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Contribution 84

REPORT UPON SCALE INSECTS COLLECTED IN CHINA (HOMOPTERA: COCCOIDEA). PART IV

Figures 23-49

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Further species collected about Kunming, Yunnan Province

This paper completes the treatment of the species collected about Kunming, Yunnan Province. A few species, perhaps a half dozen, remain which have not been considered but which are represented only by immature specimens or by inadequate material.

With the completion of this portion of the report upon the species collected by the writer in China it becomes possible to return to the coastal area and all subsequent papers of this series will be devoted to the species taken in the vicinity of Canton and in Taiwan (Formosa). It may be estimated that not less than twenty papers of the extent of those already published will be necessary before the treatment of the entire collection shall have been completed.

Genus ANDASPIS MacGillivray

1952. The genus *Andaspsis*. Rao, V. Prabhaker and G. F. Ferris. *Microentomology* 17: Part 1.

The genus *Andaspsis* has been considered in the reference cited above, which treats all the known species that could definitely be assigned to it. Among these is one species, *Andaspsis mori* Rao and Ferris, which was based upon material collected by Ferris near Kunming and in the Kunming material is another species which was not at the time recognized. Still another species is present in this Kunming material but is represented by inadequate material and will not be described.

Andaspsis mori Rao and Ferris

1952. *Andaspsis mori* Rao and Ferris, *Microentomology* 17: Part I; 21; Figure 18.

HOSTS AND DISTRIBUTION. Type from *Norus australis* at An-lin-wen-chian, near Kunming, Yunnan Pro-

vince, China. Collected by G. F. Ferris, April 24, 1949. Also from *Broussonetia papyrifera* at the same time and place.

Andaspsis yunnanensis new species Figure 23

HOSTS AND DISTRIBUTION. A single collection is available, this from *Prunus* sp., in the compound of and then American Consulate at Kunming, Yunnan Province, China, April 23, 1949, G. F. Ferris collector.

HABIT. Occurring on the branches and small twigs of the host. Scale of the female very small, scarcely equalling 2.00 mm. in length, elongate and quite slender. The basic color of the scale is brown, but it is covered by a slight film of wax at times appears white and in general the scales match quite closely the color of the bark and are quite inconspicuous. Scale of the male similar to that of the female but much smaller.

RECOGNITION CHARACTERS. Adult female about 1.00 mm. long, the body slender and elongate, membranous throughout except for the pygidium, the lateral lobes of the abdomen but little developed. Pygidium rounded apically, the median lobes relatively large and with a pair of gland spines between them, each lobe with the outer margin quite strongly notched and with the apex truncate, although some specimens are apically rounded. From the median, basal angle of each lobe there rises a slender paraphysis, these paraphyses curving toward each other. A less developed paraphysis arises from each lateral basal angle and curves toward the meson. Second lobes very small, definitely bilobed, the outer lobule very small and acute. Third lobes indicated merely by a slight projection. Between the first and second lobes are a small gland spine and a small gland prominence and between the second and third lobes are two gland spines.

Beyond the position of the third lobe there are two rather slight tooth-like projections of the margin, just posterior to each of which is a pair of small gland spines. Between the first and second lobes is a single large marginal duct, at the position of the third lobes are two such ducts and at each of the lateral marginal prominences a pair of such ducts. Segments anterior to the pygidium at the most with but two or three small gland tubercles, except that the apparent first abdominal segment possesses a series of such tubercles on the ventral side, these extending from the margin well inward. Anal opening moderately large, set quite close to the anterior margin of the pygidium. Dorsal ducts all very small, arranged in small groups of 3-6 pores to the group on the sixth to third segments and with scarcely more than 4-5 submarginal pores on each prepygidial segment. Second prepygidial segment with a small marginal tooth-like spur which varied greatly, being absent on one side and present on the opposite side of the same specimen or being entirely membranous or more or less sclerotized. On the ventral side the genital opening occurs somewhat posterior to the anal opening. Perivulvar pores in five groups, the anterior lateral group with about six and the posterior lateral group with about eight pores. Metathoracic segment with a transverse band of very small ducts. Spiracles entirely without accompanying pores. Antennae with two setae.

NOTES. It is with some doubt that this species is referred to *Andaspis*, but of the genera of *Diaspidini* known to the writer it best goes in this. It resembles only in a general way any of the species now referred to this genus.

Genus AULACASPIS Cockerell

1952. Scott, C. L. The Genus *Aulacaspis* in Eastern Asia, *Microentomology* 17:Part 2.

In the reference cited above Scott has recorded five species of the genus *Aulacaspis* on the basis of material collected by the writer from the vicinity of Kunming, describing three of these species as new.

Aulacaspis crawli (Cockerell)

1952. *Aulacaspis crawli* (Cockerell), *Microentomology* 17:Part 2:36; Figure 21.

Recorded by Scott from *Rubus* sp. at Kunming, collected by G. F. Ferris.

Aulacaspis ima Scott

1952. *Aulacaspis ima* Scott, *Microentomology* 17:Part 2:37; Figure 23.

Described by Scott from specimens taken from *Lindera communis* at An-lin-wen-chian, near Kunming,

Yunnan Province, China, April 1940, G. F. Ferris collector.

Aulacaspis madiunensis Zehntner

1952. *Aulacaspis madiunensis* Zehntner, *Microentomology* 17:Part 2:38; Figure 25.

Recorded by Scott from undetermined grasses at An-lin-wen-chian, near Kunming, Yunnan Province, China, April and May, 1949, G. F. Ferris collector.

Aulacaspis megaloba Scott

1952. *Aulacaspis megaloba* Scott, *Microentomology* 17:Part 2:38; Figure 26.

Described by Scott from specimens from a species of *Rubus* in North Park, Kunming, Yunnan Province, China, May 1949, G. F. Ferris collector.

Aulacaspis nitida Scott

1952. *Aulacaspis nitida* Scott, *Microentomology* 17:Part 2:39; Figure 29.

Described by Scott from specimens from *Nothopanax delavayi* at Si-shan, near Kunming, Yunnan Province, China, May 1949, G. F. Ferris collector.

Kwanaspis pseudoleucaspis (Kuwana) Figure 24

1941. *Kwanaspis pseudoleucaspis* (Kuwana), *Ferris Atlas of the Scale Insects of North America*, Series III, Number 288.

HOSTS AND DISTRIBUTION. Originally described from Japan and known as an introduced species on bamboo in the United States. Taken from an undetermined bamboo, probably of the genus *Arundinaria*, at Si-shan and from *Phyllostachys* sp. in the West Park at Kunming, Yunnan Province, China, May, 1949, G. F. Ferris.

NOTES. A direct comparison with the types, which are in the Stanford University collection, indicates no basis for the separation of the Yunnan specimens, although they are very slightly different. Everything about the pygidium on the type and in American specimens seems to be slightly stronger, the pygidial lobes being more strongly developed and the incisions between the various lobes and process of the pygidial margin being more strongly pronounced.

The accompanying illustration is from specimens from *Phyllostachys* at Kunming.

Lepidosaphes keteleeriae new species

Figure 25

HOSTS AND DISTRIBUTION. From *Keteleeria davidiana* at An-lin-wen-chian, near Kunming, Yunnan Province, China, April 28, 1949, G. F. Ferris collector.

HABIT. Occurring beneath bark flakes and between the layers of bark on the small twigs of the hosts. Scale of the female, as far as may be determined after dissociating it from its host, pale brown, elongate, about 2.00 mm. long, and quite flat. Scale of the male not recognized.

RECOGNITION CHARACTERS. Female about 1.5 mm. long, of quite the normal form of its genus; body membranous throughout except for the pygidium. Pygidium slightly less obtuse than is the usual form for the genus, the median lobes relatively large and apically rounded, more or less fan-shaped. Second lobes distinctly developed, flattened, bilobed. Beyond the second lobes, at the position of the seta which marks the position of the third lobes, there is a somewhat projecting serrate, marginal sclerotization and beyond this a similar sclerotization marking the position of the fourth lobe. Marginal macroducts of the normal size and distribution for the genus. Dorsal ducts, however, very few, scattered and excessively small. These small ducts are continued forward along the marginal areas of the body but are almost or entirely lacking in the submedian and median areas. Anterior spiracles with a cluster of 5-6 accompanying pores.

NOTES. This species seems to be distinct from any species that the writer has been able to find. The very few and small dorsal ducts and the rather large and somewhat fan-shaped median lobes are its distinctive features.

The host belongs to a genus of the family Pinaceae which is confined to China and Formosa.

Lepidosaphes tubulorum Ferris

Figure 26

1921. *Lepidosaphes tubulorum* Ferris, Bulletin of Entomological Research, 12:2:6; Figure 5.

1925. *Lepidosaphes tubulorum* Ferris, Kuwana, Department of Finance, Japan, Imperial Plant Quarantine Service, Revenue Bureau, Technical Bulletin 2:30; Plate II, Figures 2-3; Plate VIII, Figures k-o; Plate IX, Figures a-f; Plate X, Figures a-e.

HOSTS AND DISTRIBUTION. Originally described from *Sapium sebiferum* at Taihoku (Taipei), Formosa and at the same time recorded from *Salix warburgi* at the same locality and from *Ilex crenata*, willow and currant in Japan. It has since been recorded by Kuwana from a quite wide variety of hosts from various localities in Japan. Specimens are at hand from the vicinity of Kunming as follows: from *Salix* sp., at An-lin-wen-chian and from *Hedwigia japonica* at Si-shan.

NOTES. The specimens from Kunming agree in

every respect with the type of this species except for the fact that at the anterior extremity of the head there are numerous small, somewhat sclerotized tubercles, which are entirely lacking in the type. In this respect the Kunming specimens agree with those illustrated by Kuwana in his Plate IX. Whether or not two species are involved or whether this is simply variation can not be determined from the information at hand and for the present it seems best to consider that nothing more than variation is involved.

The species is apparently not abundant about Kunming, only two small collections having been secured. The accompanying illustration is based upon the specimens from *Salix*.

This species is recognizable especially by the extremely minute dorsal ducts of the pygidium and the prepygidial segments together with the small and strongly sclerotized lateral spurs of as many as three prepygidial segments.

Lepidosaphes ulmi (Linnaeus)

From *Salix* and *Cotoneaster* sp. at Si-shan, near Kunming, Yunnan Province, China, G. F. Ferris.

Parlatoria cupressi new species

Figure 27

HOSTS AND DISTRIBUTION. From *Cupressus duclouxiana*, on the campus of the University at Kunming, Yunnan Province, China, April 26, 1949, G. F. Ferris collector.

HABIT. Occurring on the foliage. Scale of the female definitely elongate oval, composed mostly of the second exuvium which is overlain by a layer of wax that extends beyond the extremity of the exuvium. Color white or slightly gray. Scale of the male elongate, white. The length of neither male nor female exceeds 1.00 mm.

RECOGNITION CHARACTERS. A practically pupillarial species, the adult female being enveloped dorsally by the exuvium of the second stage, which however is open ventrally. Length of adult female about .5 mm. and of exuvium about .6 mm. It is thus an extremely small species. Adult female oval, membranous throughout except for the slightly sclerotized dorsum of the pygidium. Pygidium with but two pairs of lobes, these quite similar in size and shape, straight and parallel-sided. Marginal fringe of plates confined to the pygidial area, these plates being for the most part apically fringed. Marginal series of transverse pores, surrounded by a sclerotized ring, present in the normal arrangement, there being one between the median plates, one between the median and second plates and four beyond the second plates, those at the outer range of the series becoming smaller. Dorsum with not more than 2-3 quite small pores and ducts. Ducts practically lacking on the prepygidial segments. Perivulvar pores present in but four groups, these each with not more than four pores. Gland tubercles almost lacking,

there being but two near each anterior spiracle and two and three on the prepygidial segments.

NOTES. This species is evidently very close to *Parlatoria alba* Bellio, a species from undetermined host at Langson, Indo-China, sharing with it the presence of but two pairs of pygidial lobes and having the same general features. In fact it may actually be merely a variant of *alba*, but it has no pores associated with the anterior spiracles, it has but four instead of five groups of perivulvar pores, these with but four pores as contrasted with five groups of as many as 15-16 pores. Also it has fewer dorsal ducts on the pygidium. It is also worthy of note that ordinarily species of Coccoidea which occur on members of the Coniferae are limited to this group, which may be considered as indicating that we have here to do with distinct species.

Genus PHENACASPIS Cooley and Cockerell
Figure 28

With the exception of four known North American species, the members of this genus are restricted to the Oriental Region. Within this Region the genus seems to reach a high degree of development but, unfortunately, it has never been reviewed as a whole and but few of its included species can definitely be identified from the existing literature. A student working with Oriental material is therefore confronted with certain alternatives. On the one hand he may affect to recognize names species on most inadequate grounds, with the attendant probability of a high degree of error, or on the other hand he may name almost anything that is encountered as a new species, with the strong possibility of thus creating synonyms. Of these two alternatives the writer has chosen the second as leading to the less pernicious results and consequently six species encountered in the vicinity are here named as new. It is hoped that the accompanying illustrations will make these species quite definitely recognizable when the time comes for a review of the genus as a whole.

In the China collections made by the writer in 1948 and 1949, which are in the main still to be reported upon, members of this genus undoubtedly occur in numbers and consequently before this series of papers is completed something approaching a general review of the genus will be necessary. For this reason a generalized illustration is here presented which will indicate the terminology employed and will call attention to the features which seem to present the most distinctive specific characters. Also something of a general discussion of the genus will be presented.

The genus *Phenacaspis* was segregated from the old genus *Chionaspis* in 1903, with *Chionaspis nyssae* Comstock, a North American species, as its type. The genus was based chiefly, if not entirely, upon the character of the anal lobes, which in typical forms are strongly divergent and are more or less sunken into the apex of the body, forming an apical V- or U-shaped notch in distinction from the condition in *Chionaspis* where the lobes are typically very prominent, close together throughout their

length and parallel. Unfortunately almost every degree of intergradation between the two extremes can be found and the feeling inevitably arises that the distinction between the two genera cannot and should not be maintained. Yet if we consider these two groups in the entirety, especially if we consider them in connection with another genus *Aulacaspis*, it becomes evident that the groups actually exist and seem to have a definite meaning. Thus the genus *Chionaspis* is Holarctic in its distribution, while—with the exception of the four known North American species—*Phenacaspis* is Oriental. At the other end of the series it becomes difficult in all instances to separate *Aulacaspis* from *Phenacaspis*, yet this difficulty occurs only in connection with a few species and as a whole *Aulacaspis* seems quite well defined. If we reflect for a moment upon what would result if we unite the entire series from *Chionaspis* to *Aulacaspis*—with the possible inclusion of some other dubious forms—into a single genus the prospect becomes even more unsatisfactory, for we would then have a genus with well over a hundred species within which all the distributional facts are effectively concealed unless we consider each of these groups to represent a subgenus. Actually, from a theoretical point of view, it seems possible that this recognition of subgenera would be the solution of the problem, but in view of the practical importance of the scale insects the use of subgenera meets with resistance and has but little support. What the outcome of these problems may eventually be the writer does not presume to guess but he prefers to recognize these forms as genera.

Keys to species from the vicinity of Kunming

1. Venter of the thoracic region beset with minute points.....CENTRESSA
Venter of the thoracic region not beset with minute points.....2
2. Dorsal ducts both on pygidium and segments anterior to the pygidium greatly reduced in number, the first submedian group entirely lacking, the other submedian groups reduced to a single duct and the submarginal ducts either lacking or reduced to not more than three ducts.....OSMANTHI
Dorsal ducts not thus reduced in number....3
3. First row of dorsal pygidial ducts extending to the margin of the pygidium and containing as many as five ducts, these including the marginals.....PUDICA
First row of dorsal pygidial ducts with the submedian group either entirely lacking or widely separated from the marginal pores....4
4. Submedian group of the first row of dorsal pores lacking.....5
Submedian group of the first row of dorsal pores present.....6
5. Anterior spiracle accompanied by an extremely large cluster of pores, this cluster containing more than 25 pores.....POLIOSTA

Anterior spiracle with accompanied by a cluster of not more than 3-5 pores.....DRYINA
 6. Antennae separated from each other by several times their individual length....KETELEERIAE
 Antennae separated from each other by scarcely more than their individual length....ERICACEA

Phenacaspis centreesa new species
 Figure 29

HOSTS AND DISTRIBUTION. Type from a species of *Myrsine* and paratypes from a species of *Osyris* and from *Euonymus pungens*, all at An-lin-wen-chian, near Kunming, Yunnan Province, China, April 27-29, 1949, G. F. Ferris collector.

HABIT. On the type host and on *Osyris* all the specimens occurred along the extreme edges of the leaves, while those on *Euonymus* were found in this position and also scattered over the surface of the leaves. Scales of both male and female of the type common to the genus.

RECOGNITION CHARACTERS. Length, on slide, attaining 2.00 mm. Body rather slender, expanding from the head to the posterior margin of the apparent first abdominal segment, then beginning to constrict to the rather short and apically rounded pygidium, with the lateral margins of the abdominal segments quite strongly lobed. Median pygidial lobes quite small, strongly divergent, not projecting apically. Second lobes well developed, distinctly bilobed. Third lobes represented by a low, apically notched prominence. Pygidium with the first row of dorsal pores represented by two pores on each side, flanking the anal opening. Second row of pores with as many as six or seven in the submarginal series and four or five in the submedian series. Third and fourth rows similar to the second. Fifth row lacking but the marginal lobe of the segment with a few small ducts. Marginal gland spines of the pygidium rather long and slender. Ventrally, little clusters of gland tubercles present on the lateral lobes of the abdominal segments and on the meta-thorax. Minute ducts occur along the margins of all segments almost as far forward as the region of the anterior spiracles. An area of the venter from the anterior spiracles to the first abdominal segment is beset with minute, sclerotized points.

NOTES. The most distinctive feature of this species is the area of minute, sclerotized points on the ventral side of the body. There are other species of the genus which have a somewhat similar appearance, but none is known to the writer which duplicates this.

Phenacaspis dryina new species
 Figure 30

HOSTS AND DISTRIBUTION. From *Quercus schottkyana*, at An-lin-wen-chian, near Kunming, Yunnan Province, China, May 2, 1949, G. F. Ferris.

HABIT. Occurring on the leaves. Scale of the female of the type common to the genus. Scale of the male not definitely recognized.

RECOGNITION CHARACTERS. A female thoroughly expanded on the slide attains a length of 1.5 mm. Body elongate oval, lateral margins of the prepygidial abdominal segments prominently produced. Anal lobes quite large and stout, strongly divergent, not projecting apically from the margin of the pygidium. Second lobes well developed, strongly bilobulate, the lobules almost equal to each other. Third lobe developed, bilobulate, the mesal lobule quite large and apically rounded, the second lobule very low. Dorsal pygidial macroducts very variable in number, even as between the two sides of one specimen, but quite scanty. First series not represented. Second series with a submarginal group and a submedian group, these with at times a tendency to run together, with a total of perhaps six ducts. The arrangement shown in the accompanying illustration represents the maximum seen. Third series with a submarginal group of as many as four and a submedian group of two. Fourth series the same. Anterior to this there are no dorsal ducts except a few small ducts at the extreme lateral margins of the segments. The three segments anterior to the pygidium with 2-5 gland spines. On the ventral side of the body there are no gland tubercles and only a few very small ducts on any of the segments. Anterior spiracle with but 3-4 associated pores.

NOTES. *Phenacaspis quercus* Kuwana has been described from oak in Japan and *Phenacaspis taiwana* Takahashi from oak in Formosa, but the species at hand appears to be neither of these. It is quite distinct from *Phenacaspis pudica*, herein described as new, which also is from an oak.

Phenacaspis ericacea new species
 Figure 31

HOSTS AND DISTRIBUTION. Type from *Vaccinium* sp. and paratypes from *Azalea* sp. at An-lin-wen-chian and from *Vaccinium* sp., *Zolisma ovalifolia*, *Brandisia* sp. and undetermined shrub at Si-shan, near Kunming, Yunnan Province, China in later April and early May, 1949, G. F. Ferris collector. There are also specimens, undoubtedly of this species, from *Osmanthus agnifolium* at Huangyen, Chekian Province, China, received from Mr. F. G. Chen.

HABIT. Occurring on the stems and leaves of the host. Scales of the type common to the genus.

RECOGNITION CHARACTERS. A fully expanded female attains a length of about 1.75 mm. on the slide. Body fusiform, the greatest width across the meta-thorax or the first abdominal segment. Abdominal segments relatively slightly lobed laterally. Pygidium with the median lobes quite large, strongly divergent, projecting but little or not at all. Second lobes well developed, distinctly bilobed. Third lobes bilobed, the mesal lobe quite prominent, flattened and apically toothed, the outer lobe being merely a slight projection. Dorsal pygidial ducts with the first row represented by 1-2 pores flanking the anal opening. Second row with 5-6 pores in the submarginal series and 2-3 pores in the submedian series. Third and fourth rows simi-

lar to the second. Fifth row with but a submarginal series, this with from 1-8 pores, variable even as between opposite sides of the same specimen. Anterior to the fifth row there are but a few very small ducts along the margin of the body. On the ventral side the prepygidial segments as far forward as the metathorax each bear a little cluster of 3-6 tubercles and minute ducts are present as far forward as the head. Anterior spiracle with a tight cluster of numerous associated pores. Antennae pores. Antennae set quite close together, being separated by a distance no greater than the width of an individual antennal base.

NOTES. In some respects this species resembles *Phenacaspis aucubae* (Cooley), but specimens of this are at hand from *Aucuba* in Japan and on the basis of these the two species appear to be distinct. It very closely resembles in its general characters the species herein described as *Phenacaspis keteleeriae* but the seemingly very small character having to do with the degree of separation of the antennae serves nicely as a "key character" to separate the two species.

Phenacaspis keteleeriae new species
Figure 32

HOSTS AND DISTRIBUTION. From a conifer, *Keteleeria davidiana*, at An-lin-wen-chian, near Kunming, Yunnan Province, China, April 28, 1949, G. F. Ferris Collector.

HABIT. Occurring on the upper side of the leaves or needles of the host. Scale of the type common to the genus, about 3.00 mm. long.

RECOGNITION CHARACTERS. Length of female, on slide, about 1.75 mm. Body quite strongly fusiform, widest across the metathoracic segment, with the lateral lobes of the abdominal segments strongly pronounced. Median lobes of the pygidium small, narrow and strongly divergent. Second lobes well developed and very definitely bilobulate. Third lobes represented each by a pair of low, rounded prominences. Gland spines of the pygidium quite short. Dorsal ducts with the first row represented by each side by two ducts flanking the anal opening. Second row with four or five ducts in the submarginal series and three or four in the submedian series. Third to fifth rows similar in composition to the second. Margins of the abdominal segments with a few very small ducts. Gland spines almost lacking on the marginal areas of the abdominal segments ventrally. Anterior spiracles each with an associated group of about a dozen pores, these in a tight, almost hemispherical group. Antennae separated from each other by a distance that approaches ten times their individual lengths or the width of their individual bases.

NOTES. This species is in many respects quite similar to *Phenacaspis ericacea*, herein described as new, but the two differ in a number of small details, such as the size of the median lobes. In addition the chances to be a very definite little

"key character" that can be used to separate them this being the degree of separation of the antennae. In *ericacea* the antennae in all the specimens available, are very close together, being separated by scarcely more than the width of the base of an individual antenna, while in *keteleeriae* they may be described as widely separated.

Phenacaspis osmanthi new species
Figure 33

HOSTS AND DISTRIBUTION. From *Osmanthus* sp., at An-lin-wen-chian, near Kunming, Yunnan Province, China, April 29, 1949, G. F. Ferris collector.

HABIT. Occurring on the leaves, frequently associated with a species of the fungus genus *Septobasidium*. Scale of the female of the type common to the genus, rather broadly oval. Scale of the male not differentiated because of the presence of another species of the same genus.

RECOGNITION CHARACTERS. Length of an expanded specimen on the slide about 1.5 mm. Body elongate, somewhat fusiform, widest across the mesothorax, with slight constrictions between the various segments, none of which protrude marginally. The most characteristic feature of the species is the paucity of dorsal macroducts. On the pygidium the first row—which is at times represented in other species by one or more ducts flanking the anal opening—is lacking. The second row contains only 1-2 marginal ducts and its submedian series is likewise represented by 1-2 ducts. The third series likewise includes but 2-3 marginal ducts and 1-2 in the submarginal group. Along the margin of the next abdominal segment are but a few small ducts. Anal lobes moderately large, projecting separated at the bases not divergent except toward their apices. Second lobes bilobed, shorter than the median, the second lobule apically serrate. Third lobes indicated by low, serrate prominences. Ventrally there are submarginal clusters of 4-6 gland tubercles on the two apparent prepygidial abdominal segments, these accompanied by a few small ducts, and clusters of 3-4 submarginal gland tubercles on the mesothorax and metathorax. There seem to be at the most but a few scattered microducts along the margins of the body. Anterior spiracles each with an accompanying cluster of 15-20 pores.

Phenacaspis poloosta new species
Figure 34

HOSTS AND DISTRIBUTION. Type from *Eurya nitida* at Si-shan and paratypes from *Pittosporum yunnanensis* at An-lin-wen-chian, near Kunming, Yunnan Province, China, late April to early May, 1949, G. F. Ferris collector.

HABIT. Occurring on the leaves especially but also on the stems. The specimens from *Eurya* were commonly associated with a fungus of the genus

Septobasidium. Scale of the female rather broadly oval, flat, that of the male of the type common to the genus.

RECOGNITION CHARACTERS. Length of a fully grown and expanded specimen on the slide 1.75 mm. Form elongate oval with relatively parallel sides. Median lobes of pygidium large, strongly divergent. Second lobes well developed, flat, definitely bilobed, the outer lobule but slightly smaller than the mesal. Third lobes represented each by two lobules, the mesal of which forms a somewhat sclerotized, apically toothed process. First row of dorsal macroducts—flanking the anal opening—lacking except rarely represented by a single duct; second row with about six pores in a submarginal series and 2-3 in a submedian series. Third and fourth rows similar but with 3-5 pores in the submedian series. Fifth series represented by only the submarginal series of 3-5 pores. On the ventral side each prepygidial segment, forward to the metathorax, bears a submarginal cluster of four or more gland tubercles and a few very small ducts are present along the margins. Anterior spiracle with a large cluster of pores.

NOTES. There are very slight differences between the specimens from *Pittosporum* and those from *Eurya*, this having mostly to do with the development of the third lobes, but these differences are extremely slight and apparently but a single species is represented.

Phenacaspis pudica new species
Figure 35

HOSTS AND DISTRIBUTION. From *Quercus sinensis*, at Si-shan, Kunming, Yunnan Province, China, May 8, 1949, G. F. Ferris, collector.

HABIT. Occurring on the underside of the leaves, the adult female buried beneath the very thick tomentum. The white scales of the males, on the other hand project through the tomentum and are the only conspicuous evidence of the presence of the species.

RECOGNITION CHARACTERS. A very small species, in the specimens at hand an adult female on the slide being scarcely more than .6 mm. long. Body elongate oval. Pygidium with a narrow median, sclerotized area. Median lobes small, strongly divergent, their apices projecting but little or not at all from the body. Second lobes very small, sclerotized, definitely bilobed the two lobules of about the same size, the median lobule laterally notched. Third lobe represented merely by a low, apically several times notched prominence. Dorsal macroducts very few. The first series with two marginal ducts at the position of the third lobe and a row of 3-4 ducts extending forward almost to the anal opening. Second series with apparently but one marginal duct, one submarginal and a submedian group of two. Third series the same. Anterior to this the next segment bears one marginal

and two submarginal macroducts and anterior to these there are a number of scattered, smaller ducts. On the ventral side there seem to be no gland spines and not gland tubercles anterior to the first prepygidial segment, which bears one gland spine, but there is a cluster of minute submarginal ducts on each segment anterior to the head. Anterior spiracles with associated group of 3-4 pores.

NOTES. The most distinctive features of the species are the reduced number of dorsal ducts and the narrow dorsal, median, sclerotized area of the pygidium.

Odonaspis secreta Cockerell

On bamboo, possibly a species of *Arundinaria*, at Si-shan, Kunming, Yunnan Province, May 12, 1949, G. F. Ferris collector.

Aontdiella aurantii (Maskell)

From *Morus* sp., in the West Park At Kunming.

Aspidiotus cryptomeriae Kuwana
Figure 36

1933. *Aspidiotus cryptomeriae* Kuwana, Ministry of Agriculture and Forestry, Japan, Department of Agriculture, Scientific Bulletin Number 3:4; Plate I, Figure b.

HOSTS AND DISTRIBUTION. Described from *Cryptomeria japonica* in Japan and later recorded from various other conifers, including *Pinus*, *Abies* and *Chamaecyparis* in Japan. Collected on the needles of *Keteleeria evelyniana* at An-lin-wen-chian, near Kunming, Yunnan Province, China by G. F. Ferris, April 28, 1949.

NOTES. The specimens from Kunming differ slightly from those from the type material which are at hand in the Stanford Collection. In these latter specimens the pygidium seems to be slightly short and apically more rounded, the zone of marginal and submarginal ducts seems to be more extensive and there are variably five instead of four groups of perivulvar pores. However, there seems to be no basis for the positive separation of the Kunming material into a distinct species.

In an earlier paper (Microentomology 6:Part 1; 1941) the writer indicated that *cryptomeriae* is not an *Aspidiotus*, although its actual generic position is indeterminate. A review of this matter in connection with the present pair has led to a revision of this opinion. The species belongs to *Aspidiotus* as definitely as does *Aspidiotus destructor* Signoret or *Aspidiotus tamarini* Green, both of which species were included definitely in *Aspidiotus*. In fact the resemblance to *tamarini* is quite close.

Aspidiotus nothopanacis new species
Figure 37

HOSTS AND DISTRIBUTION. Known only from a single collection, from *Nothopanax delavayi* at Sishan, near Kunming, Yunnan Province, China, May 8, 1953, G. F. Ferris collector.

HABIT. Occurring on the under side of the leaves. Scale of the female circular, very flat, quite thin and of a pale brown color; diameter about 2 mm. Scale of the male not recognized.

RECOGNITION CHARACTERS. Female of the usual more or less triangular shape, length about 1 mm. Derm membranous throughout except for the pygidium. Pygidium about one fifth of the length of the body, tapering toward its posterior extremity, its lateral margins almost straight the modifications of serrations, plates and lobes confined to slightly more than the posterior third of its length. Three pairs of lobes present these relatively small, all of much the same shape and size, the second lobes showing very small and indistinct paraphyses arising from each basal angle, the third lobe with a single very small paraphysis arising from the median basal angle. Plates distributed as follows: two slender, apically fringed plates between the median lobes and three between the second and third lobes; beyond the third lobe there are 4-5 plates which have a broad base and a long outer and short inner margin, the outer margin bearing various small points and longer, slender processes. Beyond these plates the margin is beset with very small sclerotized points and irregularities. Dorsum of the pygidium quite generally sclerotized, this sclerotization becoming stronger toward the apex and interrupted by three unsclerotized furrows. The most median of these furrows is quite short and extends into the pygidium from the first interlobular space. The second is two or three times as long and extends in from the second interlobular space. The third is less well defined and begins somewhat laterad of the inner extremity of the second, extending for some distance parallel to the margin. Along these furrows and near them are rows of dorsal pores. These dorsal pores are quite large and conspicuous and from them arise moderately broad ducts of which the length is perhaps a fifth of the length of the pygidium. Anal opening somewhat posterior to the center of the pygidium. Ventral side with four clusters of perivulvar pores. Vulva placed well anterior to the anal opening. From the base of each of the second lobes a slender sclerotization extends into the pygidium and from the base of the third lobe a somewhat less distinct laterally directed sclerotization. Body anterior to the pygidium with but a very few exceedingly small ducts near the lateral margins of the two or three prepygidial segments.

NOTES. It has not been possible to connect this species with anything that has been described from Japan by Kuwana or from Formosa or the mainland of China by Takahashi and it is therefore described as new.

This species presents something of a problem as

to its generic position. It is by no means a typical species of *Aspidiotus*, this being indicated especially by the serration and sclerotization of the pygidial margins laterad of the termination of the area occupied by plates. In this character and in the shapes of the plates themselves it is more nearly a species of *Aonidiella* or of *Chrysomphalus* but the weak development of the paraphyses arising from the bases of the lobes separates it from *Chrysomphalus* and the entire lack of the conspicuous lateral lobes of the body of *Aonidiella* separates it from the latter. In many respects it resembles the type of the genus *Octaspidotus*, but it does not possess the distinct fourth lobe of this species.

Hemiberlesia rapax (Comstock)

From *Salix* sp. and *Morus* sp. in the West Park at Kunming and from *Euonymus grandiflora* and *Osmanthus fragans* at An-lin-wen-chian, near Kunming.

This is a species so well known and so often illustrated that it calls for no discussion here. It is evidently introduced in China.

Hemiberlesia sinensis new species
Figure 38

HOSTS AND DISTRIBUTION. From an undetermined shrub of the family Apocynaceae at An-lin-wen-chian, near Kunming, Yunnan Province, China, April 29, 1949, G. F. Ferris collector.

HABIT. Occurring on the upper side of the leaves. Scale of the female about 1.00 mm. in diameter, basically round but subject to considerable modification according to its position, white or somewhat gray. Scale of the male not recognized.

RECOGNITION CHARACTERS. Diameter about .75 mm., of the normal triangular form of its genus, the derm membranous throughout except for the pygidium. Perivulvar pores lacking. Pygidium with three pairs of well-developed lobes, the median pair quite large and stout, the second pair noticeably smaller and the third pair still smaller. Two plates present between the median and second and second and third lobes, these plates apically fimbriate. Three plates between second and third lobes, these plates simple or apically fimbriate. Beyond the third lobes are 2-3 plates, the broad and marginally serrate at their base, tapering to deeply divided processes at the apex. Anal ring removed by about twice its own diameter from the base of the median lobes. Dorsal ducts slender but quite long, arranged primarily in three series, one series arising from the first interlobular space, a longer series from the second interlobular space and the third, more diffuse series from beyond the third lobe. Ducts anterior to the pygidium confined to a very few at the margins of the prepygidial segments, these very small and short. Interlobular paraphyses very small, but quite distinct. Ventral side with nondistinctive characteristics.

NOTES. This species seems to belong to the genus *Abgrallaspis*, recently named by Balachowsky for the reception of certain of the species which the present writer has referred to *Hemiberlesia*. The writer is rather inclined to doubt the value of this genus as a means of clarifying the admittedly unclear genus *Hemiberlesia* and refers this new species rather to *Hemiberlesia*. Among the species of *Hemiberlesia* it perhaps most closely resembles *cyanophylli*, but differs in lacking the perivulvar pores.

Morganella longispina (Morgan)

From *Gleditsia delavayi*, *Celtis* sp., and *Hibiscus myriacis* at An-lin-wen-chian, near Kunming. Evidently an introduced species.

Pseudoantidia paeontae (Cockerell)

From *Azalea* or *Rhododendron* at Si-shan and from *Camellia japonica* at An-lin-wen-chian, near Kunming.

This species has been illustrated by both Ferris and Kuwana and need be no further considered here. Whether or not it is native in Yunnan Province is not clear, but it is at least a native of eastern Asia.

Quadraspidotus cryptus new species
Figure 39

HOSTS AND DISTRIBUTION. From an undetermined species of *Juniperus*, growing in the compound of the then American Consulate at Kunming, Yunnan Province, China, G. F. Ferris, April 23, 1949.

HABIT. Occurring for the most part on the inner face of the more or less closely appressed needles of the host, especially near the tips of the twigs. Scale of the female quite flat, roughly circular and white or gray. Scale of the male slightly elongate and darker than the female.

RECOGNITION CHARACTERS. Adult female (on the slide) about .75 mm. in length, membranous throughout except for the pygidium and some slight sclerotization about the margin in the cephalic region, of ordinary form. Pygidium with three pairs of distinct lobes and with the fourth lobe indicated by a very slight, somewhat sclerotized projection. Median lobes quite low, with their outer margins

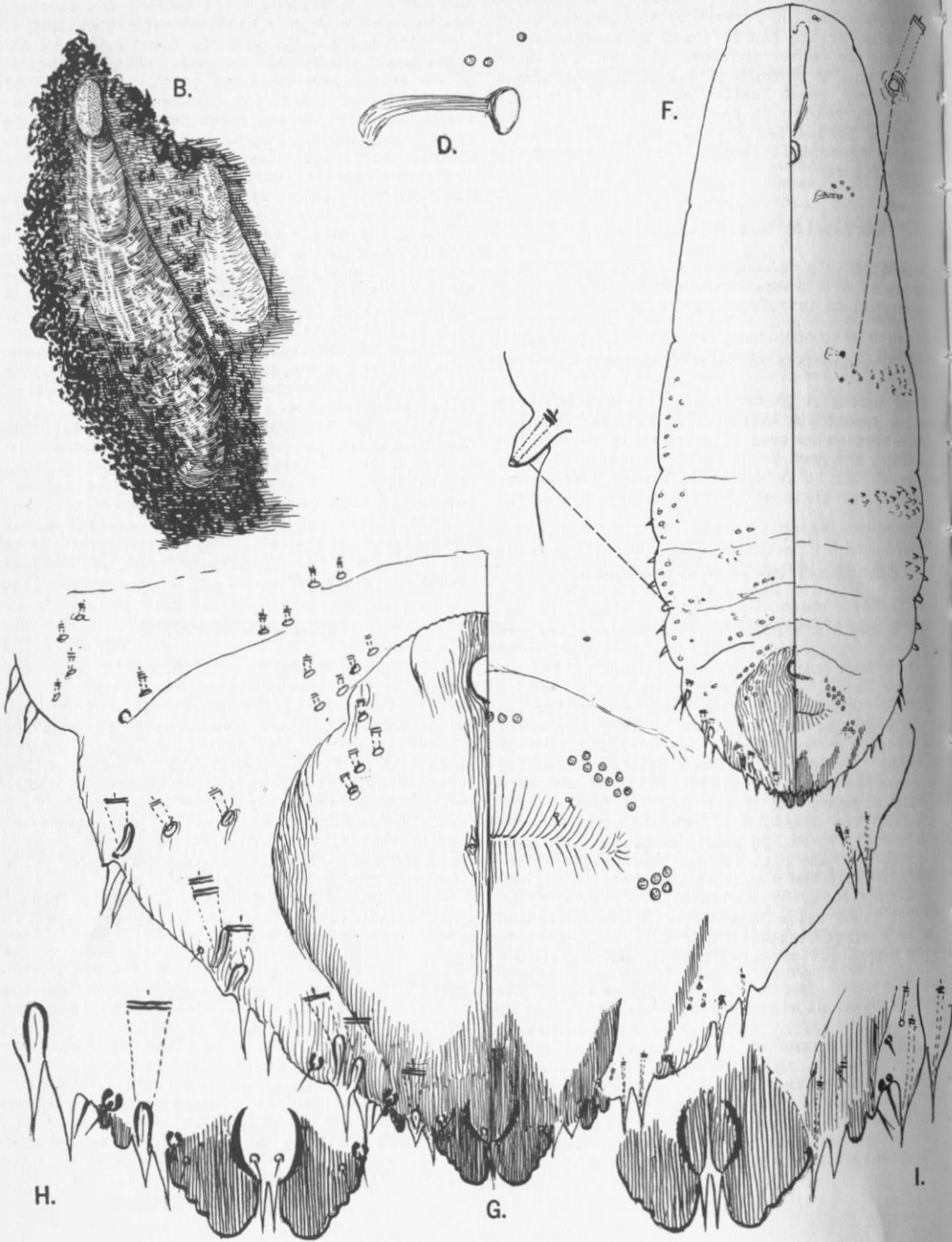
slanting and notched. Second lobes smaller and narrower. Third lobes still smaller and shorter. Median lobes with very distinct paraphyses, that at the outer angle quite long and slender, that of the mesal angles about half as long. Mesal paraphysis of the second lobe small and short. Paraphysis of the third lobe and of the intersegmental area between third and second lobes very small, but definitely developed. Dorsal ducts slender and relatively short, rather few, a short series in confined the intersegmental furrow between the first and second lobes, a longer series in the furrow between the second and third lobes and a short series paralleling the margin beyond the third lobe. Ducts lacking anterior to the pygidium except for one or two short ducts in the marginal area on the segments forward to the prosoma. Anal opening quite large, separated from the base of the anal lobes by only a little more than its own diameter. Sclerotization of the pygidial dorsum sharply divided into distinct areas, chiefly by the furrow beginning between the second and third lobes. Perivulvar pores lacking.

NOTES. The assignment of this species to *Quadraspidotus* may be questioned, yet it seems to the writer to be referable to this genus better than to any other. It is separable from the various species of this genus which have been elucidated by Balachowsky and by Ferris chiefly by the absence of the perivulvar pores the long outer paraphysis of the first pygidial lobe and the slightly indicated fourth lobe.

EXPLANATION OF FIGURES

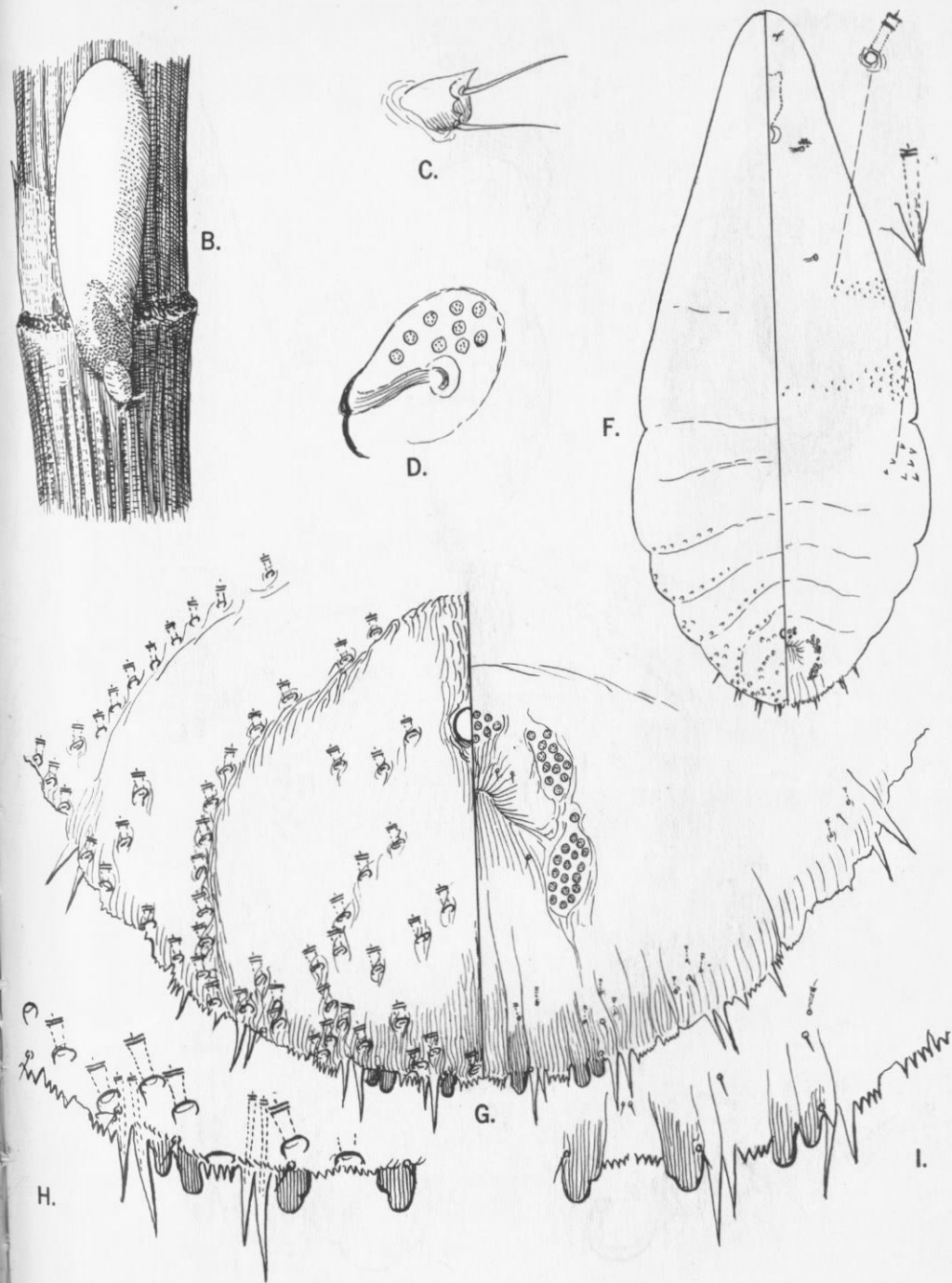
All figures, except Figure 28, are lettered according to a standard pattern, this being the same that is used in all the papers of this series. The omission of any part does not alter the sequence of the lettering. The lettering is as follows: A—antenna of first stage; B—habit; C—antenna; D—anterior spiracles; E—pygidium of second stage; F—outline of adult female; G—pygidium of adult female; H—dorsal side of detail of pygidium; I—detail of ventral side of pygidium. Other details are connected with their points of origin by guide lines and should be readily identifiable.

Figure 28. Generalized illustration of *Phenacaspis*, indicating structure for which a special terminology is employed.



Andaspis yunnanensis, new species

Figure 23



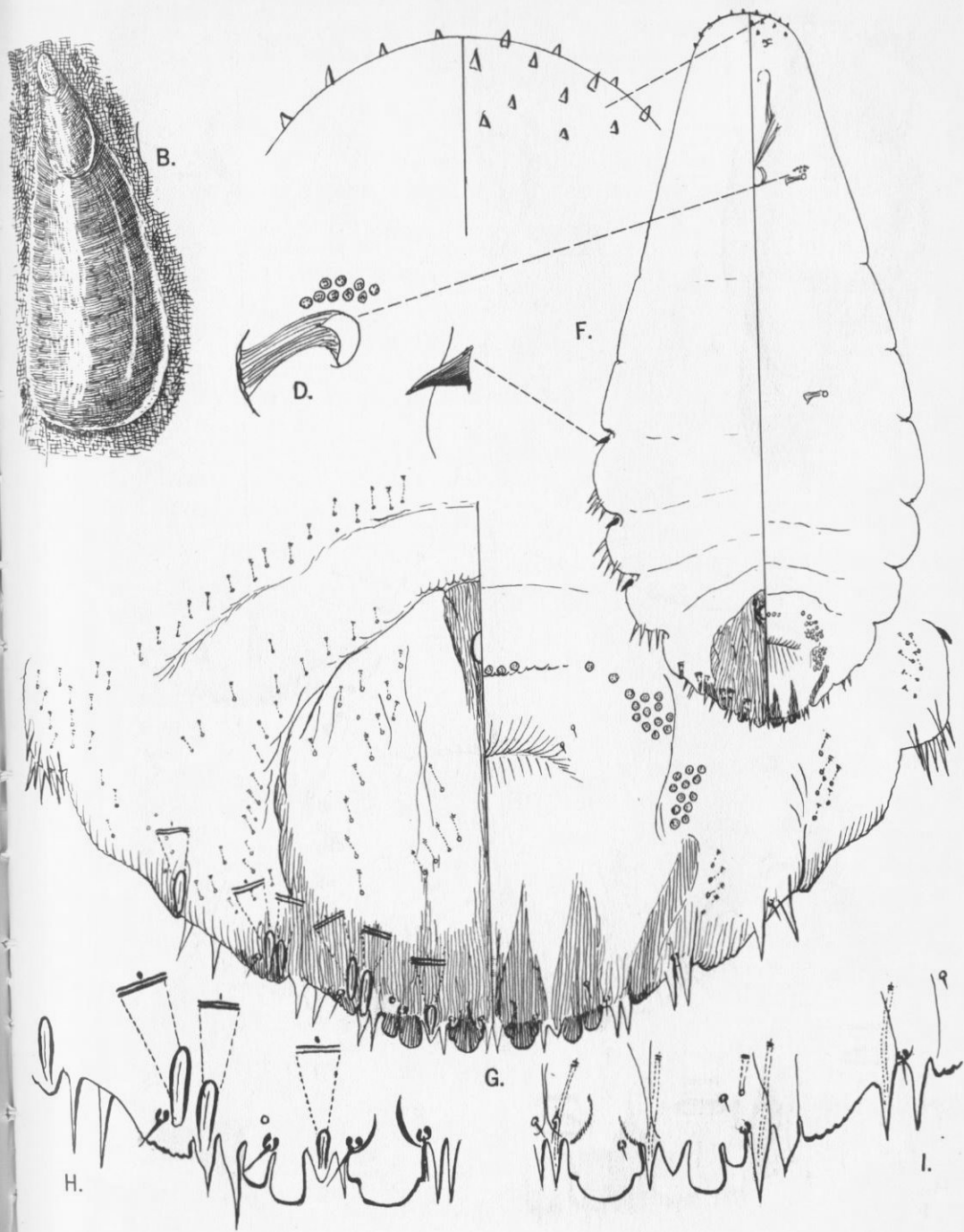
Kuwanaspis pseudoleucaspis (Kuwana)

Figure 24



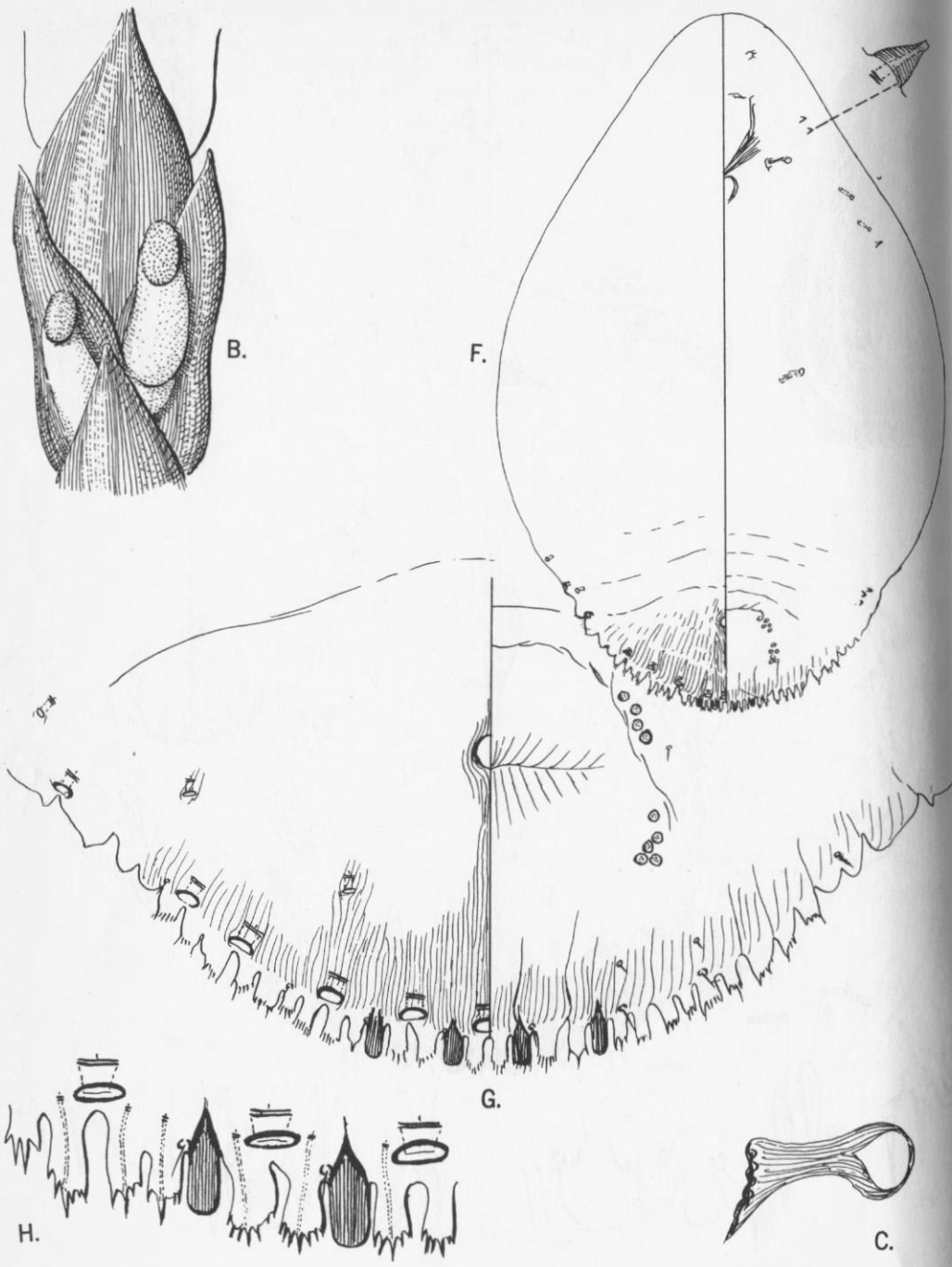
Lepidosaphes keteleeriae, new species

Figure 25



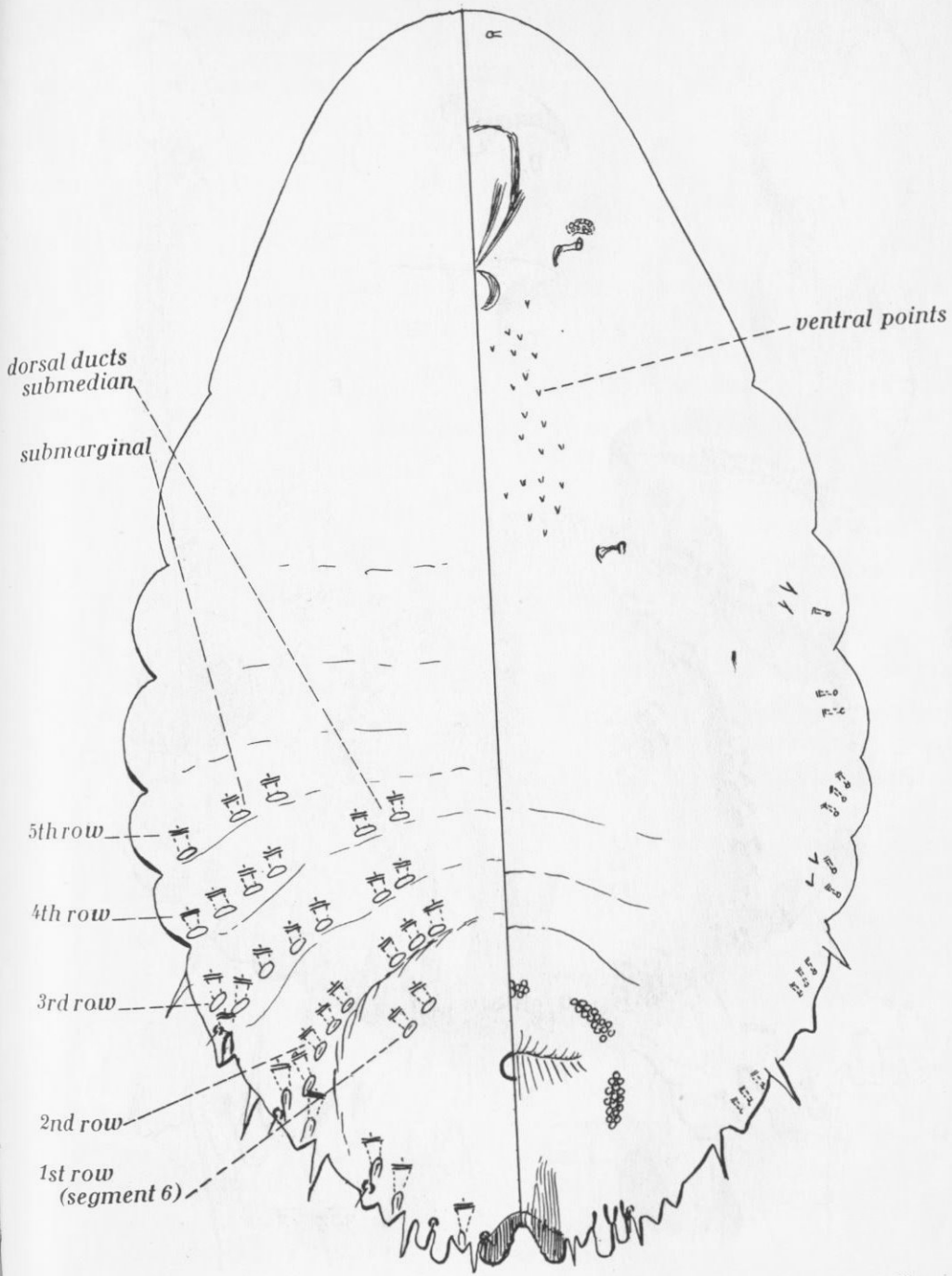
Lepidosaphes tubulorum Ferris

Figure 26



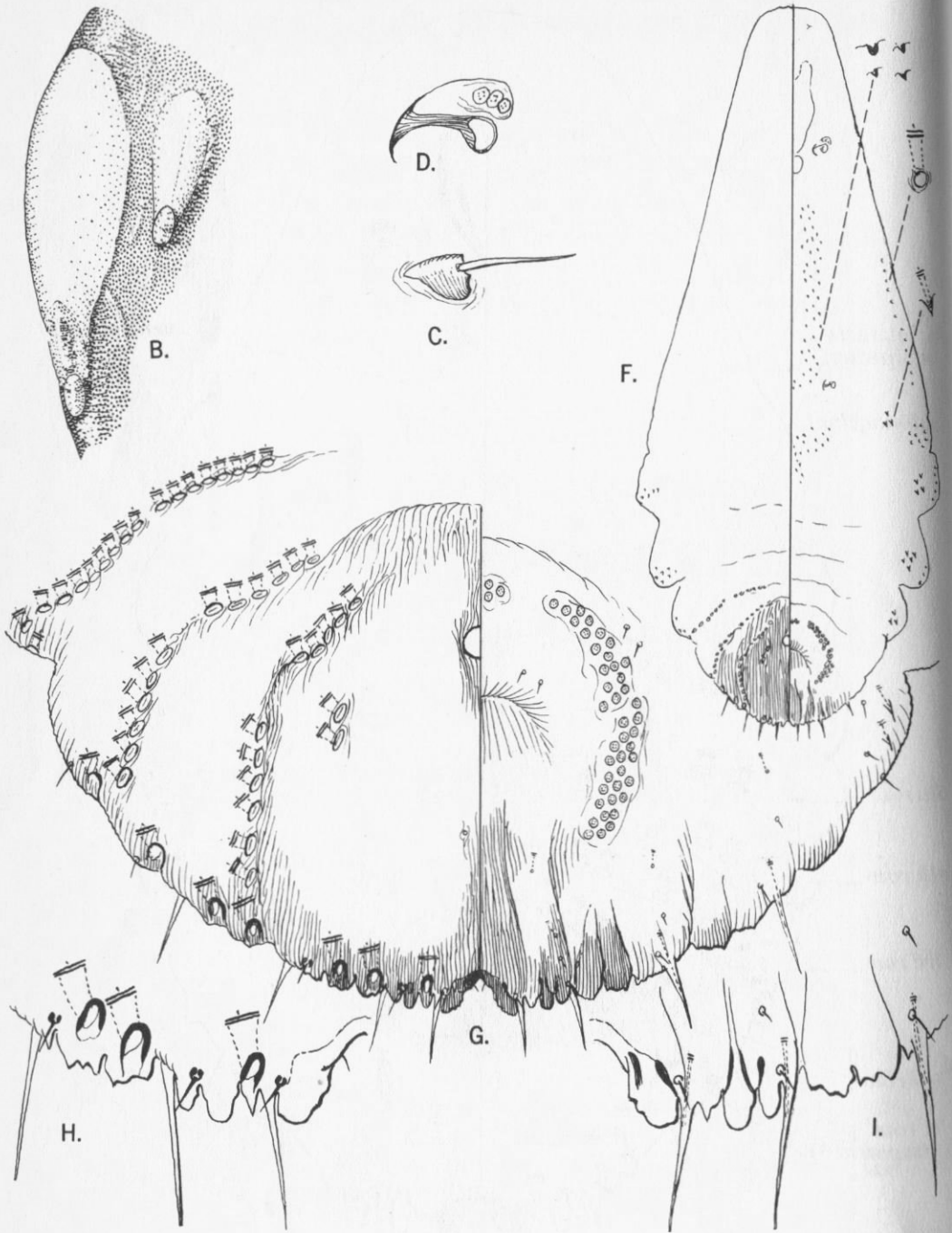
Parlatoria cupressi, new species

Figure 27



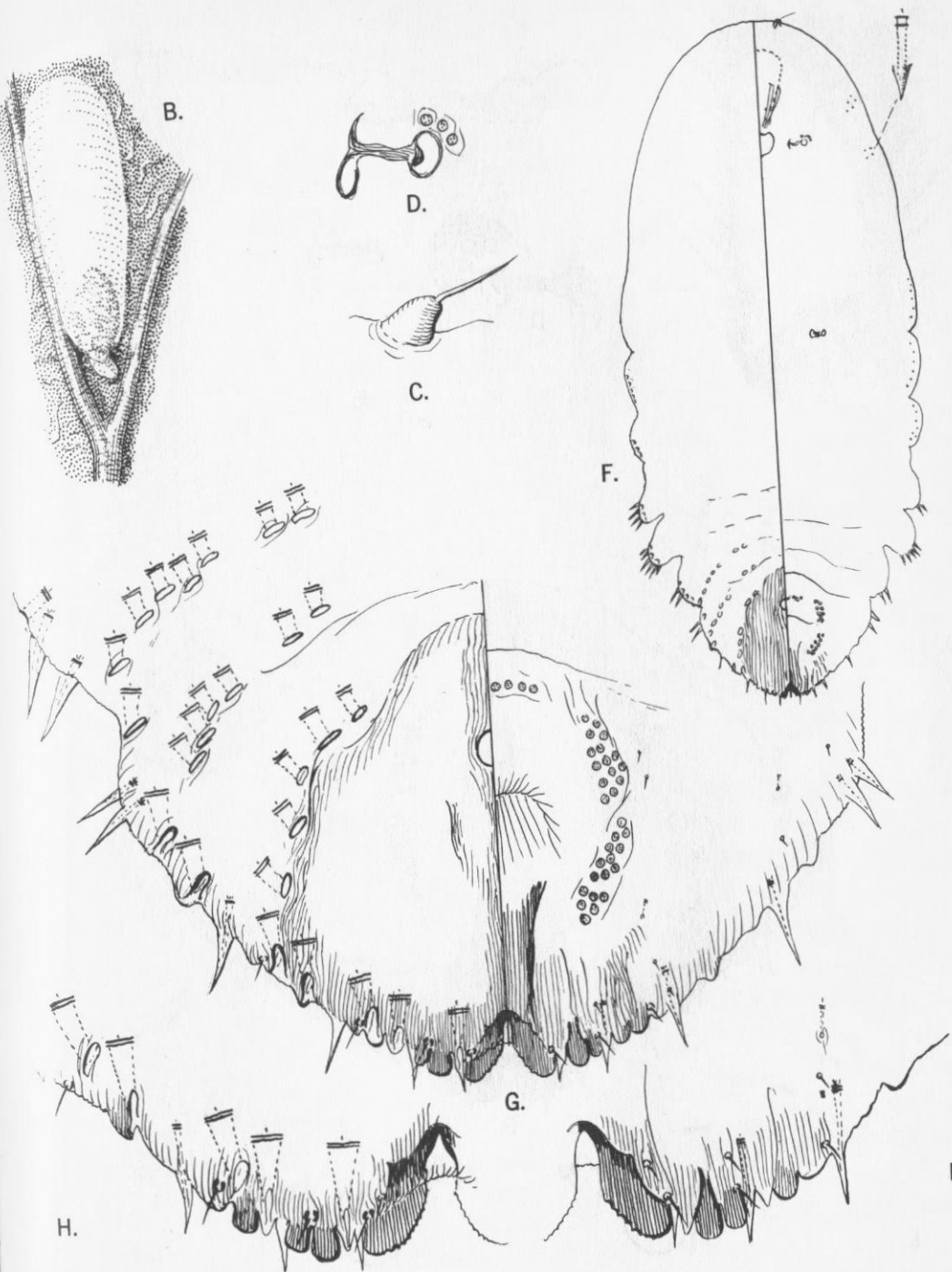
Phenacaspis, generalized

Figure 28



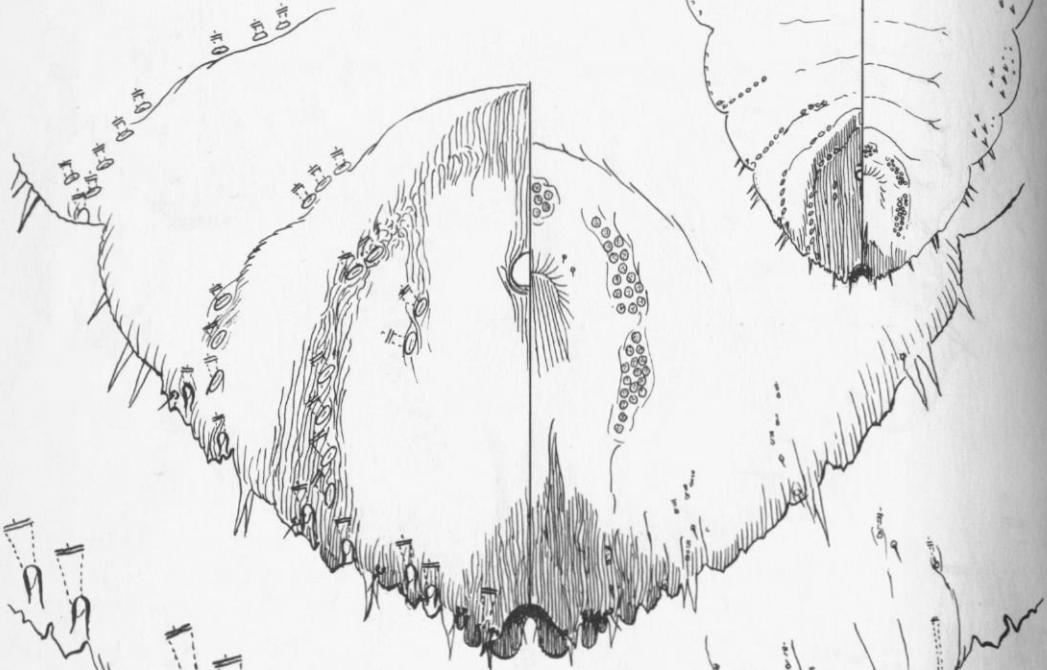
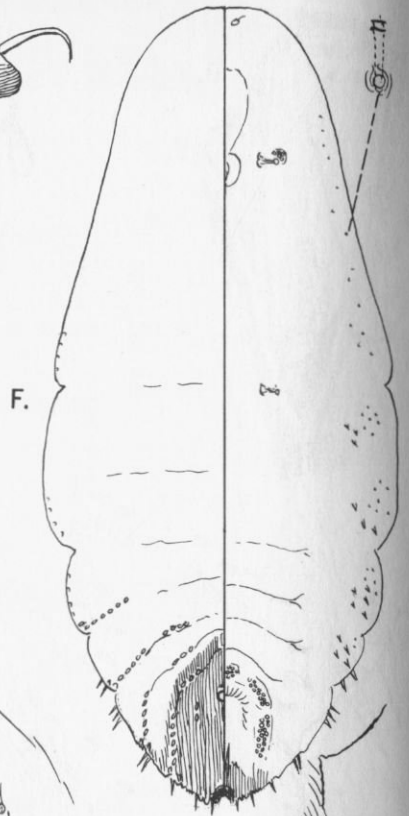
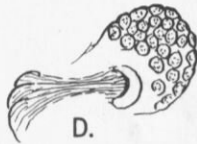
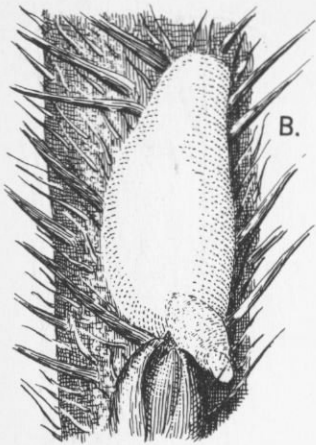
Phenacaspis centreesa, new species

Figure 29



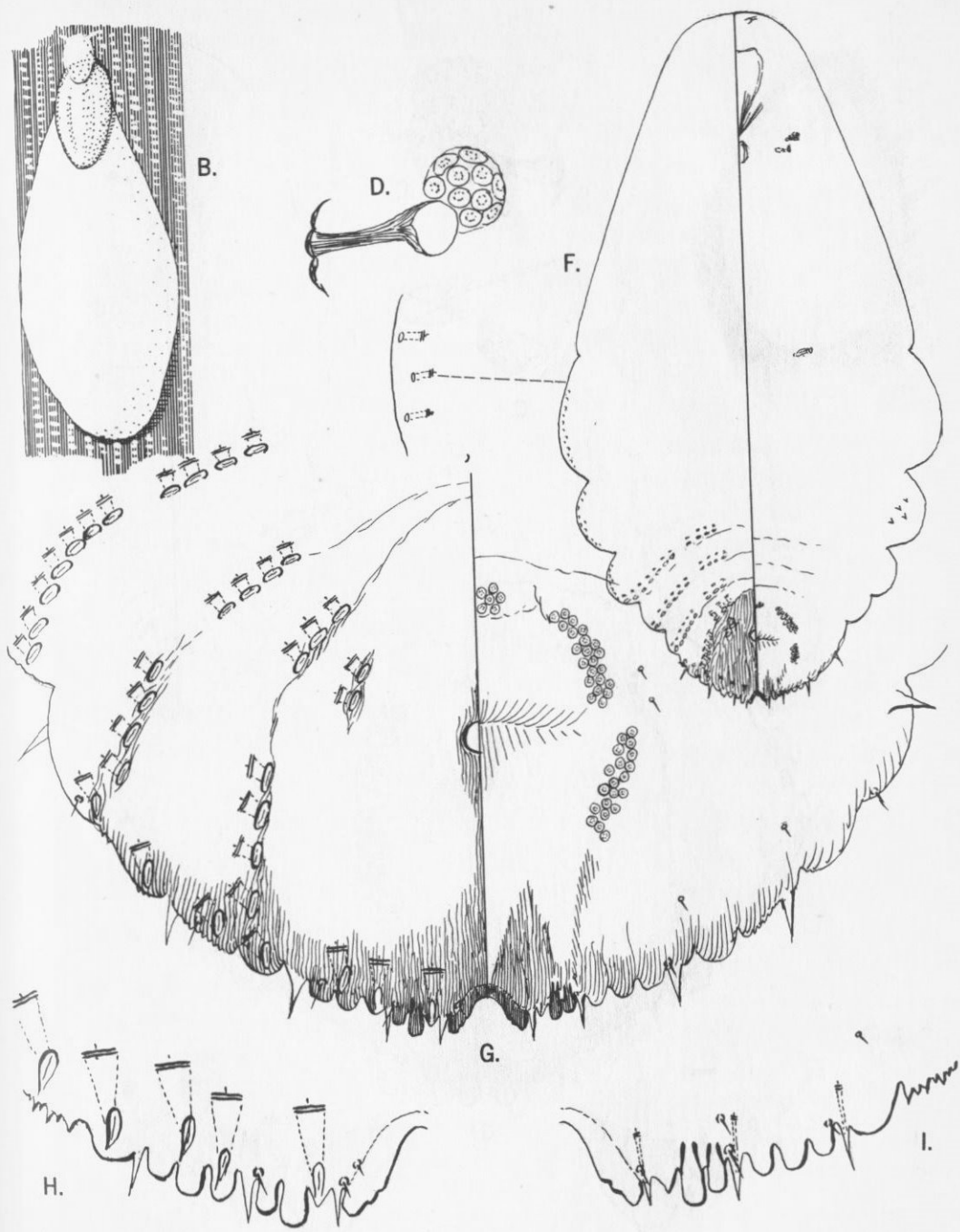
Phenacaspis dryina, new species

Figure 30



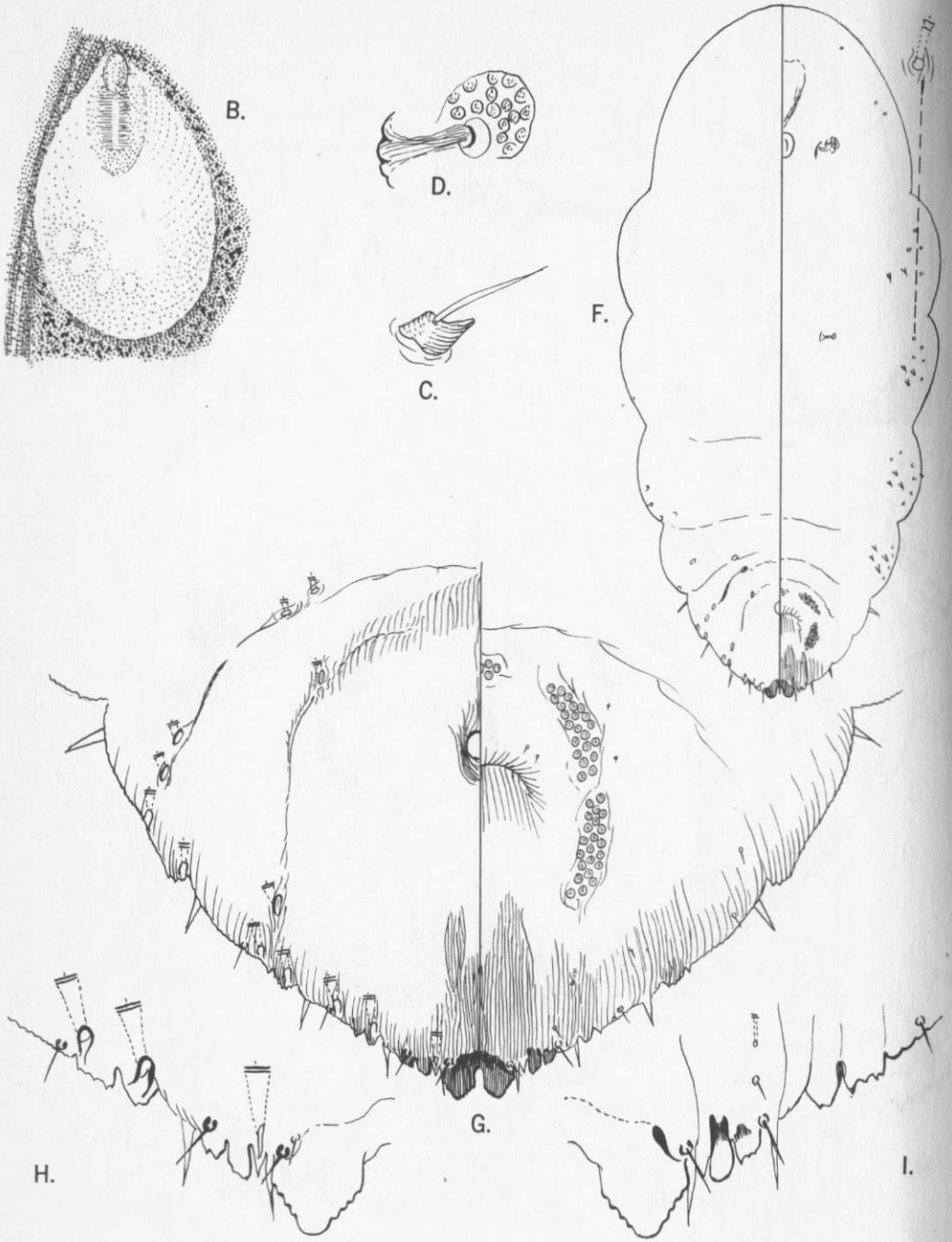
Phenacaspis ericacea, new species

Figure 31



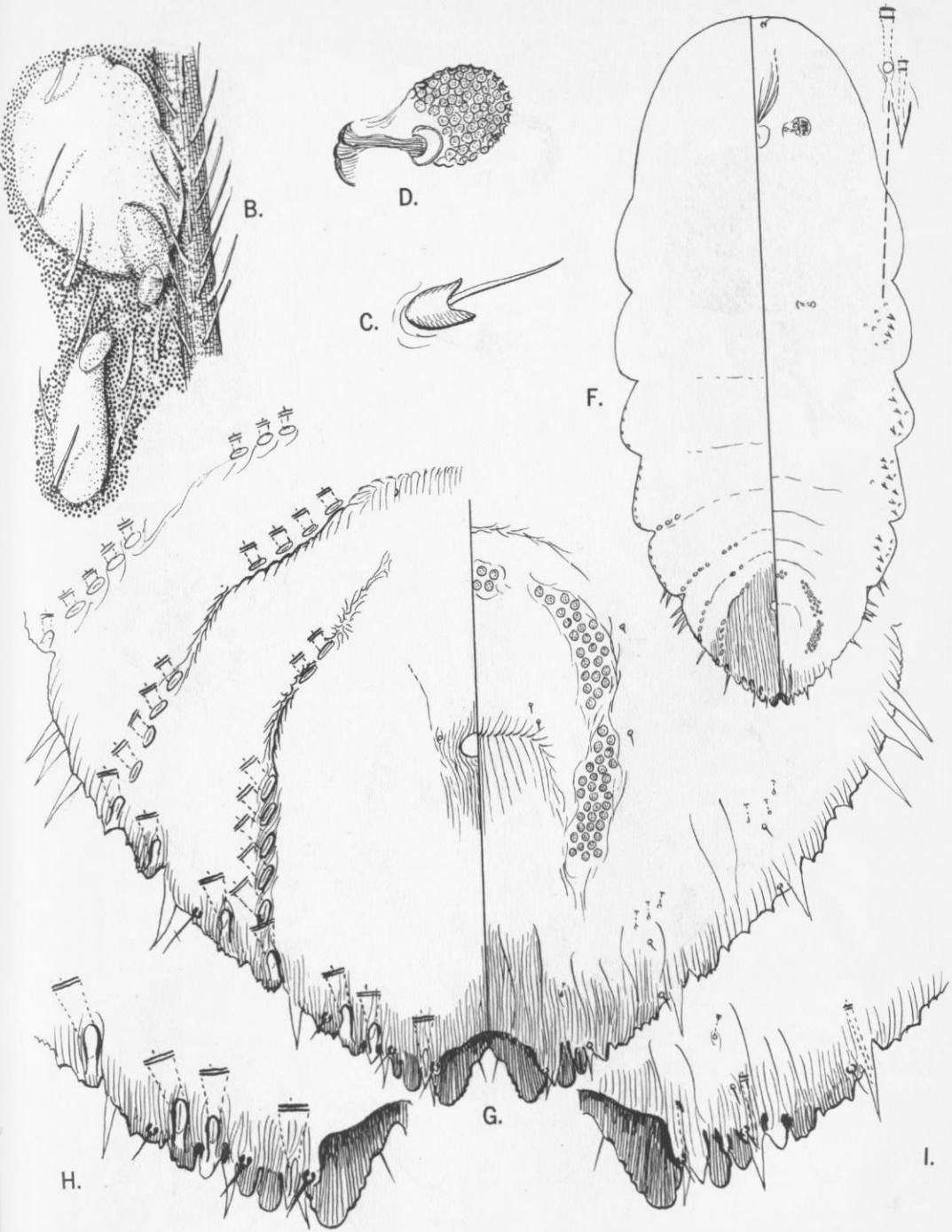
Phenacaspis keteleeriae, new species

Figure 32



Phenacaspis osmanthi, new species

Figure 33



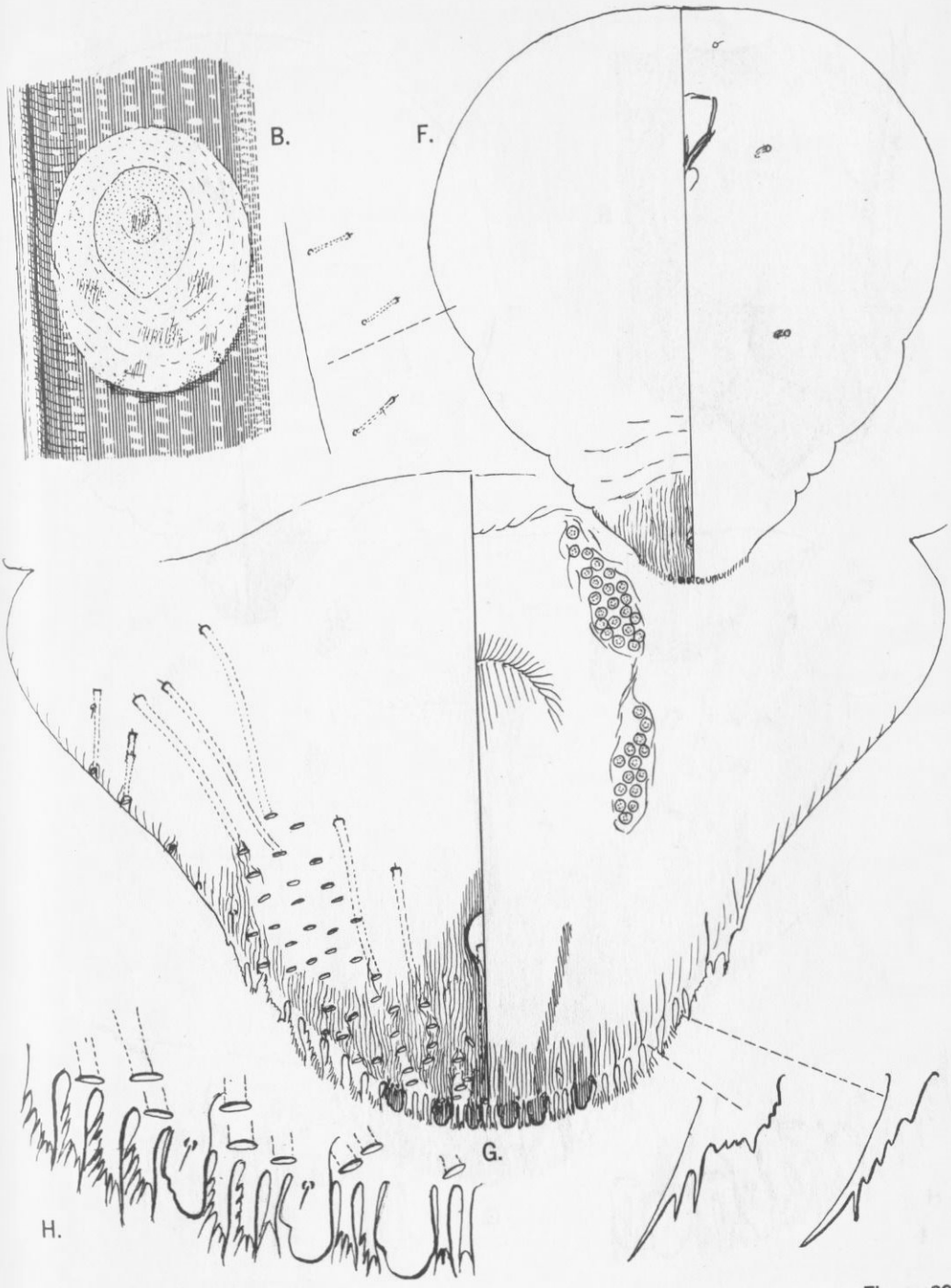
Phenacaspis poloosta, new species

Figure 34



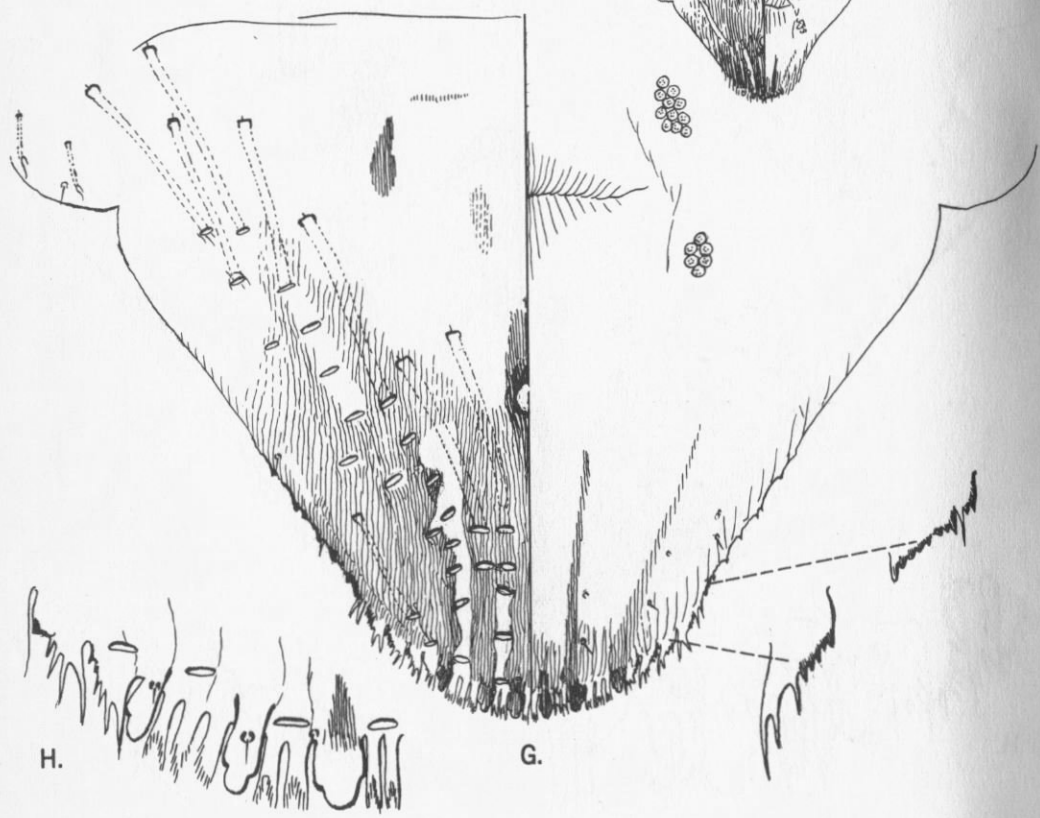
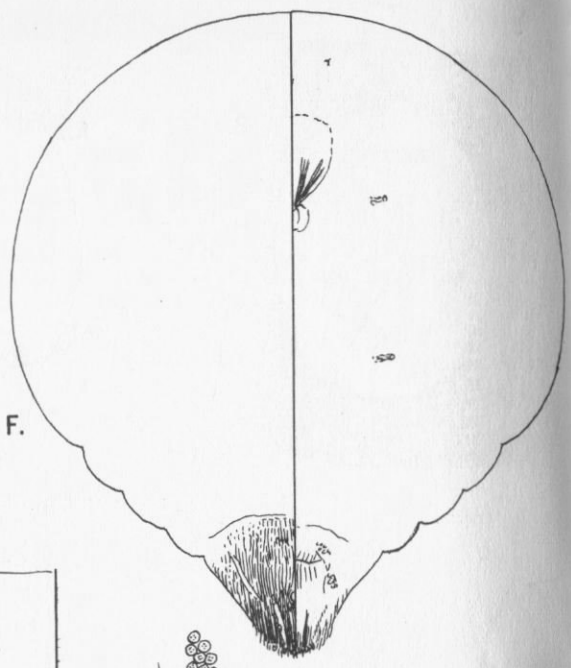
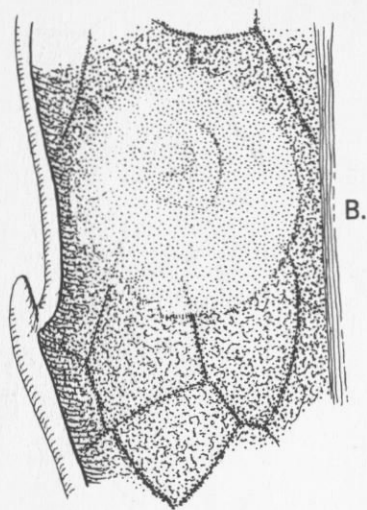
Phenacaspis pudica, new species

Figure 35



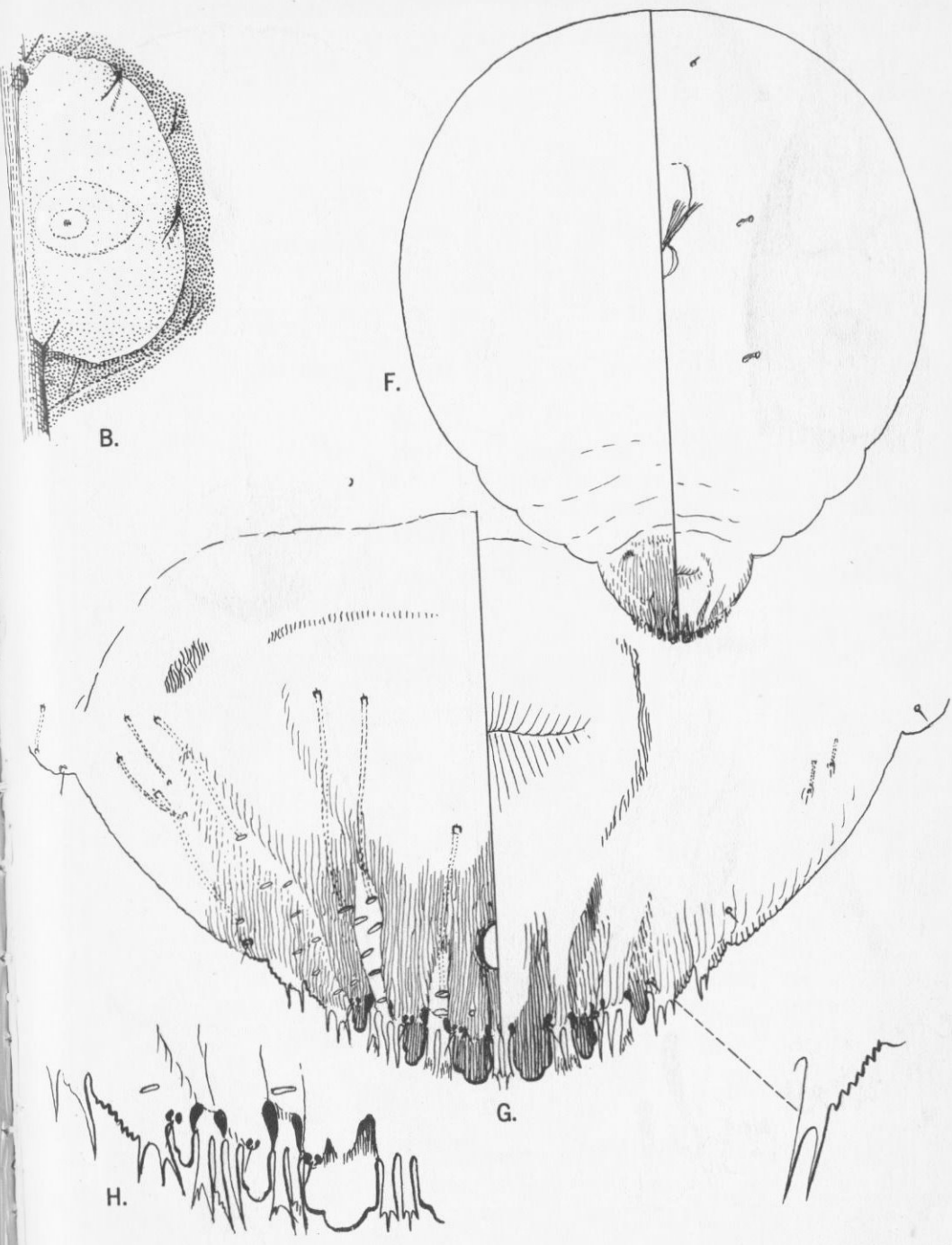
Aspidiotus cryptomeriae Kuwana

Figure 36



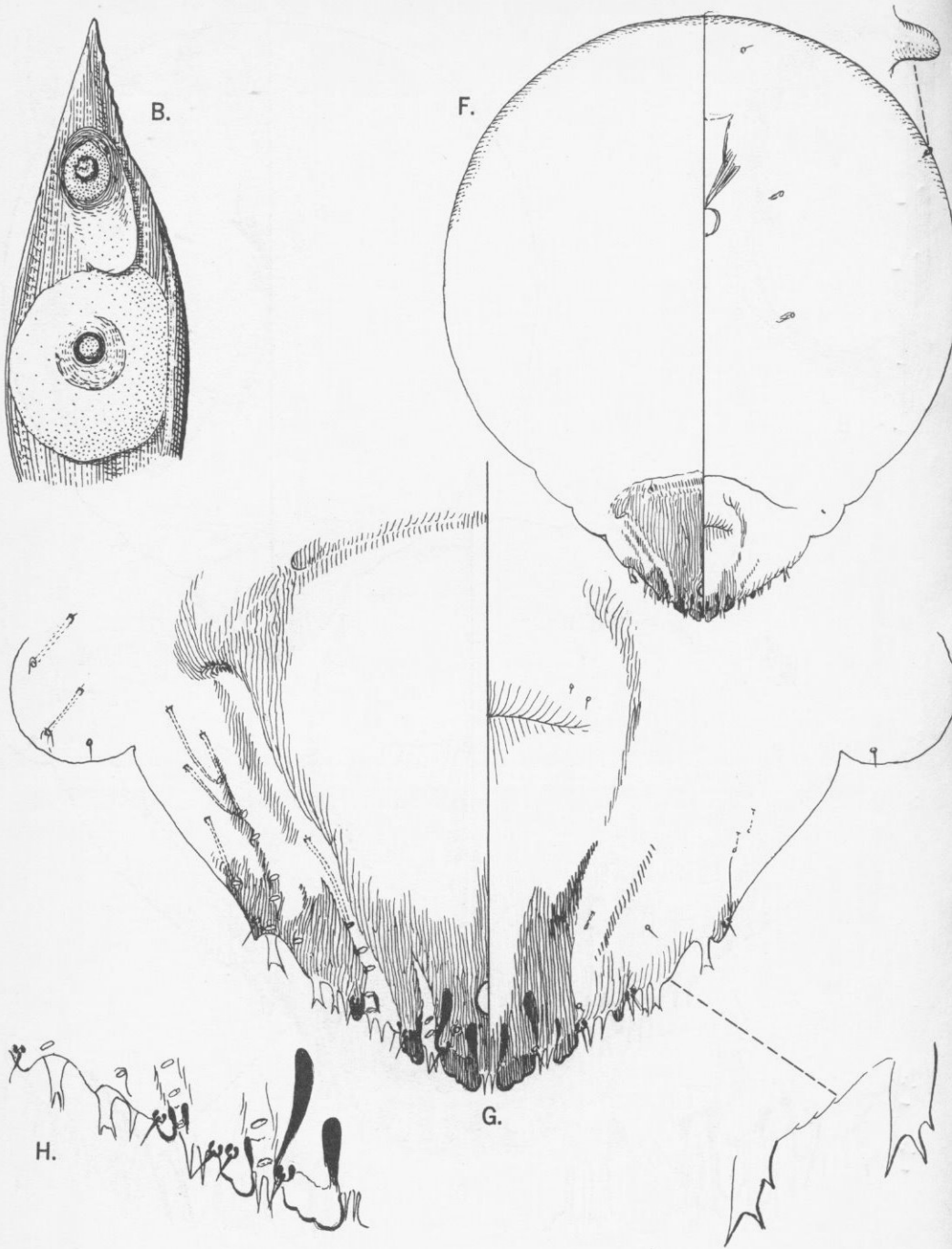
Aspidiotus nothopanacis, new species

Figure 37



Hemiberlesia sishanensis, new species

Figure 38



Quadraspidiotus cryptus, new species

Figure 39