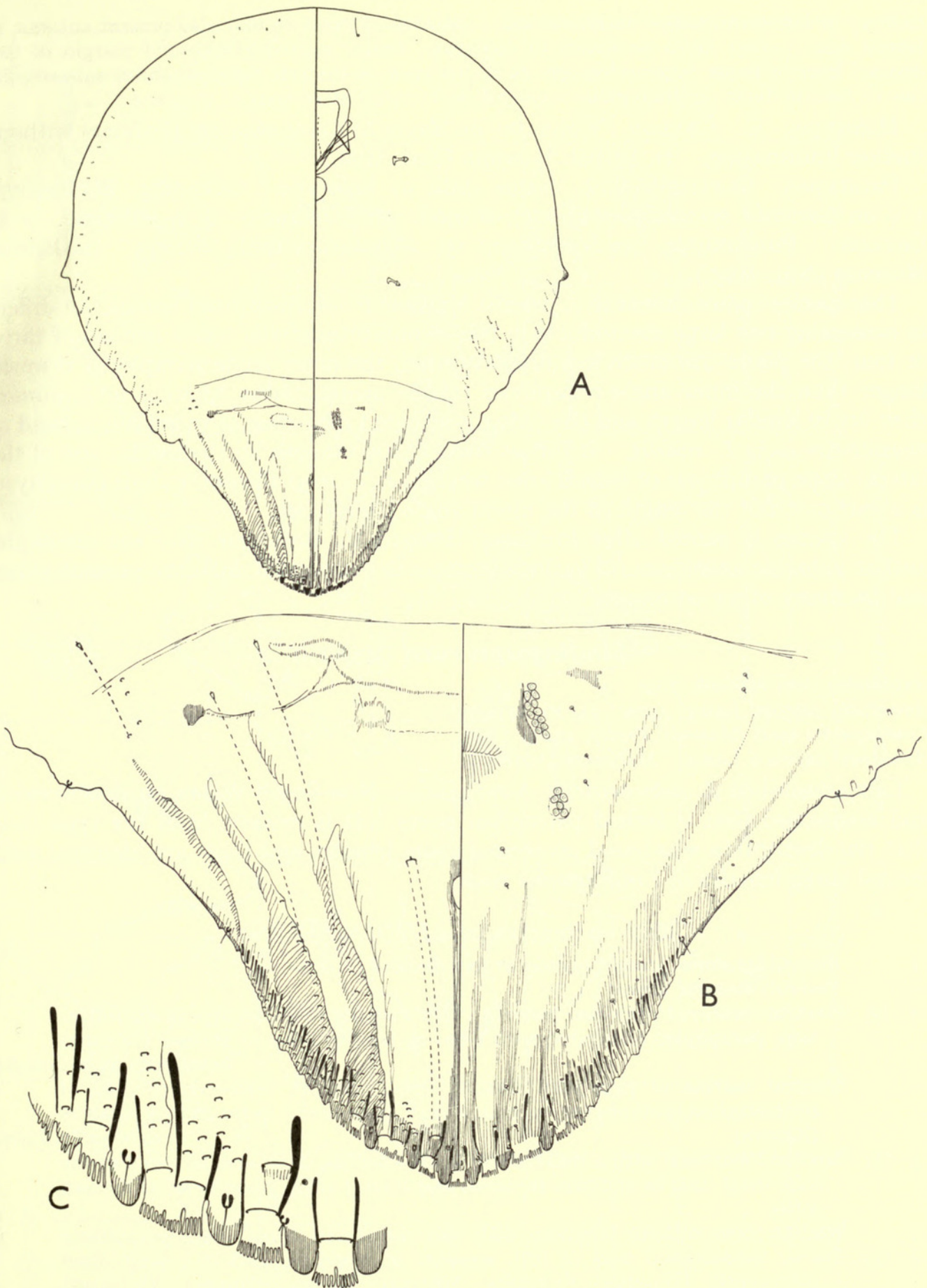


FIG. 3. *Lindingaspis mackenziei* sp. n.

halfway or less from margin to lateral scar ; a group of three or four also present anterior to lateral scar ; other ducts as shown in diagram. Dorsal microducts around margin of two distinct sizes, a larger type on margin as far forward as thoracic tubercle and a submarginal row of minute ducts on prepygidial segments and extending to apex of prosoma.

Holotype. ♀. CEYLON : Colombo, on leaves of *Cocos nucifera* (Palmae) without further information. In British Museum (Nat. Hist.).

Paratypes. CEYLON : 6 ♀. Same data as holotype. CEYLON : Peradeniya, 1 ♀ on *Garcinia spicata* (Guttiferae), ii.1900. 2 ♀, iii.1905. 4 ♀, viii.1907. 1 ♀, CEYLON : Pundaluoya, on *Nothopegia* sp. (Anacardiaceae), vi.1897. In British Museum (Nat. Hist.).

This species comes closest to *L. similis* McKenzie described from Samoa but differs in possessing two large macroducts in the second interlobular space instead of three or four, the plates are much less differentiated, the outer angle paraphysis is much longer than the inner angle paraphysis on the median lobes whereas in *L. similis* they are of similar length and the vulva is situated near base of pygidium instead of near centre as in *L. similis*. It differs from *L. tingi* mainly in the similar size of the lateral angle paraphysis of second lobes whereas in *L. tingi* the outer angle paraphysis is about one half the length of the mesal angle paraphysis.

The species is named after Professor Howard L. McKenzie who has given the author valuable assistance on various matters in connection with the present paper and on many other occasions.

Lindingaspis rossi (Maskell)

Aspidiotus rossi Maskell, 1891 : 3.

Aonidiella subrossi Laing, 1929 : 25, 26, **syn. n.**

Lindingaspis rossi (Maskell) Ferris, 1938a : 246.

Aonidiella subrossi Laing ; McKenzie, 1938 : 4.

Laing described *A. subrossi* from AUSTRALIA : New South Wales, on *Acacia rubra* and mentioned that it lacked perivulvar pores. It is evident from the type slide that the description was based on second stage females and these are identical with second stage females of *Lindingaspis rossi*.

KEY TO SPECIES OF *LINDINGASPIS*

- | | | |
|-------|---|-------------------------------------|
| 1 | Perivulvar pores present in four or five distinct groups | 3 |
| — | Perivulvar pores absent | 2 |
| 2 (1) | Ventral surface of pygidium beneath vulva with semi-circular area of sclerotization, paraphyses associated with lobes as long as lobes or shorter (GUINEA) | |
| | | <i>benaensis</i> Balachowsky |
| — | Ventral surface of pygidium beneath vulva without semi-circular area of sclerotization, paraphyses associated with lobes about twice as long as lobes (KENYA) | |
| | | <i>crocea</i> De Lotto |
| 3 (1) | Median lobes each with a well defined basal sclerosis, developed as much as the lobe itself, this in addition to mesal and lateral angle paraphyses of median lobes | 4 |
| — | Median lobes without scleroses, with only mesal and lateral angle paraphyses | 6 |
| 4 (3) | Dorsal submarginal zone of fifth segment of pygidium with 4-7 large sized macroducts (UGANDA, ETHIOPIA, SOMALIA, GHANA, NIGERIA, PRINCIPE, SOUTH AFRICA) | |
| | | <i>opimus</i> (Silvestri) |

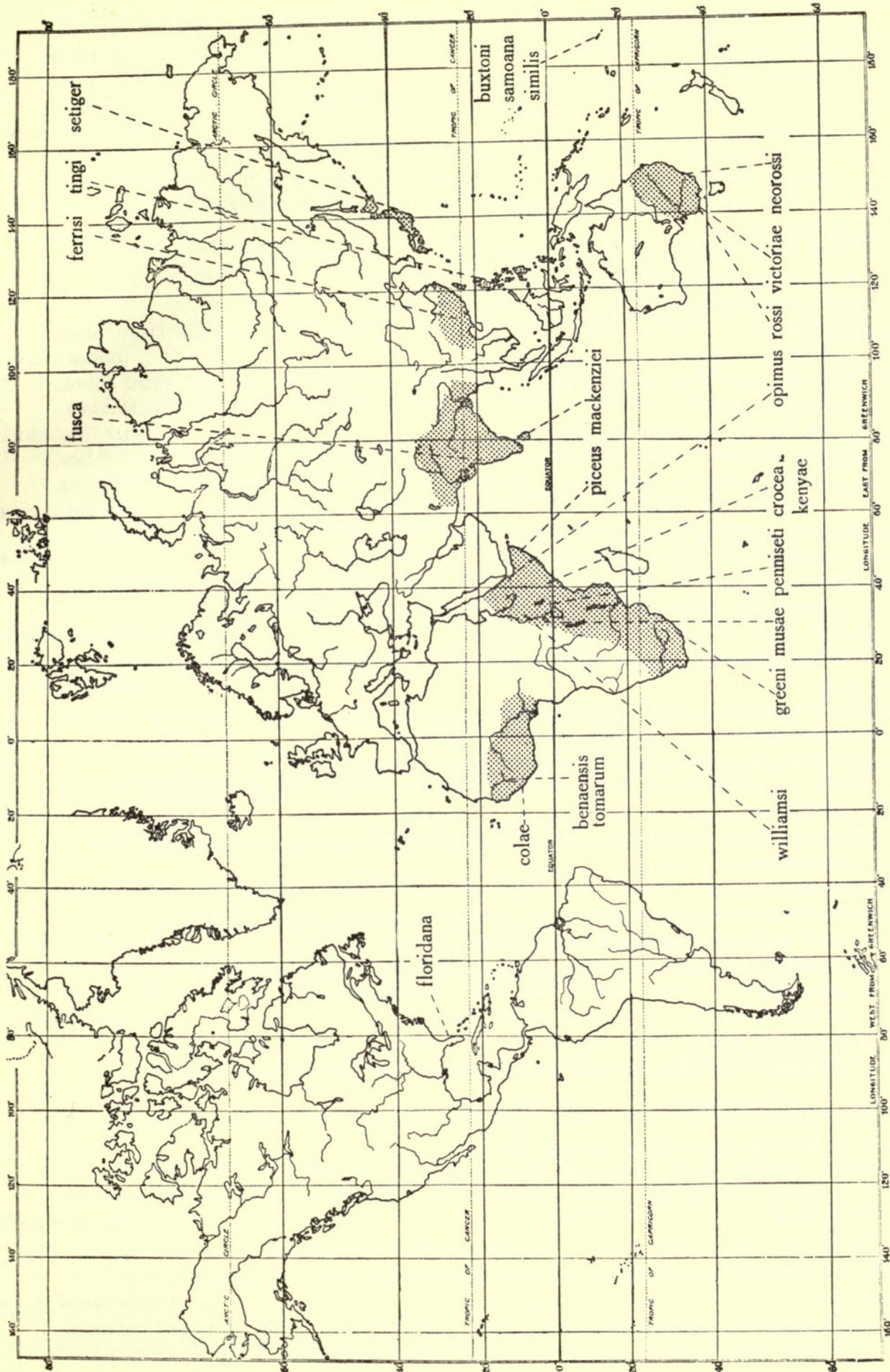


FIG. 4. *Lindingaspis*, geographical distribution.

- Without dorsal submarginal macroducts on segment five of pygidium 5
- 5 (4) Middle paraphysis between second and third lobes noticeably longer than
paraphysis arising from lateral angle of second lobes. With a row of
medium-sized ducts in fifth segment from margin to lateral scar (INDIA,
CEYLON) *fusca* McKenzie
- Middle paraphysis between second and third lobes about same size as paraphysis
arising from lateral angle of second lobes. With row of medium-sized ducts
on fifth segment reaching from margin to about half distance to lateral scar
(KENYA) *kenyae* sp. n.
- 6 (3) With fewer than three plates between second and third lobes 7
- With three plates between second and third lobes 9
- 7 (6) With two plates between second and third lobes 8
- With plates between second and third lobes fused into a single large plate
(SIERRA LEONE) *colae* (Laing)
- 8 (7) Without a median paraphysis in the space between second and third lobes.
Median ventral zone above median lobe with a longitudinal fusiform thicken-
ing (SOMALIA, UGANDA, KENYA) *piceus* (Malenotti)
- With a slender median paraphysis in the space between second and third lobes.
Median ventral zone above median lobe without a fusiform thickening
(TANGANYIKA, SIERRA LEONE, GUINEA, CONGO (Leopoldville)) *musae* (Laing)
- 9 (6) Median paraphysis between second and third lobes longer than paraphysis
arising from lateral angle of second pygidial lobe 11
- Median paraphysis between second and third lobes same size or shorter than
paraphysis arising from lateral angle of second pygidial lobe 10
- 10 (9) Lobes each with a lateral notch (SUDAN) *williamsi* Balachowsky
- Lobes asymmetrical and entirely without notches (UGANDA, CAMEROONS)
penniseti Hall
- 11 (9) With a series of medium-sized dorsal pygidial macroducts extending forward
from near seta of fourth abdominal segment 12
- Without this series of medium-sized dorsal macroducts. 16
- 12 (11) With 2-4 small dorsal ducts situated between margin and midline near base of
pygidium 13
- Without small dorsal ducts situated between margin and midline near base of
pygidium 14
- 13 (12) Paraphysis arising from outer angle of each second pygidial lobe longer than
that on inner side of this lobe ; posterior lateral groups of perivulvar pores
each with less than nine pores (INDIA, CHINA, FORMOSA) . *ferrisi* McKenzie
- Paraphysis arising from outer angle of each second lobe about same length as
paraphysis on inner side of this lobe ; posterior lateral groups of perivulvar
pores each with ten or more pores (JAPAN) *setiger* (Maskell)
- 14 (12) Paraphysis arising from lateral angle of second pygidial lobe about one-half
as long as paraphysis on inner side of this lobe (PHILIPPINE ISLANDS)
tingi McKenzie
- Paraphysis arising from lateral angle of second pygidial lobe about same length
as paraphysis on inner side of this lobe 15
- 15 (14) With three or four large-sized dorsal pygidial macroducts extending forward
between median and second lobes. Vulva situated near centre of pygidium
(SAMOA) *similis* McKenzie
- With two large-sized dorsal pygidial macroducts extending forward between
median and second lobes. Vulva situated near base of pygidium (CEYLON)
mackenziei sp. n.
- 16 (11) With ten or more medium-sized dorsal macroducts extending forward between
lateral paraphysis of second lobe and middle paraphysis between second and

- third lobes. Dorsal medium-sized macroducts on fifth segment distributed on the sclerotized zone and extending on to the membranous area (SOUTH AFRICA, UGANDA) **greeni** (Brain & Kelly)
- With less than ten dorsal intermediate macroducts extending forward between lateral paraphysis of second lobe and middle paraphysis between second and third lobes. Dorsal intermediate macroducts on fifth segment confined to sclerotized area 17
- 17 (16) With a submarginal lateral series of dorsal medium-sized pygidial macroducts originating at or near lateral scar and extending downwards 19
- Without a submarginal lateral series of dorsal medium-sized pygidial macroducts originating at or near lateral scar and extending downwards 18
- 18 (17) With a single membranous plate anterior to each third lobe. Ducts in row arising from between second and third lobes becoming progressively larger anteriorly (U.S.A., INDIA, MALAYA) **floridana** Ferris
- With three membranous plates anterior to each third lobe. Ducts in row arising from between second and third lobes of same size (GUINEA, SIERRA LEONE) **tomarum** Balachowsky
- 19 (17) Paraphyses arising from lateral angle of second lobe minute and shorter than neighbouring paraphyses (SAMOA) **buxtoni** (Laing)
- Paraphyses arising from lateral angle of second lobe long and slender, about same size as neighbouring paraphyses 20
- 20 (19) With only two or three large-sized dorsal pygidial macroducts in space between median and second lobes. Presence of similar large ducts at anterior end of row of ducts arising from between middle paraphysis between second and third lobes and mesal paraphysis of third lobes (AUSTRALIA, NEW ZEALAND, U.S.A., CEYLON, CHINA, JAPAN, PHILIPPINE ISLANDS, SOUTH AFRICA, SOUTHERN RHODESIA, TANGANYIKA, MAURITIUS, PORTUGAL, MADEIRA) **rossi** (Maskell)
- With four or more large-sized dorsal pygidial macroducts in space between median and second lobes. Row of ducts extending forward between middle paraphysis between second and third lobes and mesal paraphysis of third lobe of same size 21
- 21 (20) With 16 or more medium-sized ducts extending forward between inner angle paraphysis of third lobe and middle paraphysis between second and third lobes. With three recognizable plates beyond each third lobe (AUSTRALIA) **neorossi** McKenzie
- With less than 16 medium-sized ducts extending forward between inner angle paraphysis of third lobe and middle paraphysis between second and third lobes. With a single recognizable plate beyond each third lobe (AUSTRALIA) **victoriae** (Cockerell)

II. THE GENUS *ANDASPIS* MACGILLIVRAY WITH DESCRIPTIONS OF TWO NEW ALLIED GENERA (DIASPIDINI)

In a revision of the genus *Andaspis*, Rao & Ferris (1952) assigned to it a total of ten species. Since then further species have been added which, together with others transferred from *Lepidosaphes* in the present paper, and two new species, give a total of twenty-two species now in the genus.

It is not the intention here to enlarge on the definition of the genus given by Rao & Ferris. As these authors have pointed out, the type species of the genera *Andaspis* and *Lepidosaphes* are quite different but the difficulty is to determine a

point at which these genera can best be separated. The most important character clearly separating the two genera is the shape of median lobes. In a key to genera, Hall (1946) has given an excellent definition of the median lobes in *Andaspis* as being "close together, with inner margins straight, diverging slightly apically before curving round to a long oblique outer margin". This outer margin has numerous notches and the normal lateral margin is either short or non-existent. In *Lepidosaphes* and its nearest relatives the median lobes have one or two notches on the outer margins but the sides always show some signs of being parallel. There are possibly intermediate forms at present placed in the genus *Lepidosaphes* but until this genus is revised the following species are best retained in *Andaspis*.

The type species is almost cosmopolitan but its most important and interesting distribution is in the Oriental Region. Another species, described from U.S.A., is known from Hawaii but is recorded by Zimmerman (1948) as being intercepted from the Philippine Islands and Singapore at Hawaii. It is expected that this species will be found eventually in the Oriental Region. Of the remaining species three are known from Japan and these may be regarded as an extension of the twelve species known from the Oriental Region. Two have been described from the Australasian Region and three from the Ethiopian Region which include one from Mauritius as a representative of the Malagasian area. As is common with many groups within the Coccoidea none has yet been described from Indonesia, the Philippine Islands or New Guinea, although doubtless in due course some interesting forms will be discovered in these areas. It seems possible, however, that the genus has had its origin in the Oriental Region and the numbers now known from there represent a small fraction of those still to be discovered.

Included in the present revision are descriptions of two new genera which come close to *Andaspis*. One of these is represented by a single species from West Pakistan. The other genus contains two species, one from Northern Australia and the other from Java. Both of these genera come within the known range of distribution of *Andaspis*.

ANDASPIS MacGillivray

***Andaspis dasi* sp. n.**

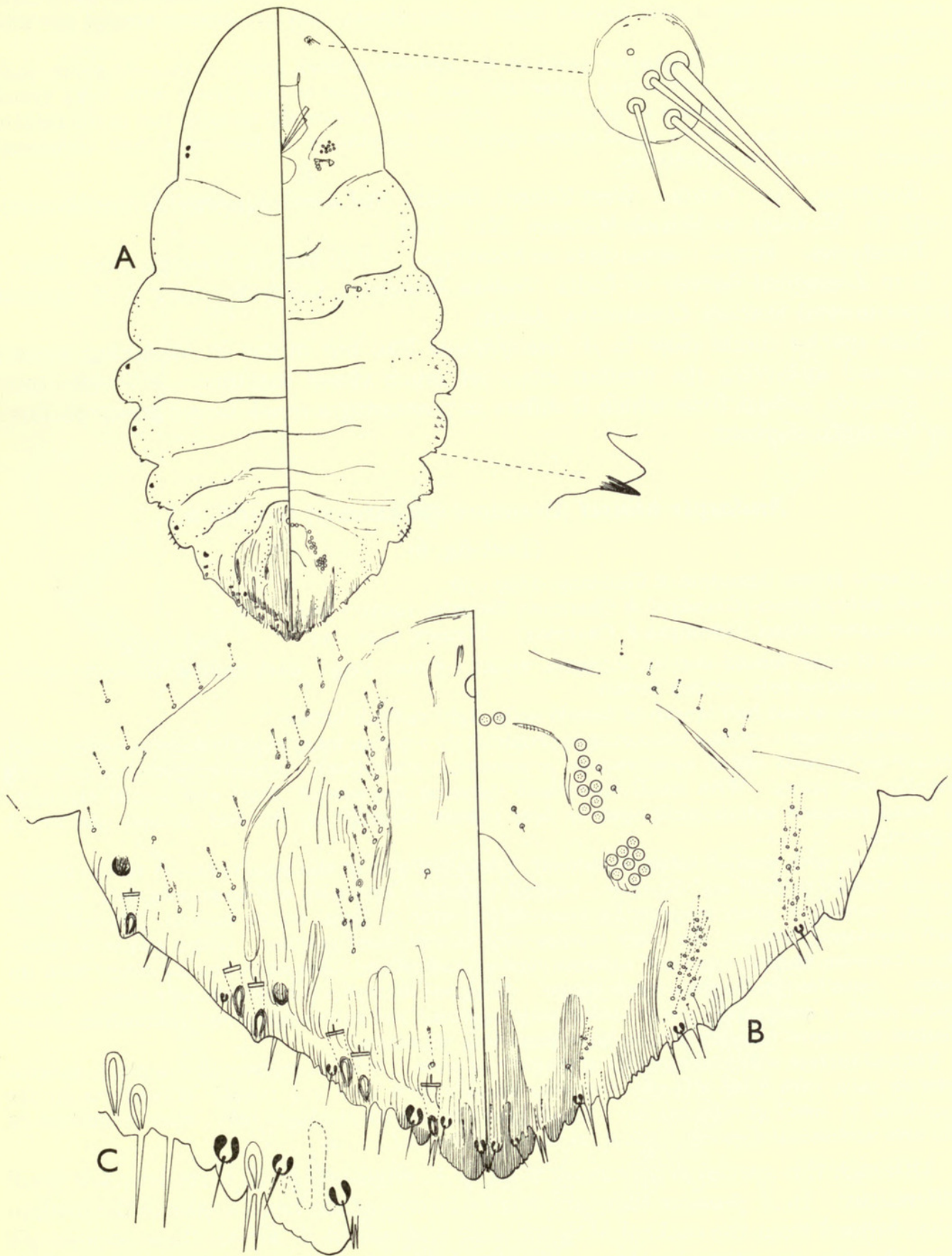
(Text-fig. 5)

Female scale greyish, almost transparent, rather wide posteriorly, about 1.5 mm. long, exuviae yellow brown.

Male scale not seen.

Adult female fusiform about 1.2 mm. long, membranous except for pygidium, lateral margins of mesothorax, metathorax and first four abdominal segments quite strongly lobed. Lateral sclerotized spurs present on first to third abdominal segments. Anterior spiracles each with a group of 6-10 pores. First six abdominal segments each with blunt spur or boss on dorsum near margin and a pair set close together on each side of prothorax.

Pygidium rather pointed, with median lobes prominent, triangular, each with long blunt paraphysis at base. Second lobes much smaller but bilobed condition easily discernible, smooth. Gland spines in pairs on pygidium, very slender, those between median lobes small. Marginal macroducts numbering 6 pairs. Dorsal ducts small and slender, a large submedian

FIG. 5. *Andaspis dasi* sp. n.

group present on sixth segment and anterior to this on third to sixth segments the ducts form almost continuous rows whilst beyond these to mesothorax they are present around the sub-margins.

Ventral surface with perivulvar pores in five groups, median group with 4–10 pores, each anterior lateral group with 10–15 pores and each posterior lateral group with 8–14 pores. Microducts in distinct groups on pygidium ; present also around the margins and in the median area of mesothorax. Small gland spines sparse, on margins as far forward as first abdominal segment ; absent on metathorax.

Holotype. ♀. INDIA : West Bengal, Dooars, on *Camellia sinensis* (Camelliaceae), 1958 (G. M. Das), in British Museum (Nat. Hist.).

Paratypes. INDIA : same data as holotype. 1 ♀ in British Museum (Nat. Hist.), 1 ♀ in Zoological Survey of India (*Indian Museum*), Calcutta and 1 ♀ in Tocklai Experimental Station, Cinnamara, Assam.

This species comes close to *A. leucophloeae* Rao but differs in possessing second lobes and in having the median lobes set much closer together. It is also near *A. naracola* Takagi from which it differs in possessing a much larger group of ducts on the sixth segment.

Andaspis hibisci (Grandpré & Charmoy) (comb. n.)

(Text-fig. 6)

Mytilaspis hibisci Grandpré & Charmoy, 1899 : 32.

Lepidosaphes hibisci (Grandpré & Charmoy) Fernald, 1903b : 310.

Lepidosaphes hibisci (Grandpré & Charmoy) ; Mamet, 1941 : 32.

Scale of adult female narrow, elongate, about 1.5 mm. long ; dark reddish brown to almost black ; exuviae pale reddish brown.

Male scale about half length of female scale, light reddish brown.

A small elongate species measuring approximately 1.0 mm. long, pygidium always sclerotized, remainder of body either membranous or somewhat sclerotized. Anterior spiracles each with usually two pores. With small sclerotized spurs on the second, third and fourth segments. A small rounded submarginal spur or boss present dorsally on the first, second and fourth segments.

Pygidium with median lobes prominent, triangular and of the type common to the genus ; apical margin straight and dentate ; ventral surface of lobe with mid-basal seta each with the socket forming a small sclerosis on inner side ; setae at basal angles normal. Second lobes well developed, bilobed, the inner lobules with two or three notches. Gland spines in pairs ; those between median lobes and between median and second lobes short and no longer than the lobes. Anterior gland spines much longer. Marginal macroducts numbering six pairs. Dorsal ducts small, a submedian group on the sixth segment and submarginal and submedian groups distinct or almost merging on the three preceding segments.

Ventral surface with three groups of perivulvar pores ; median group with 2–4 pores, anterior laterals each with 5 or 6 pores, posterior laterals each with 2–4 pores. Microducts on the pygidium in small groups, sparse. Small gland spines on abdomen only, more numerous on the first abdominal segment, absent on the metathorax.

Although this species is extremely close to *A. punicae* (Laing) there are a few small differences. In *A. punicae* there are small scleroses at the basal angles of the median lobes formed from the sockets of small setae whereas in *A. hibisci* these sockets are normal. On the other hand a ventral mid-basal seta on the median lobe of *A. punicae* is normal whereas in *A. hibisci* the socket forms a noticeable sclerosis. The

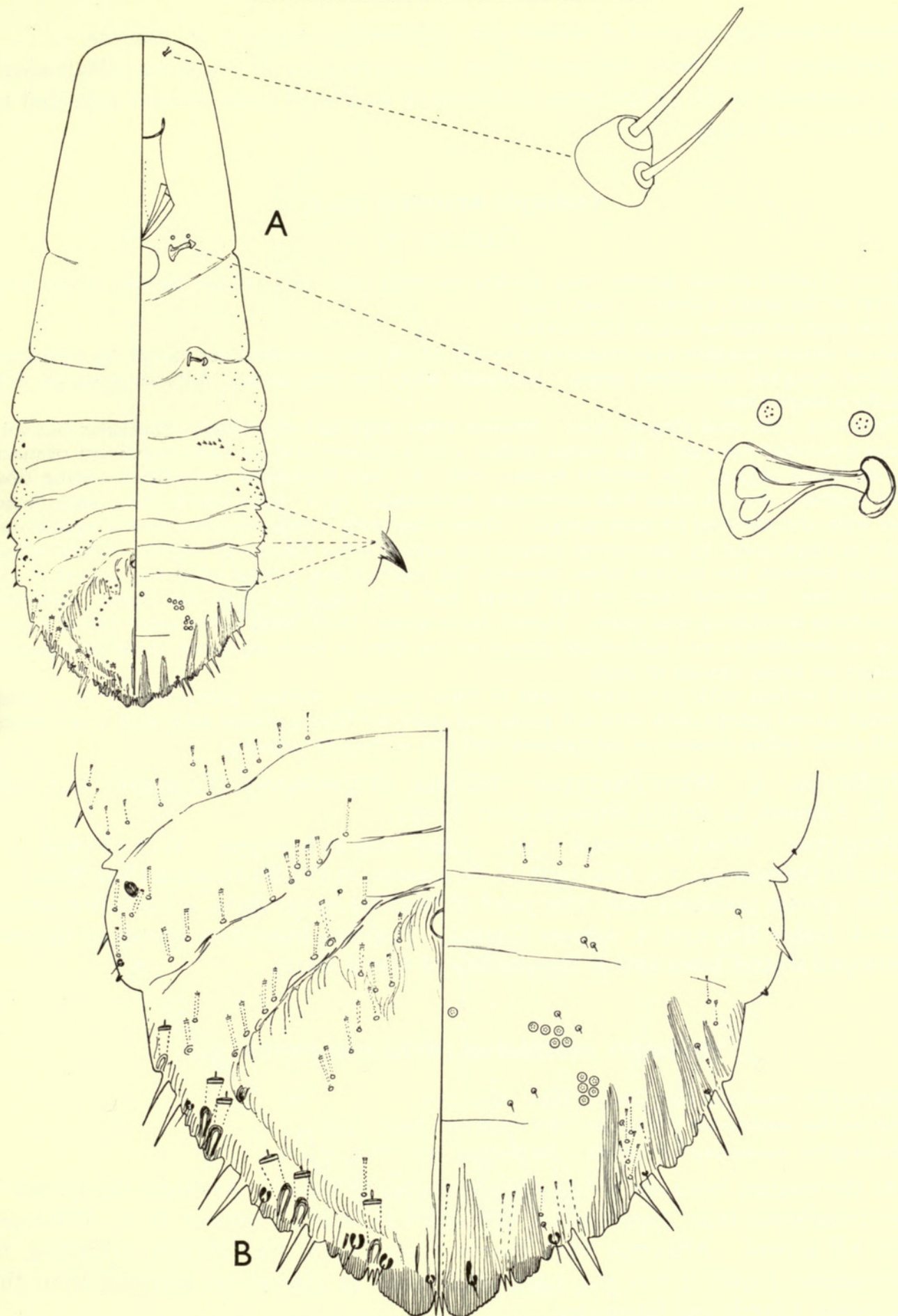


FIG. 6. *Andaspis hibisci* (Grandpré & Charmoy)

lateral sclerotized spurs of *A. hibisci* are, apparently, absent in *A. punicae*.

Specimens have been examined from MAURITIUS on *Hibiscus* sp. (Malvaceae) sent originally by D. D'Emmerez de Charmoy and on *H. rosa-sinensis* collected by R. Mamet 26.ii.1934.

***Andaspis kazimiae* sp. n.**

(Text-fig. 7)

Scale of adult female known from alcohol material only, pale reddish brown, of the form typical of the genus, about 1.5 mm. long.

Male scale of similar colour but smaller.

Adult female elongate oval attaining a length of 0.8 mm., membranous except for pygidium. Without marginal sclerotized spurs. Antennae with two long setae. Anterior spiracles with usually a single pore.

Pygidium with anal ring at base. Median lobes large and prominent, triangular but with apices somewhat rounded; the dorsal surface with a transverse sclerotized bar almost connecting the basal angles; the ventral surface with two well developed paraphyses arising from basal angles. Second lobes well developed, represented by a single lobule only, each longer than wide and notched on each margin; these lobes with a characteristic curved appearance which is emphasized by the curved paraphyses arising from the lateral angles. Gland spines in pairs between the median lobes, between the median and second lobes and lateral to the second lobes. Beyond these on the fourth and fifth segments they are single. Marginal macroducts numbering four pairs. Dorsal ducts sparse, there being a few submarginal groups as far as metathorax and submedian groups on the third to sixth segments, those on segments five and six being usually in pairs.

Ventral surface with perivulvar pores in three groups; median group with 3 or 4 pores, anterior lateral groups each with 6-8 pores and posterior lateral groups each with 4 or 5 pores. Small gland spines present on metathorax and first abdominal segment.

Holotype. ♀. WEST PAKISTAN: Behrain, on *Quercus* sp. (Fagaceae), 20.x.1961 (S. K. Kazimi), in British Museum (Nat. Hist.).

Paratypes. WEST PAKISTAN: 3 ♀. Same data as holotype. WEST PAKISTAN: Mana, on *Quercus* sp., 7 ♀, 28.ii.1962 (S. K. Kazimi) in British Museum (Nat. Hist.).

This species possesses only four pairs of pygidial macroducts, a character shared with *A. laingi* Rao and *A. retrusa* (Green). It differs from these species in the well developed second lobes and in the paucity of dorsal ducts.

***Andaspis mackieana* (McKenzie) (comb. n.)**

Lepidosaphes mackieana McKenzie, 1943: 153-155.

Lepidosaphes mackieana McKenzie; Zimmerman, 1948: 422.

Lepidosaphes mackieana McKenzie; McKenzie, 1956: 123.

As the median lobes are of the shape common to those in *Andaspis* the species is here transferred from *Lepidosaphes*, a move with which Professor H. L. McKenzie is in full accord. Although only known from U.S.A. and Hawaii, according to Zimmerman (1948) it has also been intercepted at Hawaii on material from the Philippine Islands and Singapore.

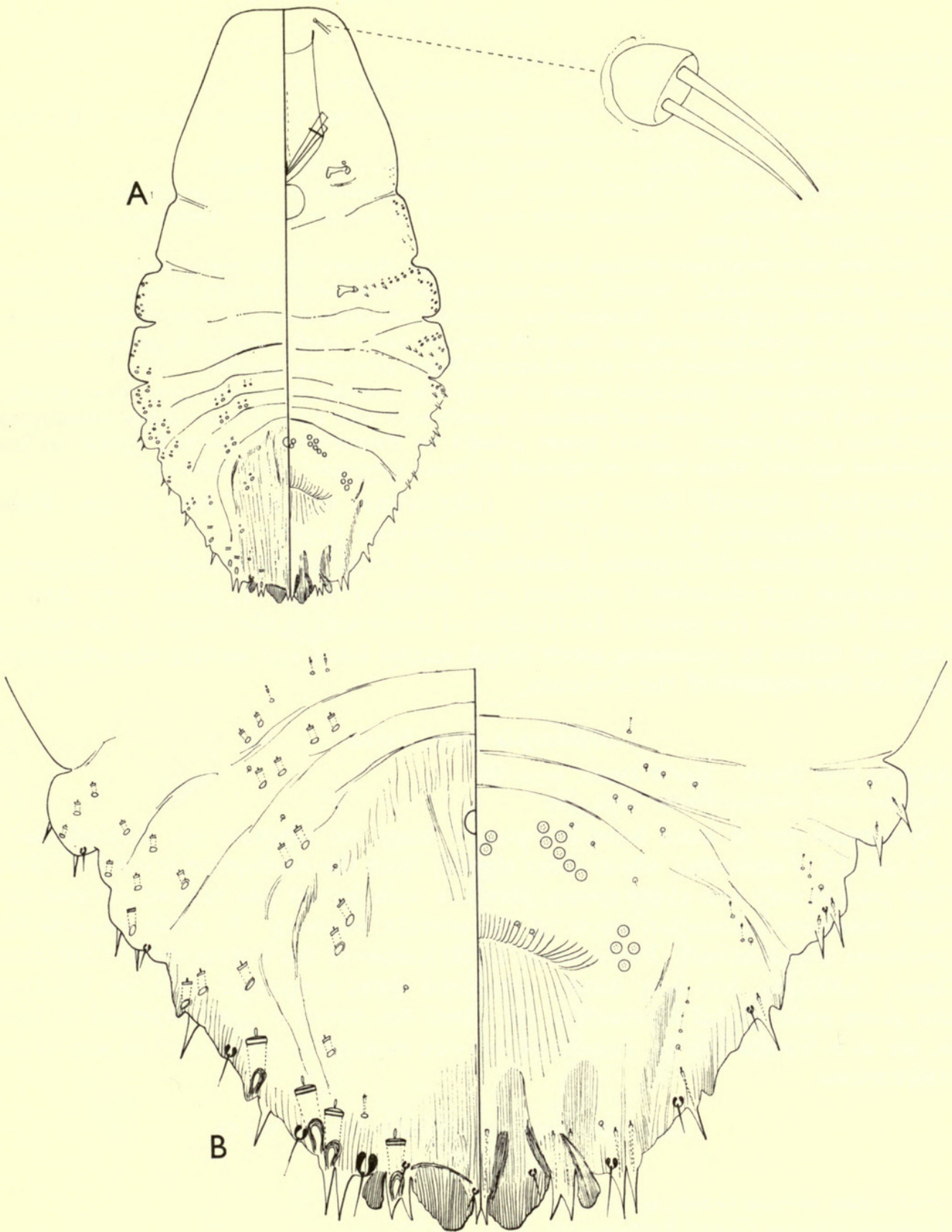


FIG. 7. *Andaspis kazimiae* sp. n.

***Andaspis meliae* (Green) (comb. n.)**
(Text-fig. 8)

Lepidosaphes meliae Green, 1919c : 445, 446.

Mytilaspis (*Lepidosaphes*) *meliae* Green ; Ramakrishna Ayyar, 1919a : 24.

Scale of adult female dull dark brown, moderately convex, attaining a length of 2.5 mm., exuviae reddish brown, often with whitish secretion.

Scale of male smaller, about 1.2 mm. long, dark brown to almost black.

Adult female broadly oval, about 1.2 mm. long ; membranous except for pygidium. Marginal sclerotized spurs absent. Antennae with four setae of various sizes. Anterior spiracles each with a group of 3-5 pores.

Pygidium with prominent median lobes of the form common to the genus except that apices tend to be more rounded. Second lobes bilobed, the inner lobules barely perceptible. Gland spines in pairs on pygidium. Marginal macroducts numbering six pairs. Dorsal ducts minute, there being a submedian group on the sixth segment and a smaller group on seventh segment. Anteriorly on the abdomen there are submarginal and submedian groups.

Ventral surface with perivulvar pores in five groups, median group with 5-12 pores, anterior laterals each with 17-21 pores and posterior laterals each with 10-15 pores. A few submarginal microducts on pygidium. Gland spines present on abdomen only, pointed except on first abdominal segment where they are replaced by small sclerotized gland tubercles.

Described originally from INDIA : Coimbatore, on the " Nim " tree, *Melia azederach* (Meliaceae), 5.iii.1918 (T. V. Ramakrishna Ayyar).

In their revision of the genus *Andaspis*, Rao & Ferris (1952) considered this species for inclusion but excluded it without any definite reason. It comes very close to *A. mori* Ferris in the general distribution of ducts and in the shape of the median lobes but differs in possessing much larger second lobes and lacking the sclerotized spurs on the margins of the abdomen.

***Andaspis mori* Ferris**

Andaspis mori Ferris ; Rao & Ferris, 1952 : 21.

Andaspis mori Ferris ; Ferris, 1953 : 59.

Specimens are at hand from FORMOSA : Kagi, on *Sapindus* sp. (Sapindaceae), 1.xi.1927 (R. Takahashi), which differ slightly from the description given by Ferris. They possess only two gland spines lateral to each second lobe instead of three and more numerous submedian ducts on the seventh segment. In other respects the specimens are identical. Professor H. L. McKenzie of the University of California, Davis, California, has very kindly compared these specimens with the holotype and given some useful information for which the writer is most indebted to him. So far as is known Dr. R. Takahashi has not mentioned this record in any of his publications.

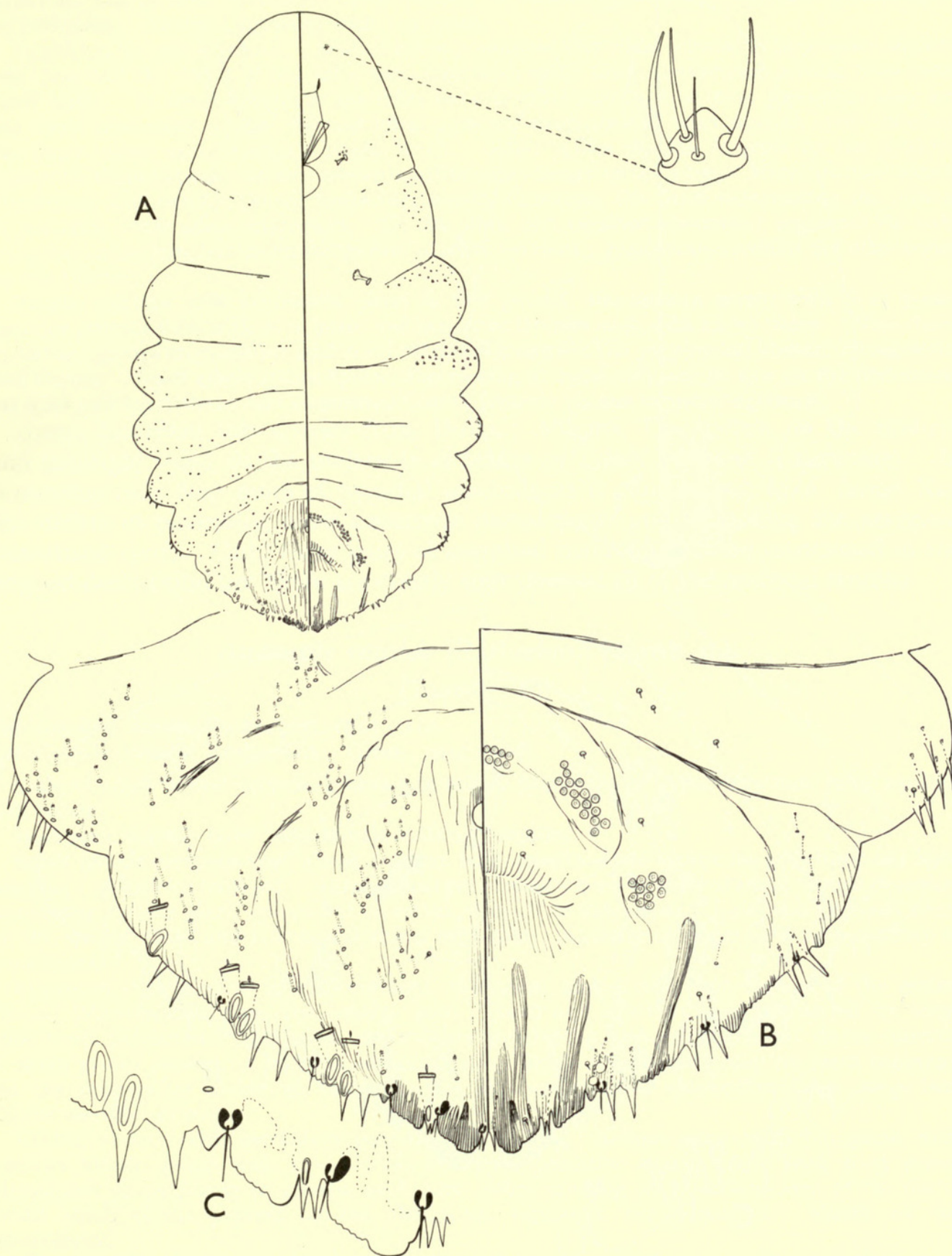
***Andaspis retrusa* (Green) (comb. n.)**
(Text-fig. 9)

Lepidosaphes retrusus Green, 1919c : 446.

Mytilaspis retrusus (Green) Ramakrishna Ayyar, 1919a : 24.

Scale of adult female dull to reddish brown, moderately convex, up to 1.5 mm. long, exuviae tending to be yellow brown.

Male scale lighter and paler in colour, length about 1.0 mm.

FIG. 8. *Andaspis meliae* (Green)

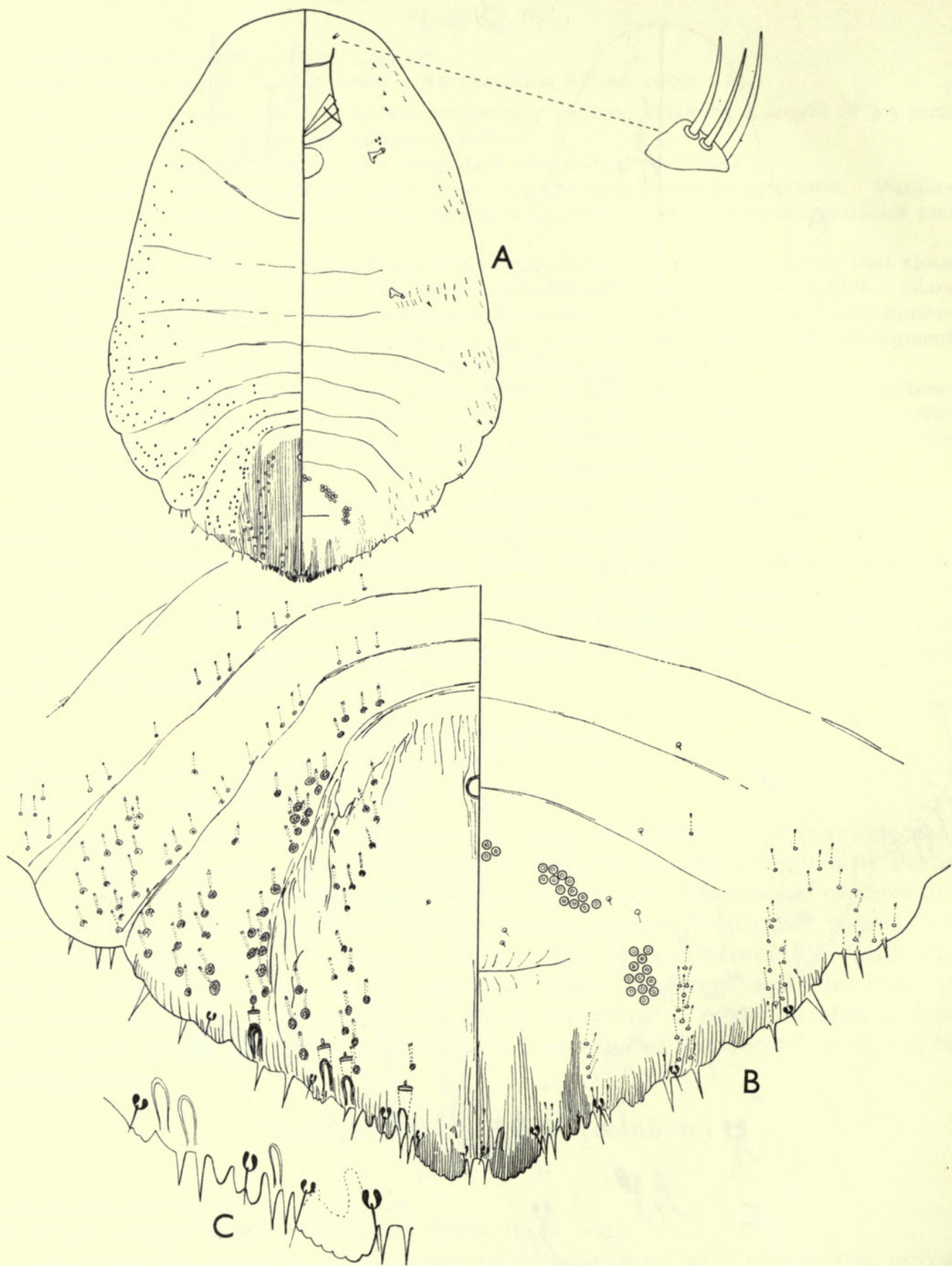


FIG. 9. *Andaspis retrusa* (Green)

A broadly oval species measuring approximately 0.8 mm. long, membranous except for pygidium but in some specimens body tending to become sclerotized. Without lateral spurs on abdomen. Anterior spiracles with 1-3 pores.

Pygidium broadly rounded. Median lobes prominent and wide, separated by a space slightly less than half the width of one lobe, each lobe with small blunt paraphyses arising from inner basal angle. In some specimens the lobes have parallel sides but in most specimens they are the usual triangular shape. Second lobes present, much smaller than median lobes, bilobed, the inner lobule usually with a single notch. Gland spines slender, in pairs on the pygidial segments, those between median lobes about the same length as the lobes. Marginal macroducts numbering four pairs. Dorsal ducts very small, numerous, the derm surrounding the orifices of posterior ducts often sclerotized. On the sixth and anterior abdominal segments the submarginal and submedian ducts merge into continuous rows; present also around the submargins on the thorax.

Ventral surface with perivulvar pores in five groups, the median group with 6-12 pores, anterior laterals each with 8-18 pores and posterior laterals each with 11-18 pores. Microducts in distinct groups on pygidium and in submarginal groups on the prepygidial abdominal segments and thorax. Small gland spines sparse, there being at most only one or two on the abdominal margins and metathorax but sometimes absent entirely on one or more segments.

Green described this species from INDIA: Nilgiris, Dodabetta, on the mid-rib and principal veins on the underside of leaves of *Litsea whiteana* (Lauraceae). In possessing only four pairs of pygidial macroducts it comes close to *A. laingi* Rao but differs in possessing more numerous dorsal ducts and in lacking the marginal sclerotized spurs. Only three pairs of marginal macroducts were mentioned in the original description but there are clearly four pairs in all of the material studied.

Andaspis vandae (Rutherford) (comb. n.)

(Text-fig. 10)

Lepidosaphes vandae Rutherford, 1915: 116.

Lepidosaphes vandae Rutherford; Green, 1937: 328.

Scale of adult female very dark brown to nearly black, shiny, about 2.75 mm. long, exuviae dull brown.

Male scale slightly paler than female scale and smaller.

Adult female elongate-oval, about 1.5 mm. long, membranous except for pygidium and head margins; pygidium rounded. Anterior margin of head with a number of small conical processes resembling minute gland spines but structure difficult to determine. Lateral sclerotized spurs on the second, third and fourth abdominal segments. Anterior spiracles each with a group of 9-14 pores.

Pygidium with median lobes prominent, triangular and of the form typical of the genus. Second lobes smaller than the median pair. Third and fourth lobes represented by large sclerotized projections. Marginal macroducts numbering six pairs. Dorsal ducts minute. A small group present on seventh segment and a larger submedian group on sixth segment. On the prepygidial abdominal segments the submarginal and submedian ducts merge into almost continuous rows.

Ventral surface with perivulvar pores in five groups. Median group with 5-9 pores, each anterior lateral group with 12-15 pores and each posterior lateral group with 9-15 pores. Microducts on pygidium in groups, each with orifice opening on to a clear area of the derm. Small gland spines present on the abdominal segments, not numerous; absent on the metathorax.

This species was described from CEYLON: Peradeniya, on *Vanda spathulata* (Orchidaceae), ix.1914. The accompanying illustration is based on specimens

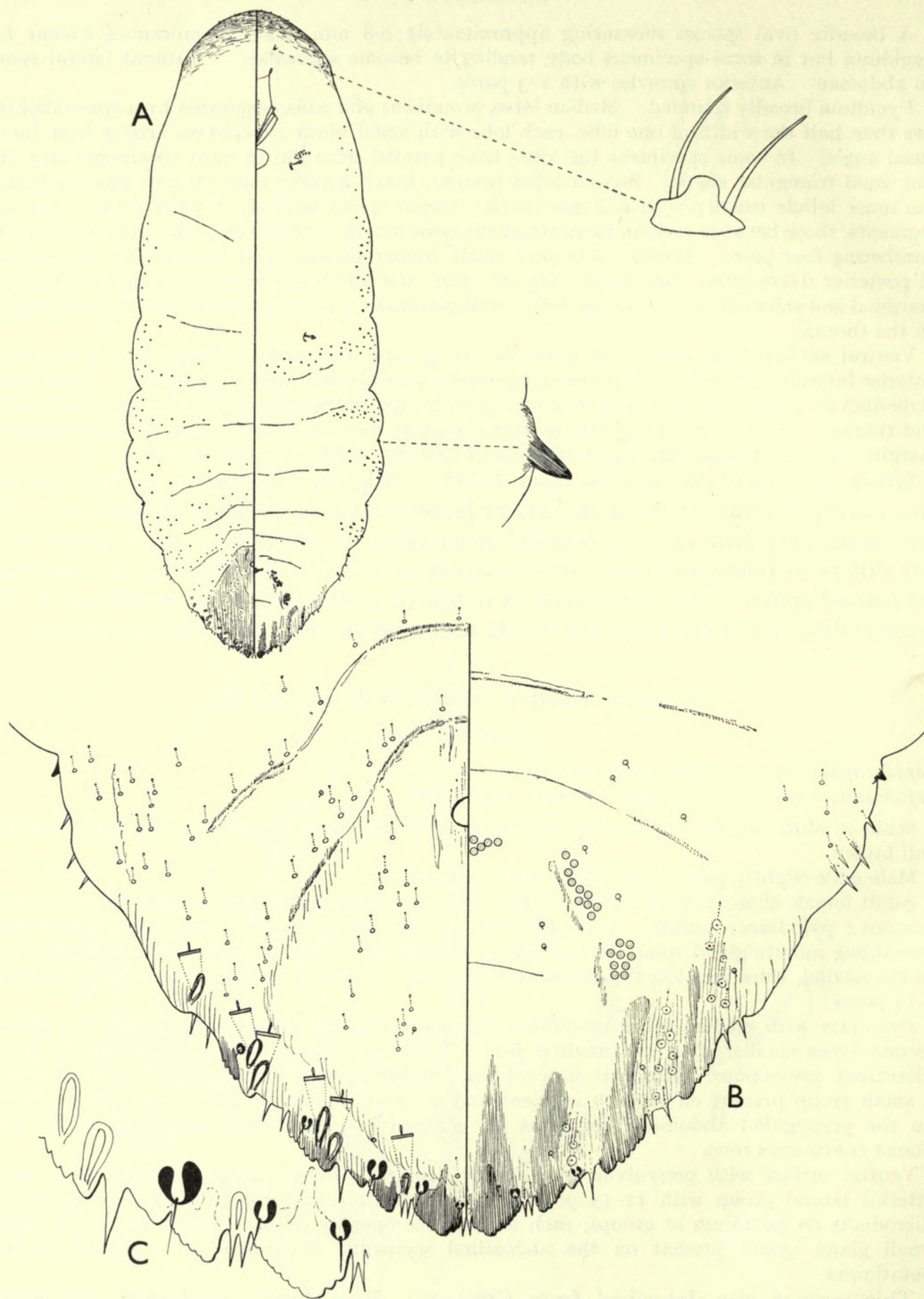


FIG. 10. *Andaspis vandae* (Rutherford)

collected at CEYLON, Colombo, on *Vanda teres*, ix.1911, originally in E. E. Green's collection, which agree with the description given by Rutherford. The species forms a distinct group with *A. mori* Ferris, *A. meliae* (Green) and *A. naracola* Takagi in possessing well developed second lobes and minute ducts.

KEY TO SPECIES OF *ANDASPIS*

- | | | |
|---------|---|------------------------------|
| 1 | Marginal macroducts numbering 4 pairs | 2 |
| — | Marginal macroducts numbering 5 or 6 pairs | 4 |
| 2 (1) | Submedian group of dorsal ducts on sixth segment absent (INDIA) | <i>laingi</i> Rao |
| — | Submedian group of dorsal ducts on sixth segment present | 3 |
| 3 (2) | Submedian group of dorsal ducts on sixth segment numbering only 2 and separated from submarginal group (PAKISTAN) | <i>kazimiae</i> sp. n. |
| — | Submedian group of dorsal ducts on sixth segment numerous and almost continuous with submarginal ducts (INDIA) | <i>retrusa</i> (Green) |
| 4 (1) | With a stout club-shaped or blunt paraphysis extending into the pygidium either from the median basal angle or the middle basal part of each median lobe | 5 |
| — | Without such a paraphysis extending into the pygidium, a paraphysis if present, being either transverse or present on ventral surface as two normal slender paraphyses only | 13 |
| 5 (4) | Submedian group of dorsal ducts on sixth segment absent (ALMOST COSMOPOLITAN) | <i>hawaiiensis</i> (Maskell) |
| — | Submedian group of dorsal ducts on sixth segment present | 6 |
| 6 (5) | With only one or two ducts flanking anal opening (SOUTHERN RHODESIA) | <i>halli</i> Rao |
| — | Ducts flanking anal opening numerous | 7 |
| 7 (6) | Ducts flanking anal opening in a definite row on sixth segment only | 8 |
| — | Ducts flanking anal opening scattered on sixth and seventh segments | 10 |
| 8 (7) | Second lobes absent (INDIA) | <i>leucophloeae</i> Rao |
| — | Second lobes present although small | 9 |
| 9 (8) | Lateral sclerotized spurs and dorsal submarginal tubercles or bosses present (INDIA) | <i>dasi</i> sp. n. |
| — | Lateral sclerotized spurs and dorsal submarginal tubercles or bosses absent (AUSTRALIA) | <i>numerata</i> Brimblecombe |
| 10 (7) | Lateral sclerotized spurs absent, second lobes as wide as median lobes (INDIA) | <i>meliae</i> (Green) |
| — | Lateral sclerotized spurs present, second lobes narrower than median lobes | 11 |
| 11 (10) | Paraphysis extending into pygidium short and arising from basal angle of median lobe (CHINA, FORMOSA) | <i>mori</i> Ferris |
| — | Paraphysis extending into pygidium about as long as lobe and arising from middle basal part of median lobe | 12 |
| 12 (11) | Dorsal ducts on prepygidial segments in almost continuous rows (CEYLON) | <i>vandae</i> (Rutherford) |
| — | Dorsal ducts on prepygidial segments in distinct submarginal and submedian groups (JAPAN) | <i>naracola</i> Takagi |
| 13 (4) | Median lobes each with, at least, a small transverse paraphysis arising from one or both basal angles or, if the paraphysis extends from the inner basal angle into the pygidium, then it is never clavate or blunt | 15 |
| — | Without definite slender paraphyses arising from basal angles of lobes | 14 |
| 14 (13) | Median lobes each with a small sclerosis at each basal angle formed by the socket surrounding a small seta, lateral sclerotized spurs absent (TANGANYIKA) | <i>punicae</i> (Laing) |

- Setal bases at basal angles of median lobes normal, mid ventral basal part of median lobe with small sclerosis formed by the socket surrounding seta, lateral sclerotized spurs present (MAURITIUS) . . . **hibisci** (Grandpré & Charmoy)
- 15 (13) Second pygidial lobes distinctly developed 16
- Second pygidial lobes absent 20
- 16 (15) Dorsum of pygidium with a row of pores on sixth segment flanking anal opening, marginal macroducts numbering six pairs 17
- Dorsum of pygidium without such pores, marginal macroducts numbering five pairs (JAPAN) **crawii** (Cockerell)
- 17 (16) With transverse slender paraphyses arising from basal angles of median lobes and in addition a transverse bar slightly anterior to these 18
- Slender paraphyses not transverse, these extending into pygidium 19
- 18 (17) Second lobes not bilobed, with lateral blunt tubercles each bearing a duct on abdomen (JAPAN) **kashicola** (Takahashi)
- Second lobes bilobed, without lateral blunt tubercles each bearing a duct on abdomen (CEYLON) **antidesmae** Rao
- 19 (17) Paraphyses arising from inner basal angle of median lobes curving towards each other and away from the paraphyses arising from the outer basal angle (CHINA) **yunnanensis** Ferris
- Paraphyses arising from inner basal angle of median lobes curving away from each other and towards the paraphyses arising from the outer basal angle (U.S.A., HAWAII) **mackieana** (McKenzie)
- 20 (15) With a group of submedian ducts flanking anal opening on sixth abdominal segment 21
- With but a single duct or none near anal opening on sixth abdominal segment (AUSTRALIA) **incisor** (Green)
- 21 (20) Dorsal ducts very slender, paraphysis arising from lateral angle of median lobes robust, lateral sclerotized spurs absent (CHINA) **micropori** Borchsenius
- Dorsal ducts not slender, without paraphysis arising from lateral angle of median lobes but slender transverse paraphysis arising from inner basal angle, lateral sclerotized spurs present (CEYLON) **erythrinae** (Rutherford)

CAIA gen. n.

Type species : *Caia querneae* sp. n.

Scales of adult female and male not seen.

Adult female of the tribe Diaspidini and belonging to the *Lepidosaphes* series, i.e. with two-barred ducts and gland spines on the pygidial margin, there being a pair between the median lobes. Median lobes prominent with one or at most two notches on lateral margins and with a well developed clavate paraphysis arising from the inner angle of each median lobe. Second and third lobes represented by, at most, small sclerotized points. Marginal macroducts present. Anal opening situated towards apex of pygidium.

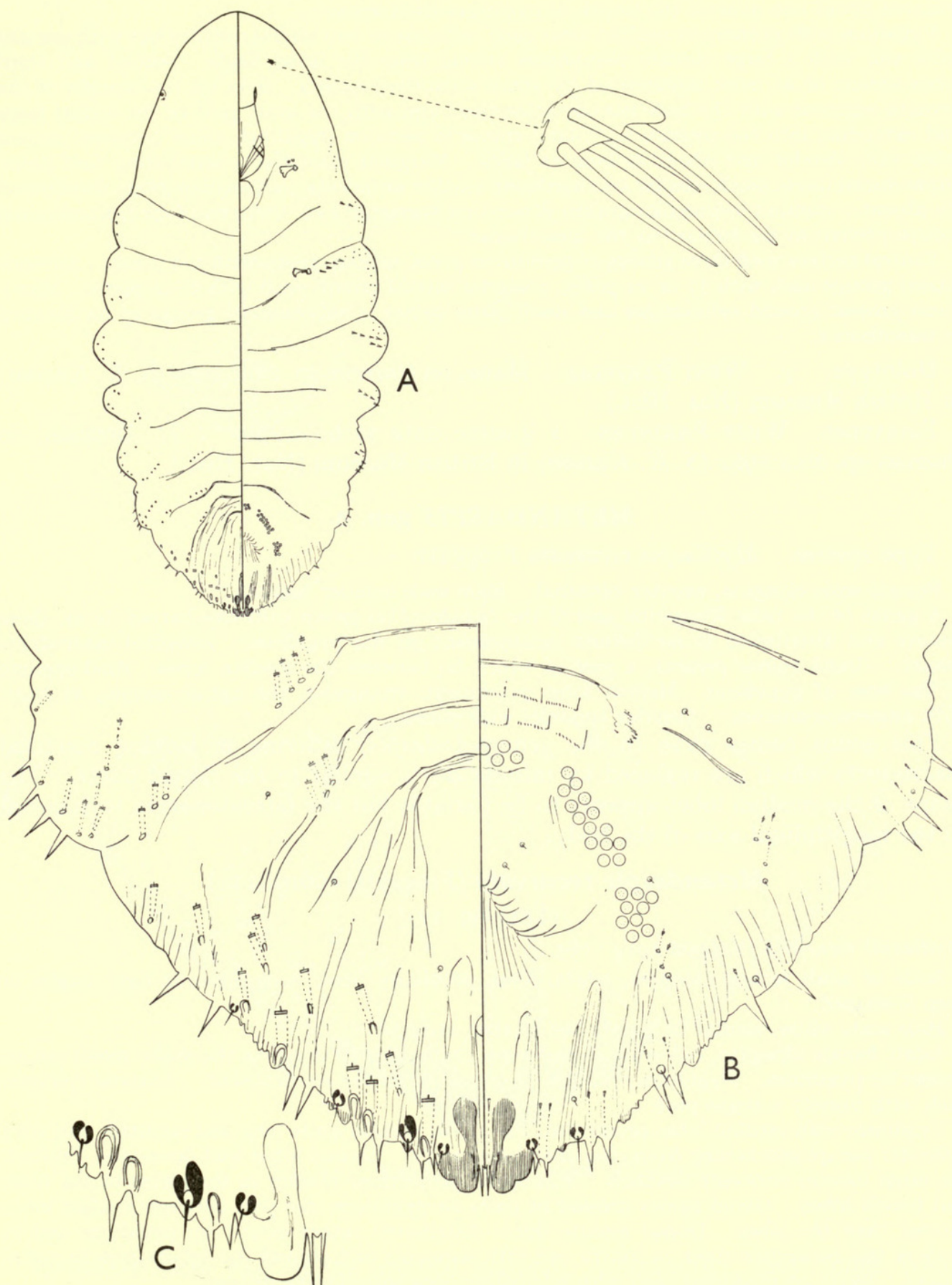
This genus has close affinities with *Andaspis* but differs mainly in the shape of the median lobes which have only one or two notches on the lateral margins and in the position of the anal opening which is situated towards the apex rather than at the base of the pygidium.

***Caia querneae* sp. n.**

(Text-fig. 11)

Scales not seen.

Adult female elongate oval, fusiform, about 1.0 mm. long, membranous except for pygidium. Lateral sclerotized spurs absent. Anterior spiracles with two or three pores. Anal ring

FIG. II. *Caia querneia* sp. n.

situated about one quarter the length of pygidium from apex.

Pygidium with prominent median lobes each with one or two lateral notches but with parallel sides and with a large clavate paraphysis arising from the inner angle. Second and third lobes absent or at most represented by small sclerotized points. Seta on the margin of the seventh segment with the base heavily sclerotized and with the inner part of the socket large and extending into the pygidium. Gland spines in pairs on pygidium, those between median lobes very slender and about as long as lobes. Marginal macroducts numbering four pairs. Other dorsal ducts much smaller and becoming smaller anteriorly ; submedian group on segment six absent ; distinct submedian groups present on segments two, three and four ; submarginal groups present as far forward as the mesothorax.

Ventral surface with three groups of perivulvar pores, median group with 5-8 pores. Anterior lateral groups each with 11 or 12 pores, posterior lateral groups each with 8-12 pores. Microducts present around submargins and small gland spines in submarginal groups as far forward as mesothorax.

Holotype. ♀. WEST PAKISTAN : Mana, on *Quercus* sp. 28.ii.1960 (S. K. Kazimi) in British Museum (Nat. Hist.).

Paratypes. WEST PAKISTAN. 1 ♀ same data as holotype. 1 ♀. Berhain, on *Quercus* sp. 20.x.1961 (S. K. Kazimi) in British Museum (Nat. Hist.).

METANDASPIS gen. n.

Type species : *Mytilaspis recurvata* Froggatt.

Female scale elongate, exuviae terminal. Male scale smaller, smooth.

A genus of the tribe Diaspidini and of the *Lepidosaphes* group with two-barred ducts, these minute and distributed in no definite arrangement on the pygidium ; marginal macroducts absent. Gland spines present, a pair of which lie between the median lobes. Anal opening at the base of pygidium. Median lobes prominent, triangular, the apical margin, at least, with numerous notches. Anterior spiracles with pores.

This genus comes close to the genus *Andaspis*, differing in lacking marginal macroducts which are replaced by minute ducts similar to the dorsal ducts. The shape of the median lobes appears to be variable but the lateral margin is diagonal to the longitudinal axis of the body.

Metandaspis recurvata (Froggatt) (comb. n.)

(Text-fig. 12)

Mytilaspis recurvata Froggatt 1914 : 683.

Scale of adult female elongate, white, often peculiarly bent, sometimes at right angles or even U-shaped.

Male scale white, similar to female but smaller, straight.

Adult female elongate, following in the same characteristic shape as the scale, membranous except for pygidium. Pygidium rounded. Lateral sclerotized spurs absent. Anterior spiracles each with usually a single pore.

Pygidium with median lobes prominent, the apical margin quite long and serrated, and with a slender paraphysis arising from near each basal angle. Second lobes well developed, bilobed, the inner lobules variously notched. Sclerotized projections present in the places of the third and fourth lobes. Gland spines present in pairs on pygidium, the pair between median lobes shorter than the lobes. Dorsal minute ducts distributed rather evenly on pygidium and in more or less transverse rows on fourth and fifth segments and around the submargins to metathorax ; ducts on pygidium each with sclerotized area surrounding orifice.

Ventral surface with microducts sparse on pygidium but more numerous around submargins. Perivulvar pores absent. Small gland spines present as far forward as metathorax.

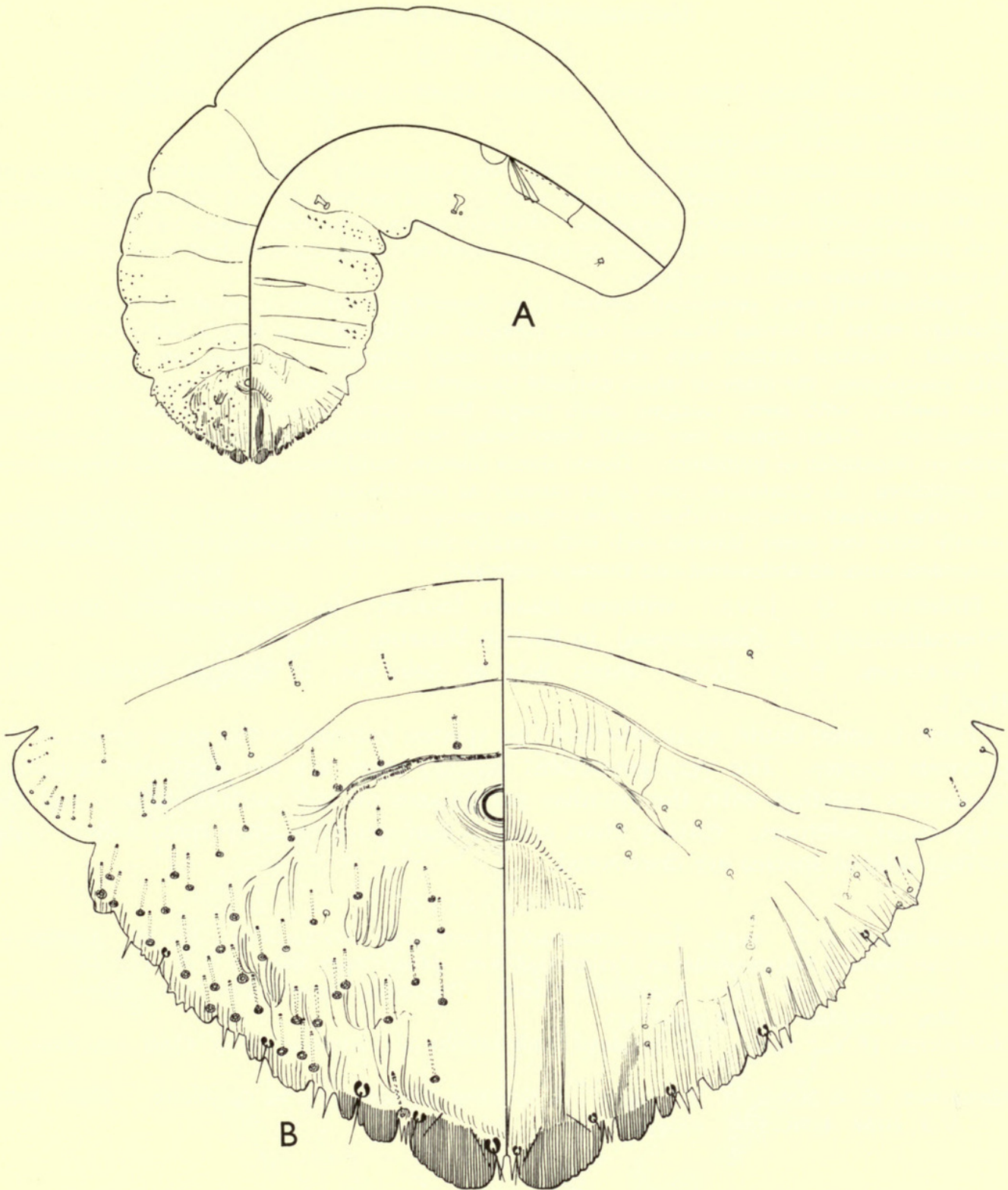


FIG. 12. *Metandaspis recurvata* (Froggatt)

Described from part of the original material, AUSTRALIA : New South Wales, Cowra, on branches and twigs of the Black Wattle, *Acacia decurrens* (Leguminosae), 7.vi.1900 (W. W. Froggatt).

***Metandaspis javanensis* sp. n.**

(Text-fig. 13)

Scale of adult female white, smooth, elongate, about 1.5 mm. long but usually covered with reddish-brown matter.

Male scale similar but smaller.

Adult female elongate about 0.6 mm. long, sides subparallel. Body membranous except for pygidium but older individuals often sclerotized on head margin and in a characteristic pattern on the prepygidial abdominal segments. Without lateral sclerotized spurs but dorsal surface with submarginal tubercles which are rounded, blunt and sclerotized on first to sixth segments. Anterior spiracles with 2 or 3 pores.

Pygidium with very prominent median lobes departing from the usual shape of those of the *Andaspis* series in having inner and outer margins roughly equal in length but entire margins serrated; ventral surface with well developed basal scleroses extending into pygidium and with paraphyses, the inner of which extends forwards near the midline. Second lobes smaller than median, with outer margins much longer than inner, serrated; ventral side showing paraphyses. Gland spines very small, there being two between median lobes and arranged in pairs on remainder of pygidium. Dorsal ducts minute, numerous, in no definite arrangement on pygidium; in transverse rows as far forward as metathorax.

Ventral surface with perivulvar pores in three groups arranged in a broad arc; median group usually with two pores, laterals each with usually four pores. Microducts quite numerous in transverse rows on abdominal and thoracic segments.

Holotype. ♀. JAVA: without known locality, on *Pterospermum javanicum* (Sterculiaceae), (A. Zimmerman), in British Museum (Nat. Hist.).

Paratypes. 8 ♀. JAVA: same data as holotype, in British Museum (Nat. Hist.).

There is some doubt as to whether this species belongs to the same genus as the previous species. The very prominent median lobes are the chief distinguishing characters together with the peculiar paraphyses on the ventral surface and the large basal scleroses. Rather than erect a new genus it may remain here until further related species are discovered.

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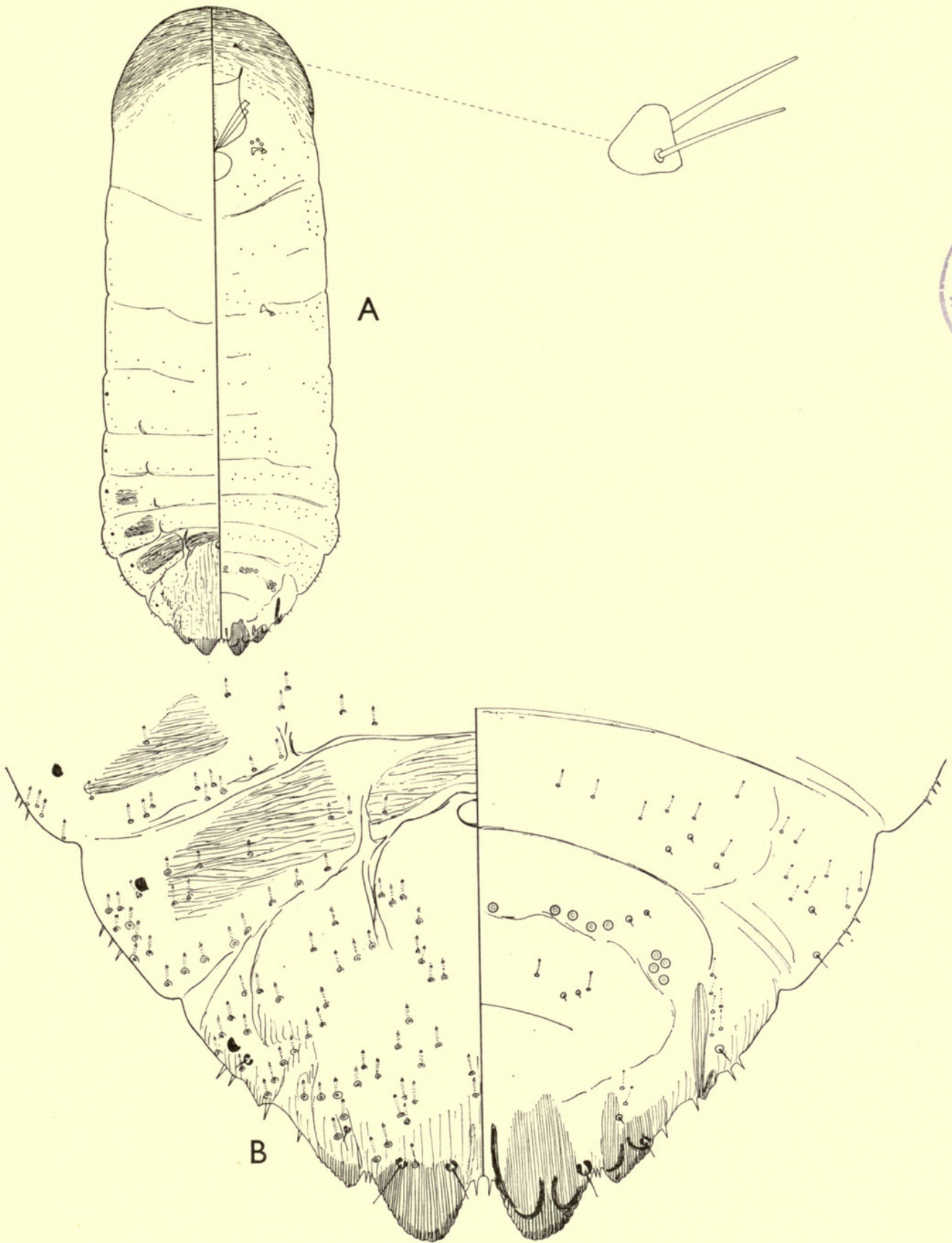


FIG. 13. *Metandaspis javanensis* sp. n.



Williams, D. J. 1963. "Synoptic revisions of I. Lindingaspis and II. Andaspis with two new allied genera (Hemiptera: Coccoidea)." *Bulletin of the British Museum (Natural History) Entomology* 15, 3–31. <https://doi.org/10.5962/bhl.part.20533>.

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