

XXX NOTES ON INDIAN COCCIDAE OF
THE SUB-FAMILY DIASPIDINAE, WITH
DESCRIPTIONS OF NEW SPECIES

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(Plates XXVI—XXXI).

Since the publication of my last enumeration of Coccidae from the Continent of India ('*Mem. Dep. Ag. Ind.*' Ent. Ser., II, No. 2, Ap. 1908), many fresh records have accumulated, including a considerable number of undescribed species. The present paper deals with those belonging to the sub-family Diaspidinae, describing the new species and listing others that have not previously been recorded from India. Of the fifty species now added to the Indian list, twenty are here described for the first time. It is only to be expected that, in such a vast and (in this respect) unexplored region, we can have touched no more than the fringe of the subject. Every fresh parcel that I receive discloses one or more novelties.

I am indebted to T. V. Ramakrishna Aiyar, of the Agricultural College, Coimbatore, for repeated consignments of valuable and interesting material. I have also had the privilege of examining collections from the Indian Museum, from the Agricultural Research Institute (Pusa), from the Forest Zoologist (Dehra Dun) and from the Poona Agricultural College.

***Diaspis cinnamomi-mangiferae*, Newst.**

(Pl. XXVI, fig. 1a).

Female puparium thin, semitranslucent, whitish, circular. Dried insect pallid: probably yellowish in life. Form similar to that of *D. rosae*: the thoracic area broad, the abdominal area constricted. Pygidium with median lobes smaller, narrower, and less divergent than in *rosae*.

On *Mangifera indica*: Bangalore (*Ramakrishna*, No. 114).

***Diaspis loranthi*, Green.**

(Pl. XXVI, fig. 1g).

On *Loranthus cordifolius*: Paresnath, Bihar, 4000 ft. (*Ind. Mus.* No. 71). Differs from *rosae* in the larger, more prominent and more rounded median lobes, which extend far beyond the lateral lobes. Dr. Annandale writes of this species, "It has perhaps

some economic importance, for it was strictly confined to the *Loranthus* upon which it was found in some abundance, and species of *Loranthus* have been known to do serious damage to forest timber in the Himalayas. I could find no trace of the Coccid on the tree on which the *Loranthus* was growing."

***Diaspis rosae* (Bouche).**

(Pl. XXVI, fig. 1b-f).

On *Loranthus* sp.: Ootacamund (coll. E.E.G.). On *Hemigys-rosa*: Courtallum, Tinneveli District (*Ramakrishna*, No. 141).

D. rosae varies considerably in the size of the median lobes; but they are always more or less pointed at the outer extremity, and scarcely project beyond the lateral lobes. Figs. b to f represent examples of *rosae* from different localities, showing a gradual increase in the size of the median lobes.

***Chionaspis annandalei*, n. sp.**

(Pl. XXVI, fig. 2a-c).

Puparium of female sordid white, pellicles castaneous. Form elongate, straight or slightly curved, very narrow; underside with a ventral scale enclosing the insect and ova, except for a narrow median slit which remains open—as in *Mytilaspis gloveri*. Length 2 to 2.5 mm. Greatest breadth 0.3 mm.

Male puparium pure white, with a rather indistinct median carina: pellicle castaneous. Length 1.25 mm.

Adult female (fig. 2a) elongate, linear; the cepalo-thoracic area occupying more than half the length of the body. Pygidium (fig. 2b) with six prominent lanceolate lobes, of which the median are slightly the largest: the two lateral lobes are situated close together on each side, but are separated by a considerable interval from the median lobes. All the lobes have radices extending far back into the pygidium. There is a conspicuous marginal pore between the median lobes, one in the space between the median and lateral lobes, and others at intervals on each side beyond the lobes. Squames spiniform. Anal and genital orifices near the base of the pygidium. There are no circumgenital pores. The oval dorsal pores are numerous and conspicuous, and are arranged as shown in the figure. Length 1 to 1.5 mm.

Nymphal pellicle (fig. 2c) with a well defined division between the thoracic and abdominal areas.

On stems of *Dendrocalamus strictus*. Paresnath Hill, 2500 ft., Bihar (*N Annandale*, 10-iv-1909).

***Chionaspis caroli*, n. sp.**

(Pl. XXVI, fig. 3a-b).

Puparium of female snowy white; smooth; pellicles fulvous. Form elongate, moderately dilated behind. Owing to the position

taken up by the insect (on the extreme margins of the leaves), the sides of the puparium are turned down, clasping the edge of the leaf (see fig. 3*a*). Average length 2 mm.

Male puparium (see also fig. 3*a*) white; narrow elongate; transverse section lenticular; without any trace of carinae; attached by the anterior extremity only, the rest of the scale tilted up from the leaf. Average length 1.5 mm.

Adult female narrow in front, widest across the abdomen, increasing in width up to the segment immediately preceding the pygidium. Lateral margins of abdominal segments moderately produced. Pygidium (fig. 3*b*) rounded. Median lobes very small, inconspicuously dentate on free edge: first lateral lobes duplex, the inner lobule large and conspicuous, with rounded entire margin, the outer lobule small and bluntly pointed, other lobes obsolete. Squames spiniform, tubular, unusually long and slender. Circum-genital glands in five groups: median group with from 10 to 12 pores, upper laterals 15 to 17, lower laterals 14 to 16. Oval dorsal pores in short diagonal series on the pygidium and on the preceding two segments; other similar pores on margins of remaining abdominal segments, and—occasionally—on the margins of the thorax. Length 1 to 1.25 mm.

On leaves of tea plant: Darjiling (*C. B. Antram*). The female insects disposed along the recurved edge of the leaf; male puparia in small groups on the undersurface of the leaves.

The species is well characterized by the exceptionally small median lobes.

Although the male puparia are not carinated, I consider that the insect bears closer relationship to the genus *Chionaspis* than to *Lepidosaphes*, in which it might otherwise be included.

Chionaspis chir, n. sp.

(Pl. XXVI, fig. 4*a-e*, Pl. XXVII, fig. 5*f*).

Puparium of female snowy white; smooth and shining; pellicles reddish, often partially obscured by a layer of white secretion: long-ovate or pyriform, rather strongly convex in transverse section. Average length 2.75 mm. Breadth 1.4 mm.

Male puparium not observed.

Adult female (fig. 4*a*) oblong ovate, narrower in front, broadly rounded behind. Anterior spiracles with a small group of parastigmatic pores. Lateral area of meso-thoracic and of the first three abdominal segments with numerous minute circular pores. Pygidium (fig. 5*f*) with evenly rounded margin, broken by four conspicuous pore-bearing prominences on each side: the extremity (between the innermost pair of marginal pores) varying—often asymmetrically—in almost every individual examined. In the most symmetrical form (fig. 4*d*), there is a small median conical point followed, successively, on each side, by a prominent lanceolate process, a broad tridentate process and an irregularly falcate

process. The tridentate processes are probably homologous with the usual median lobes. The lateral lobes are possibly represented by a minute process immediately caudad of the second marginal pore. In one example (fig. 4c) all of the median processes have been suppressed, leaving the margin—at this part—irregularly sinuate. Squames represented (if at all) by a few minute projections towards the base of the pygidium. Circumgenital glands in four groups: the upper lateral group with from 13 to 17 pores, the lower laterals with from 34 to 41 pores. Dorsal oval pores numerous, large and conspicuous: in regular series following the contour of the suppressed segments. Anal orifice near the base of the pygidium. Length 1.5 to 2 mm.

On 'Chir Pine' (*Pinus* sp.): Almora, Kumaon, U.P. (coll. Forest Zoologist, Dehra Dun.)

It is with considerable hesitation that I have assigned this insect to the genus *Chionaspis*. The characters of the covering scale, and most of those of the insect itself, suggest its affinity to Maskell's genus *Poliaspis*. But that genus was founded especially to contain species possessing more than five groups of circumgenital pores, of which this insect has four only—an unusual number in any Diaspidine genus, except *Parlatoria* and *Aspidiotus*, with neither of which can this species be associated.

***Chionaspis* (*Phenacaspis*) *gudalura*, n. sp.**

(Pl. XXVII, fig. 6a, b).

Puparium of female (fig. 6a) circular, the larval pellicle projecting beyond the margin; slightly convex above. Colour clear white, the pellicles castaneous. Average diameter 2 mm.

Male puparium white: strongly tricarinate. Length approximately 1 mm.

Adult female ovate; length approximately equal to twice the breadth. Pygidium (fig. 6b) broadly rounded. Median lobes occupying a slight median depression; their bases united, their distal edges divergent, without serrations or indentations. Lateral lobes duplex, prominent; the first laterals distinct, the two lobules of approximately equal size; the second laterals in the form of thickened marginal prominences, the inner lobule with an oval dorsal pore at its base. Squames spiniform. Marginal spines inconspicuous. Anal orifice central. Circumgenital glands in five groups, with numerous pores; median group 16 to 25; upper laterals 30 to 42, lower laterals 29 to 28. Oval dorsal pores conspicuous, in broken longitudinal curved series. Length 1.5 mm. Breadth approximately 0.75 mm.

Massed on the stems of a large species of Bamboo. Gudalura, Nilgiris (coll. E. E. Green).

This is one of those species which reveal the close affinity between the *Phenacaspis* section of the genus *Chionaspis* and the *Aulacaspis* section of *Diaspis*, the chief distinction between which

appears to be that in the former the larval pellicle is ultra-marginal, while in the latter it is intra-marginal in position.

***Chionaspis spiculata*, n. sp.**

(Pl. XXVII, fig. 7*a-d*, 8*e, f*).

Puparium of female (fig. 7*a*) elongate and very slender; straight, parallel-sided, posterior extremity tapering abruptly to a point, exuviae fulvous, secretionary appendix white, sides sloping upwards to a median ridge which extends the whole length of the puparium. Length 2.25 to 3 mm; breadth approximately 0.25 mm.

Male puparium not observed.

Adult female (fig. 7*d*) long and narrow, more than half the length occupied by the thoracic area. Pygidium (fig. 8*e, f*) without the usual chitinous lobes; but with a terminal series of longish acuminate processes (7 or 8 on each side) of which the median two are longer and stouter than the others. These processes are possibly homologous with the tubular squames of other species, but do not appear to be associated with any glandular ducts. Circumgenital glands in five groups, the upper three forming a more or less continuous arch: average number of pores,—median 2, upper laterals 4, lower laterals 7 to 8. Dorsal pores large and conspicuous (see fig. 8*i*), sausage-shaped, placed transversely. Diagonal series of similar pores on each side of the abdominal segments. Anterior spiracles with 3 or 4 parastigmatic pores. Length 1 to 1.25 mm.

Nymphal pellicle (fig. 7*b*) narrow, acuminate behind: the posterior extremity (fig. 7*c*) with six prominent, slender, acuminate processes.

On foliage of *Bambusa* sp. Peria Ghat, N. Malabar, 2000 ft. (*Ramakrishna*, No. 126-part).

This is a very distinct insect, quite unlike any other known species. It is placed provisionally in the genus *Chionaspis*, pending the discovery of the male puparium.

***Chionaspis (Phenacaspis) varicosa*, Green.**

(Pl. XXVIII, fig. 9).

Green, "*Cocc. Ceylon*," II, p. 146, pl. L (1899).

On *Loranthus*, Dodabetta, Nilgiris (*Ramakrishna*, No. 74), and on *Piper* sp. Coorg, Sidapur (*Ramakrishna*, No. 62).

The Indian form (fig. 9) has the median lobes rather more strongly divaricate than in typical examples from Ceylon, and shows a single spiniform squame on the margin of the fourth space, in place of the group of three or four that occur in the same position in typical examples. The female puparium, also, is longer and narrower than in the type, and does not exhibit the conspicuous raised lines that characterize examples from Ceylon.

Chionaspis acuminata, Green.

On *Evodia*. Peria Ghat, North Malabar, 2,000 ft. (*Ramakrishna*, No. 127-part).

Chionaspis acuminata var **atricolor**, Green.

On *Tamarindus* and *Carissa*. Coimbatore (*Ramakrishna*, Nos. 124 and 147).

Chionaspis elongata, Green.

On *Bambusa* sp. Ootacamund (coll. E. E. Green).

Chionaspis litseae, Green.

On 'Ghumti.' Darjiling District. (Ex coll. Ind. Mus.).

Chionaspis megaloba, Green.

On *Zizyphus jujuba*. Pusa (*T. B. Fletcher*, No. 44).

Hemichionaspis chionaspiformis, Newst.

On 'Wild Indigo.' Coimbatore (*Ramakrishna*, No. 122).

Dinaspis permutans (Green).

On *Evodia*. Peria Ghat, 2,000 ft., N. Malabar (*Ramakrishna*, No. 127-part).

Aspidiotus (Hemiberlesia) pseudocamelliae, n. sp.

(Pl. XXVIII, fig. 10).

Puparium of adult female ochraceous (when on the twigs or the upper surface of the foliage), whitish (on undersurface of foliage): pellicles darker ochreous, occupying the greater part of the area of the scale. Form irregularly circular, slightly convex above. Diameter 0.75 to 1 mm.

Male puparium slightly paler in colour: ovate. Length 0.75 mm.

Adult female broadly ovate: bluntly pointed behind. Pygidium (fig. 10) with a single median pair of large prominent lobes, their inner edges converging and rather closely approximated, their free edges sloping steeply and indented at one or two points. Squames very slender and inconspicuous, spiniform, obscurely pectinate outwardly: the three or four outermost squames each on a slight prominence. Marginal spines long and conspicuous. A well-marked claviform paraphysis running inwards from the outer edge of each median lobe. Anal orifice ovate; distant from the posterior extremity by about a quarter the length of the pygidium. No circumgenital pores. Oval dorsal pores conspicuous: in two irregular series on each side. Length 0.5 to 0.75 mm.

Thickly clustered on the smaller twigs and on both surfaces of the leaves of *Capparis stylosa*. Ittige, Bellary District (*Ramakrishna*. No. 64).

The species differs from *camelliae* in the nature of the squames, which are not broadly pectinate, as in that species, and in the greater number and size of the oval dorsal pores. The puparia, also, are quite distinctive.

***Aspidiotus tamarindi*, n. sp.**

(Pl. XXVIII, fig. 11A, b).

Female puparium irregularly oval or subcircular, flattish. Colour stramineous, ochreous, or pale castaneous, the darker examples being situated on the upper surface of the leaves. Diameter 2 mm.

Male puparium small; oblong oval, slightly narrower behind. Colour rather paler than that of the female scale, occasionally whitish. Length 0.75 mm.

Adult female (fig. 11A) evenly turbinate, without any indications of abdominal segmentation. Pygidium somewhat produced: the margin (fig. 11B) with six prominent, somewhat narrow lobes; all the lobes with a translucent band across the base; the median lobes are markedly indented on each side; the lateral lobes indented on the outer side only. Squames very thin and delicate, the distal extremity of each deeply fringed; those in the interlobular spaces ligulate; the ultra-lobular squames (of which there are six or seven on each side) broader, and acutely pointed at the inner edge. Anal orifice small, circular, approximately central. Circumgenital glands in four groups; the upper groups with 7 or 8, and the lower with 3 or 4 pores. Numerous slender filiform ducts communicate with inconspicuous marginal (and ? dorsal) pores. Length 1 to 1.25 mm.

On *Tamarindus*. Coimbatore (*Ramakrishna*, No. 26-part).

Crowded on both surfaces of the leaflets. Male puparia intermingled with those of the females.

***Aspidiotus cyanophylli*, Sign.**

On 'Ceara Rubber.' Nilgiris, 2,000 ft. (*Ramakrishna*, No. 53-part).

***Aspidiotus hartii*, Ckll.**

On *Curcuma*. Poona (*H. H. Mann*, No. 34).

***Aspidiotus rossi*, Mask.**

On *Carissa carandas*. Coimbatore (*Ramakrishna*, No. 36).

On 'Pomegranate.' Bilaspore, C.P. (*T.B. Fletcher*, No. 38).

***Odonaspis penicillata*, Green.**

On *Bambusa*. Coimbatore (*Ramakrishna*, No. 134-part).

Odonaspis simplex? (Green).

On *Bambusa*. Coimbatore (*Ramakrishna*, No. 134-part).

Aonidia indica, n. sp.

(Pl. XXVIII, fig. 12*a*, *b*).

Puparium of female circular, moderately convex, the median area usually depressed or slightly concave; secretionary margin very narrow, the centre of the scale usually bare. Colour pale castaneous, the secretionary margin grayish brown. Diameter approximately 0.5 mm.

Male puparium larger; broadly ovate; the larval pellicle nearer one extremity. Colour dull grayish brown. Length 0.75 mm.

Adult female circular, the pygidium slightly prominent. Posterior extremity of pygidium (fig. 12*a*) somewhat truncate; with eight small rounded or slightly indented lobes, the median pair largest, the others decreasing in size to the outermost. Between the lobes are some delicate fimbriate or truncate squames, and there are three or four similar squames beyond the outermost lobe, on each side. Anal orifice relatively large, near the posterior extremity. Length approximately 0.5 mm.

Posterior margin of nymph (fig. 12*b*) with six prominent lanceolate lobes, the median pair slightly indented on each side. There are also six large and conspicuous semilunar marginal pores.

On undetermined plant. Museum Compound, Calcutta (*N Annandale*).

Aonidia tentaculata, n. sp.

(Pl. XXIX, fig. 13*a-d*).

Female puparium flattish, dull castaneous, consisting of the large, naked nymphal pellicle upon which is superimposed the smaller larval pellicle—of a darker shade of brown. The nymphal pellicle is of the peculiar form shown at fig. 13*a*, the thoracic area widely expanded, subcircular, the narrow parallel-sided abdominal area projecting posteriorly. The substance of the pellicle is densely chitinous, with a markedly granular structure, and with concentric series of irregularly oval clearer spaces. There is a sharply defined narrow marginal border. The posterior extremity of the pellicle (fig. 13*b*) exhibits six well defined lobes, of which the median pair is very small and slender, the others broader and hastate in form. The intervals between the lobes are occupied by broad ligulate squames, and there are three obscurely dentate squames immediately exterior to the outermost lobe. The margin beyond the lobes is deeply incised at seven or eight points, and there are seven conspicuous lunate pores on each side. Length 1 mm. Width of thoracic area 1 mm., of abdominal area 0.3 mm.

Adult female (fig. 13*c*) with thoracic area broadly crescentic; the projecting pygidium tapering to a sharp point, its distal

extremity with a marginal series of sixteen long and slender spatulate processes (fig. 13*d*), beyond which is a single strong marginal spine on each side. Three small blunt projections on each side probably represent rudimentary pygidial lobes. Length 0.75 mm. Breadth 0.75 mm.

On *Vateria indica*. Quilon, Travancore (*Ramakrishna*, No. 146-part). Associated with *Websteriella vateriae*.

The species is well characterized by the remarkable spatulate tentacle-like processes on the pygidium.

***Aonidia crenulata*, Green.**

On *Vatica lanceifolia*. "Makum Forest, Assam" (*Lindinger*).

***Aonidia dentata*, Lindinger.**

On *Walsura piscidia*. "Kamlekum Hill, India" (*Lindinger*).

***Aonidia spinosissima*, Lindinger.**

On *Mimusops hexandra*. "Central-India" (*Lindinger*).

***Aonidia targioniopsis*, Lindinger.**

On *Miliusa velutina*. "Burma" (*Lindinger*).

***Aonidia viridis*, Lindinger.**

On *Aglaia minutiflora*. Travancore (*Lindinger*).

***Gymnaspis ficus*, n. sp.**

(Pl. XXIX, fig. 14*a, b*).

Puparium of female consisting of the swollen nymphal pellicle, sometimes with a superimposed larval pellicle: very broadly ovoid, strongly convex. Colour ochreous yellow, the centre with a dark patch where the colour of the dried insect shows through the semitranslucent scale. Length 0.6 mm. Breadth 0.5 mm.

Male puparium oblong: consisting of the yellowish larval pellicle at the anterior extremity, and a white secretory appendix. Strongly convex on the anterior half, depressed behind. Length 0.75 mm. Breadth 0.5 mm.

Posterior margin of nymphal pellicle (fig. 14*a*) with six narrow lanceolate, prominent lobes: the median pair strongly indented on each side, the lateral lobes indented weakly on the inner but more strongly on the outer side.¹ Two large and conspicuous lunate pores on each side, situated in the interlobular spaces, and two or three similar but smaller pores beyond the lobes. Squames broad and deeply fringed.

¹ The lithographic artist has not reproduced quite correctly the outline of these marginal lobes.

Adult female subcircular or broadly oval. Rostral apparatus very large and conspicuous. Pygidium (fig. 14*b*) rounded, the margin serratulate at the extremity. A denser chitinous area surrounds the anal orifice and extends to the genital region.

On *Ficus retusa*. Kollegal, Coimbatore (*Ramakrishna*, No. 22).

***Gymnaspis ramakrishnae*, n. sp.**

(Pl. XXIX, fig. 15*a-f*).

Female puparium consisting of the enlarged nymphal pellicle alone, the larval pellicle almost invariably becoming detached during the later growth of the nymph. The nymphal pellicle (fig. 15*c, d*) is broadly oval in outline, with a sharply defined pygidial area, in front of which the disc of the dorsum rises abruptly into a rounded dome-like protuberance. A lateral view (see fig. 15*d*) is suggestive of the shape of one of the shrapnel helmets used by our troops during the recent war. Length approximately 0.5 mm.

The early nymph (fig. 15*e*) is of the same contour, but shows no sign of the dorsal elevation. The pygidial area is strongly demarked, and recessed into the abdominal segments. The pygidial fringe (fig. 15*f*) is like that of a typical *Parlatoria*, with six small but prominent lobes and broad fimbriate squames.

Adult female (fig. 15*a*) subspherical; the pygidial area slightly projecting, weakly chitinized and with its inner boundary ill defined. Rostral apparatus large and conspicuous. Pygidium (fig. 15*b*) with two very small tricuspid lobes which are recessed into the margin. Between the lobes is a single prominent median process, and there are two similar processes (? modified squames) immediately exterior to each lobe. Anal orifice comparatively large, approximately central. Length 0.25 to 0.3 mm.

On undersurface of leaves of *Hemigyrosa*, disposed—principally—along the prominent veins. Courtallum, Tinneveli (*Ramakrishna*, No. 140).

***Parlatoria artocarpi*, n. sp.**

(Pl. XXIX, fig. 16).

Puparium of female castaneous, with a blackish medio-longitudinal vitta; broadly ovate; consisting of the nymphal exuviae alone, without any secretory appendix. Nymphal pellicle unusually large. Length 0.8 to 0.9 mm.

Male puparium narrower and slightly longer; larval pellicle dull greenish-olivaceous; appendix white. Length 1 mm.

Adult female entirely concealed beneath the large nymphal pellicle. Of normal form; broader across the metathoracic area. Pygidium (fig. 16) with six prominent tricuspid lobes. A large and densely chitinous lunate marginal pore in each inter-lobular space, and smaller lunate pores at intervals along the margin beyond the lobes. The paired squames that occupy the inter-lobular spaces

are ligulate, irregularly serrate distally, the outer edges of each pair markedly longer than the inner edges, so that the distal margins of the two squames slope in opposite directions. The squames that lie outside the lobes are of irregular form; those nearest the lobes being comparatively broad, the remainder decreasing in width till, towards the base of the pygidium, they become long and slender. There are three tooth-like marginal prominences on each side, situated respectively after the 3rd, 7th and 11th squames, the last sometimes obsolescent. On the margins of the abdominal and post-thoracic segments the fimbriate squames are replaced by narrow, tapering, tentacle-like processes, similar to those at the extreme base of the pygidium. Anal orifice approximately central, surrounded by a narrow denser chitinous border. Circumgenital glands in four groups, each containing from 7 to 8 pores. A few small oval (or obscurely crescentic) dorsal pores, in pairs, near the margin of the pygidium. Length 0.5 to 0.75 mm.

On upper surface of foliage of 'jak' (*Artocarpus integrifolia*). Peria Ghat, North Malabar (*Ramakrishna*, No. 128).

Characterized by the large nymphal pellicle, absence of secretory appendix, and the tentacular marginal processes.

***Parlatoria (Websteriella) papillosa*, n. sp.**

(Pl. XXX, fig. 17a-g).

Puparium of female (fig. 17b, c) minute; oval; consisting of the nymphal pellicle without any secretory appendix, the disc rising abruptly into a hemispherical boss. Colour bright yellow or ochreous, the median elevation jet black. Length 0.5 mm.

Male puparium (fig. 17a) creamy white or very pale ochreous, the larval pellicle dusky olivaceous; elongate ovate, broader in front, appendix moderately convex, with a broad medio-longitudinal depressed groove. Length 0.7 mm.

Adult female (fig. 17d) broadest across the anterior thoracic area, tapering behind. Mouth parts large and conspicuous. Margin of meso-thorax with a series of from 10 to 12 minute rounded papillae (see fig. 17e). Margins of metathorax and abdomen with a rather distant series of truncate conical papillae. Pygidium (fig. 17f) with median and lateral lobes represented by densely chitinous deltoid marginal prominences. The space between the median lobes is occupied by a single prominent broadly spathulate process; two similar but smaller processes occupy the space between the median and first lateral lobes, followed by three similar processes in the next interval. These processes apparently take the place of the deeply fimbriate squames that occur in the same positions in typical members of the genus. There are five conspicuous lunate pores situated immediately above the spaces occupied by the spathulate processes, and usually—but not invariably—a similar pore further up the margin on each side. Circumgenital glands in four groups, the upper lateral groups with six pores, the

lower laterals with from three to four pores. Anal orifice approximately central. Length 0.4 mm.

Posterior extremity of nymphal pellicle (fig. 17g) with six conical lobes, each placed on a sharp marginal prominence. There are six large and conspicuous lunate marginal pores in the deeply incised spaces between the lobes. Squames broad and deeply fimbriate at their extremities.

On *Artocarpus integrifolia*. Palghat (*Ramakrishna*, No. 137).

The insect has anomalous characters,—notably, the single median process on the pygidium of the adult female,—which might justify the erection of a separate sub genus for its reception. But, until other allied species have been discovered, it may remain in the present genus. It most nearly approaches Leonardi's sub-genus *Websteriella*.

***Parlatoria vateriae*, n. sp.**

(Pl. XXX, fig. 18a-e).

Female puparium irregularly ovate, flattish; consisting of the larval and nymphal exuviae, without any secretory appendix. Larval pellicle slightly projecting beyond the anterior margin of the nymphal pellicle; subcircular; very pale stramineous, the centre slightly greenish. Nymphal pellicle (fig. 18a) stramineous or pale fulvous, translucent, marginal area darker; elongate ovate, narrower behind. Posterior extremity (fig. 18b) with rather small and narrow tricuspid lobes; lunate marginal pores strongly developed; squames either entire or obscurely dentate, broad. There is a sharply defined cleft between the median pair of squames, extending inwards as far as the anal orifice. Length of nymphal pellicle 0.85 to 0.9 mm. Total length of puparium 1 mm.

Adult female (fig. 18c) minute, entirely covered by the nymphal pellicle. Thoracic area and pygidium rigid and indurated, the former with a small translucent oval space on each side of the rostrum; abdominal segments soft and flexible. Anterior margin broadly rounded; body widest across the base of the abdomen; thence narrowed abruptly. Rudimentary antennae (fig. 18e) in the form of a ring with a radiating series of stout but short setae. Pygidial area sharply defined; base rounded, the extremity (fig. 18d) rather pointed; with six small obscurely tricuspid lobes; two small and inconspicuous lunate marginal pores on each side, squames long and narrow, projecting far beyond the lobes, sharply pointed, some of them obscurely dentate or fimbriate on their lateral margins: circumgenital glands in four groups, the upper laterals with 7 or 8 pores, lower laterals with 4 or 5. Length approximately 0.5 mm.

On *Vateria indica*. Quilon, Travancore (*Ramakrishna*, No. 146-part).

This insect, with its long sharply pointed squames and reduced semilunar pores, is very distinct from any other known species of *Parlatoria*; but may—for the present—be included in Leonardi's sub-genus *Websteriella*.

***Parlatoria calianthina*, Berl. and Leon.**

(Pl. XXX, fig. 19).

On *Mangifera*. Rajputana Provinces (*T. Bainbrigge Fletcher*); and on *Nerium* and *Michelia*. Madras (*Ramakrishna*).

Typical examples of the species are distinguished from *pergandei* by the presence of a fifth (median) group of circumgenital glands, containing from 1 to 3 pores; by the broader and more densely chitinous pygidial lobes; and by the smaller and less pectinated marginal squames. I find, however, after examination of much material, from various localities and host plants, that the presence of the median group of pores is by no means constant and—in some gatherings—is actually exceptional. Fig. 19 shows the pygidium of an example from *Michelia champaca*, in which the median group is absent.

***Parlatoria pergandei*, Comst.**

On *Garcinia cowa*. "Singbhum, India" (*Lindinger*).

***Parlatoria (Websteriella) atalantiae*, Green.**

On *Miliusa indica*. Courtallum (*Lindinger*).

***Lepidosaphes meliae*, n. sp.**

(Pl. XXX, fig. 20a-c).

Puparium of female clear ochreous brown, but usually appearing dark brown from the inclusion of fragments of the cortex of the plant. Mytiliform; straight or variously curved; moderately convex in transverse section. Larval pellicle reddish ochreous. Nymphal pellicle concealed. Total length averaging 2.5 mm.

Nymphal pellicle with two series of irregular translucent lacunae on each side of the cephalic area, the outermost series sometimes partially double. Length averaging 0.75 mm.

Male puparium dark brown; posterior extremity whitish; larval pellicle reddish ochreous. Narrow; margin somewhat sinuous. Length 1.25 mm.

Adult female broadest across base of abdomen. Median area of abdomen somewhat heavily but irregularly chitinized. Lateral area of second segment of abdomen with a transverse patch (fig. 20a) of stout conical spiniform spinnerets, each of which has a short tubular extension at its apex (fig. 20b). Pygidium (fig. 20c) considerably broader than long; the median lobes broad and prominent, adjacent, the apices towards the median line: lateral lobes duplex, the inner lobe large, sloping away from the inner edge, the outer lobule minute: long chitinous paraphyses extend inwards from each lobe. Beyond the lobes, on each side, are three marginal prominences, the inner two moderately cristate and rather heavily chitinized. Squames spiniform. Circumgenital

glands in five groups; the median group with from 8 to 11 pores, upper laterals with an average of 20, lower laterals averaging 14. Dorsal pores minute, circular. Length averaging 1.15 mm.

On 'Nim tree' (*Melia azedarach*). Coimbatore (*Ramakrishna*, No 149).

***Lepidosaphes retrusus*, n. sp.**

(Pl. XXXI, fig. 21).

Puparium of adult female dull ochreous brown to reddish brown; occasionally with an incomplete superficial layer of whitish secretion; usually overlaid with hairs and extraneous matter from the leaf upon which it rests. Rather strongly but irregularly convex; often distorted; usually broadest across the middle, but sometimes wider behind. Length 1.25 to 1.5 mm.

Male puparium brighter ochreous brown; moderately convex; narrow. Length 1 mm.

Adult female broadly ovate. Pygidium obtuse; median area more densely chitinous. Median lobes large and prominent, the free edges strongly but irregularly dentate—with from 6 to 8 denticles. First lateral lobes usually duplex, the inner lobule largest and obscurely bi-dentate, the two lobules occasionally coalescing to form a single tri-dentate process. Second lateral lobes smaller, obscurely tri-dentate. Squames spiniform, stout, a pair in each of the spaces between the median and the lateral lobes, and a third pair shortly beyond the outermost lobe. Anal orifice oblate, close to the base of the pygidium. Circumgenital glands in five groups, the median group with from 6 to 12 pores, the upper laterals with from 8 to 18, and the lower laterals with 11 to 18. Oval dorsal pores of two sizes, three very large pores on each side near the margin, and numerous smaller pores, in irregular scattered series. Length 0.5 to 0.75 mm.

On the undersurface of leaves of *Litsea whiteana*, arranged along the mid-rib and principal veins. Dodabetta, 8,000 ft., Nilgiris (*Ramakrishna*, No. 73).

***Lepidosaphes auriculatus*, Green.**

On *Codiaeum*. Calcutta (*H. M. Lefroy*).

***Lepidosaphes pallidus*, Green.**

On *Psidium*. Ramchandrapur, Godaveri District (*Ramakrishna*, No. 105).

***Lepidosaphes travancoriensis*, Lindinger.**

On *Aglaia minutiflora*. Travancore (*Lindinger*).

***Ischnaspis spathulata*, Lindinger.**

On *Vatica obscura*. "W Palukananda, Jumpalai" (*Lindinger*).

***Fiorinia frontecontracta*, n. sp.**(Pl. XXXI, fig. 22*a-d*).

Puparium of female pale castaneous, usually with a darker medio-longitudinal stripe running through both larval and nymphal pellicles. Little or no secretory appendix. Elongate; narrow; with a distinct medio-longitudinal ridge. Length 2 to 2.25 mm. Breadth across middle 0.5 mm.

Nymphal pellicle (fig. 22*c*) elongate; narrow; anterior extremity with a sharply defined depressed area where it is overlapped by the larval pellicle. Margin of abdominal area with two (sometimes three) prominent thorn-like spines on each side. Margin of posterior extremity (fig. 22*d*) with well-developed median and lateral lobes; the former sunk in a median excision, wide apart and divergent, their free margins minutely serrate; the lateral lobes duplex, the inner lobule larger and more prominent. Length of pellicle 1.75 mm.

Male puparium white; larval pellicle pale stramineous. The white secretory appendix wider towards the posterior extremity; flattish, with a single (often obscure) medio-longitudinal carina. Length 1 to 1.25 mm.

Adult female (fig. 22*a*) with the anterior extremity contracted and transversely wrinkled. Rudimentary antennae conspicuous; each with a stout curved seta. No inter-antennal tubercle. Mouth-parts large and conspicuous. Form narrow at anterior extremity, gradually widening behind; broadest immediately above the pygidium; abdominal segments retracted. Pygidium (fig. 22*b*) with circumgenital glands forming an almost continuous arch; the upper and lower lateral groups confluent, together containing from 35 to 40 crowded pores, connected above by a loose series of 5 or 6 pores representing the median group. Median lobes well developed; recessed; rather widely separated; of irregular form, broadest across the base, the free edge coarsely and irregularly dentate. Lateral lobes minute, inconspicuous. Three conspicuous conical marginal prominences project on each side of the pygidium—one immediately exterior to the median lobes, a second exterior to the lateral lobes, and the third about half way between the last and the base of the pygidium. Closely following upon each of the second and third prominences is a shallow recess with its margin conspicuously thickened. Length approximately 0.75 mm.

On foliage of *Garcinia indica*. Bombay (H. H. Mann, No. 41).

***Fiorinia plana*, n. sp.**(Pl. XXXI, fig. 23*a, b*).

Puparium of female pale stramineous, translucent; elongate-ovate, flattish or slightly convex above; consisting of the larval and nymphal pellicles, with little or no secretory appendix. Larval pellicle small. Nymphal pellicle enlarged, the pygidial area depressed; posterior margin (fig. 23*b*) with prominent median

and lateral lobes, all of which are narrow at the base and broadly expanded distally, the extremities squarely truncate. Length of puparium 1.75 to 2 mm.

Male puparium not observed.

Adult female with the abdominal segments strongly retracted. I have been unable to detect any trace of either antennae or inter-antennal tubercle. Lateral margins of thorax and abdomen with scattered tuberculate spines. Spiracles without parastigmatic pores. Pygidium (fig. 23a) with five groups of circumgenital glands; the median group with four widely separated pores, the upper laterals averaging 11 and the lower laterals 15 pores. Posterior margin with the median lobes rather widely separate, their distal extremities sharply and irregularly dentate; lateral lobes duplex, both lobules unusually broad, contiguous or more or less confluent, their free margins strongly dentate. Length of extended example 1 mm. Retracted examples 0.5 to 0.75 mm.

On upper surface of leaves of *Elaeodendron glaucum*. Coimbatore (*Ramakrishna* No. 139).

***Fiorinia sapindi*, n. sp.**

(Pl. XXXI, fig. 24a-d).

Female puparium covered almost completely by the nymphal pellicle, with sometimes a very narrow colourless secretory margin. Pellicles dark castaneous, lighter towards the margins. Length 1 to 1.35 mm.

Nymphal pellicle (fig. 24a) rather narrow; the posterior abdominal segments with lateral margin produced into small but acute points. Posterior extremity (fig. 24b) with a very large pair of median lobes which are widely divaricate and recessed into the margin, first lateral lobes duplex, the inner lobule longer than the other: second lateral lobes tridentate. Length 1 to 1.25 mm.

Adult female minute, with very thin and delicate derm. Antennae (fig. 24c) consisting of a pair of obscurely dentate tubercles, each with a longish curved bristle on the outer side, a slight fold between the antennae. Posterior extremity (fig. 24d) with small but prominent median lobes, set rather wide apart, with a lunate chitinous plate between them. Lateral lobes represented by a small conical prominence on each side. There is a pair of long slender spines between the median lobes, and other similar spines are set at intervals along the margin. Circumgenital glands consisting of a practically continuous arch containing about 50 pores. Length 0.5 mm.

On *Sapindus trifoliatu*s. Poona (*H. H. Mann*, No. 20).

***Fiorinia odinae*, Leonardi, var. *multipora*, Lindg.**

On *Taxus wallichiana*. "Khasia, India" (*Lindinger*).

***Fiorinia saposmae*, var. *geloniae*, Green.**

On *Gelonium*. Ootacamund (coll. E.E.G.)

Leucaspis indica, Marlatt.

On *Mangifera indica*. Poona (*H. H. Mann*, No. 35).

Leucaspis japonica, Ckll.

On *Ficus religiosa*. Calcutta. (Ex coll. Ind. Mus., Nos. 60 and 93).

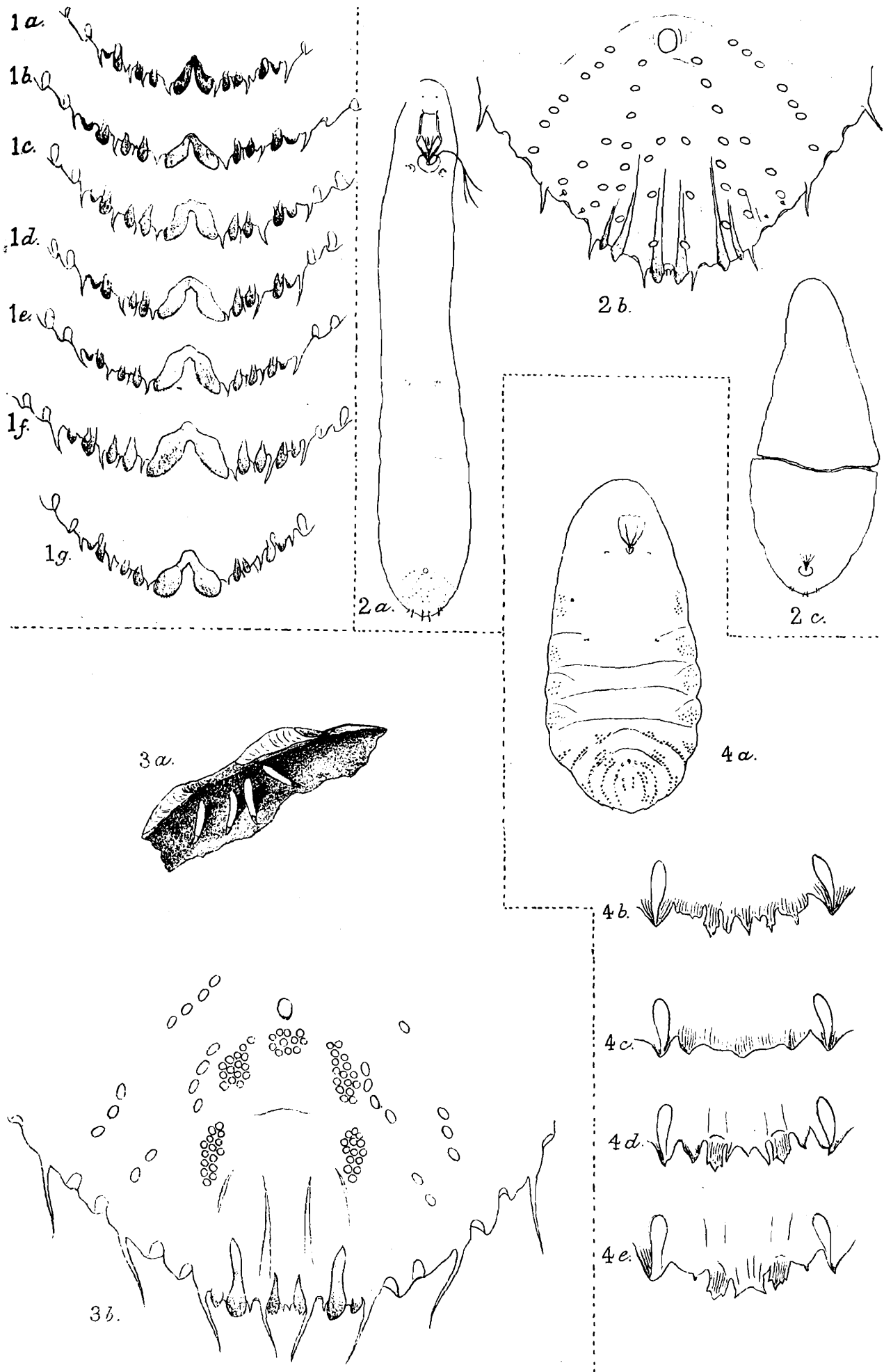
Leucaspis salicis, Green.

On *Salix* sp. Baluchistan (*V Iyer*).



EXPLANATION OF PLATE XXVI.

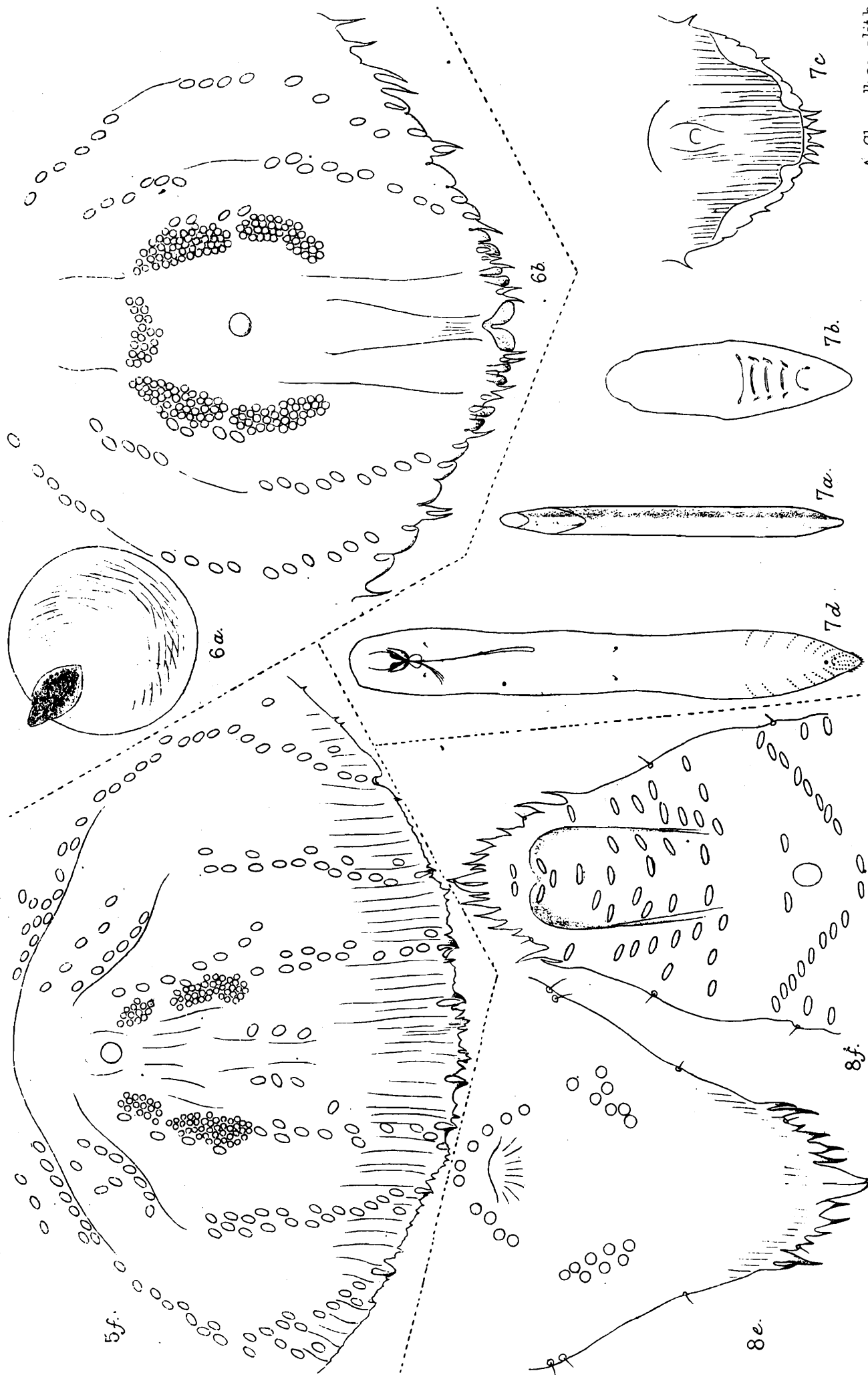
- FIG. 1a.—*Diaspis cinnamomi-mangiferae*, Newst. Posterior extremity of adult ♀, × 280.
- „ 1b.—*Diaspis rosae* (Bouche). Posterior extremity of adult ♀, from *Loranthus*, Ootacamund, × 280.
- „ 1c.—*Diaspis rosae* (Bouche). Posterior extremity of adult ♀, from Rose, England, × 280.
- „ 1d.—*Diaspis rosae* (Bouche). Posterior extremity of adult ♀, from Rose, Bohemia, × 280.
- „ 1e.—*Diaspis rosae* (Bouche). Posterior extremity of adult ♀, from Rose, Singapore, × 280.
- „ 1f.—*Diaspis rosae* (Bouche). Posterior extremity of adult ♀, from Rose, New Zealand, × 280.
- „ 1g.—*Diaspis loranthi*, Green. Posterior extremity of adult ♀, × 280.
- „ 2.—*Chionaspis annandalei*, n. sp. a. Adult ♀, × 30. b. Pygidium of adult ♀, × 280. c. Nymphal pellicle, × 30.
- „ 3.—*Chionaspis caroli*, n. sp. a. Puparia, ♂ and ♀, × about 6. b. Pygidium of adult ♀, × 280.
- „ 4.—*Chionaspis chir*, n. sp. a. Adult ♀, × 30. b, c, d, e. Various forms of extremity of pygidium, × 450.



EXPLANATION OF PLATE XXVII.

- FIG. 5.—*Chionaspis chir*, n. sp. *f*. Pygidium of adult ♀, × 220.
,, 6.—*Chionaspis* (*Phenacaspis*) *gudalura*, n. sp. *a*. Female puparium, × 10. *b*. Pygidium of adult ♀, × 280.
,, 7.—*Chionaspis spiculata*, n. sp. *a*. Puparium of adult ♀, × 30. *b*. Nymphal pellicle, × 65. *c*. Posterior margin of nymphal pellicle, × 450. *d*. Adult ♀, × 65.
,, 8.—*Chionaspis spiculata*, n. sp. *e*. Pygidium of adult ♀, ventral view, × 450. *f*. Pygidium of adult ♀, dorsal view, × 450.

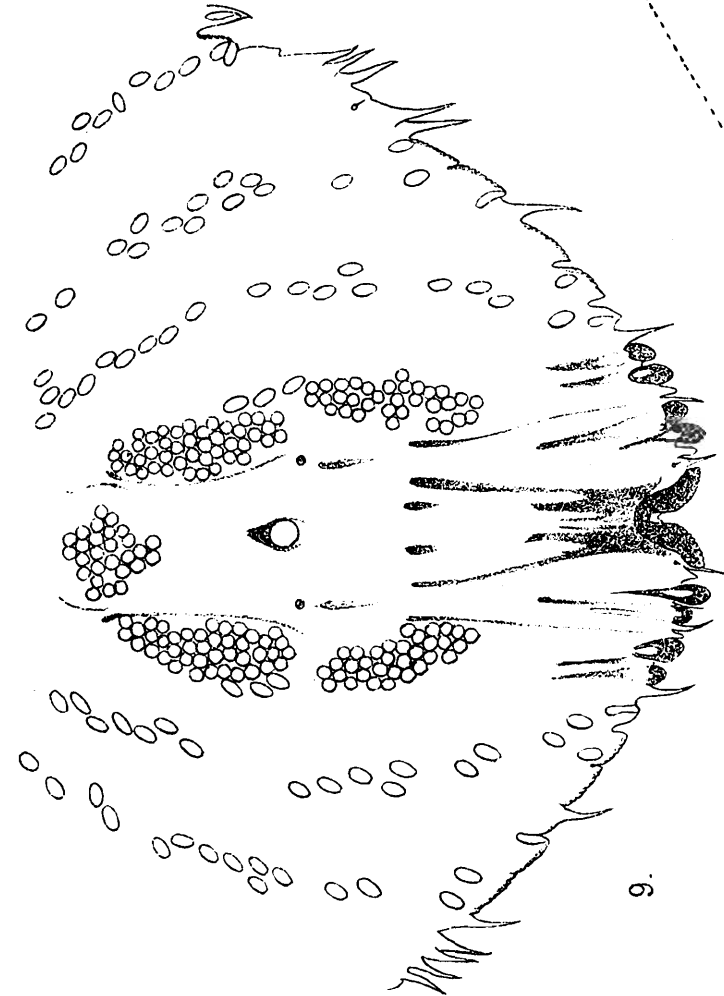
A. Chowdhary lith.



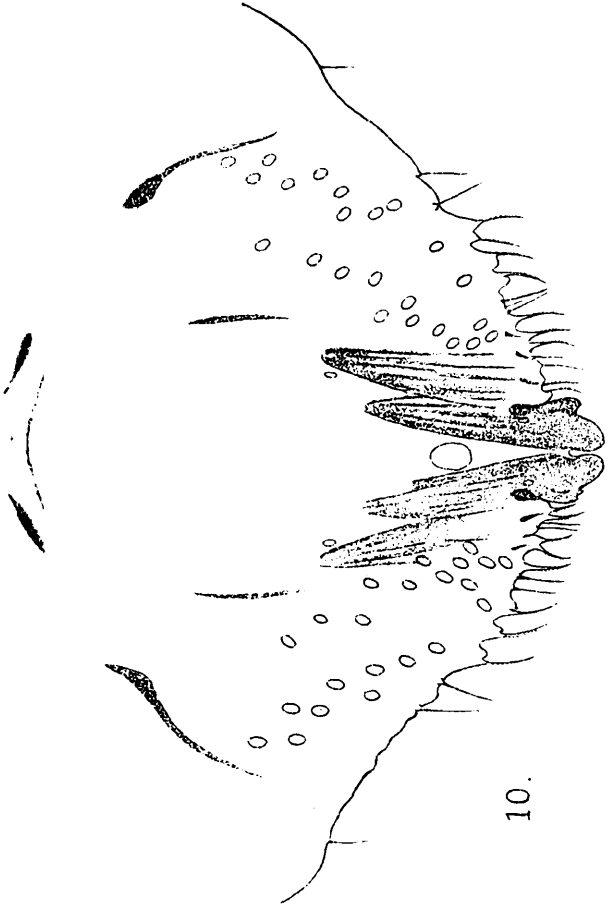
E.E. Green del.

EXPLANATION OF PLATE XXVIII.

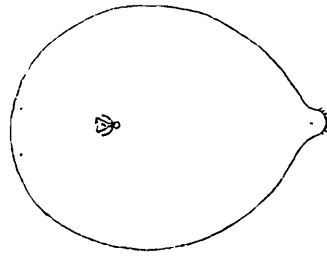
- FIG. 9.—*Chionaspis* (*Phenacaspis*) *varicosa*, Green. Pygidium of adult ♀, × 280.
- „ 10.—*Aspidiotus* (*Hemiberlesia*) *pseudocamelliae*, n. sp. Pygidium of adult ♀, × 450.
- „ 11.—*Aspidiotus tamarindi*, n. sp. *a.* Outline of adult ♀, × 30. *b.* Pygidium of ♀, × 280.
- „ 12.—*Aonidia indica*, n. sp. *a.* Posterior margin of nymph, × 280. *b.* Pygidium of adult ♀, × 280.



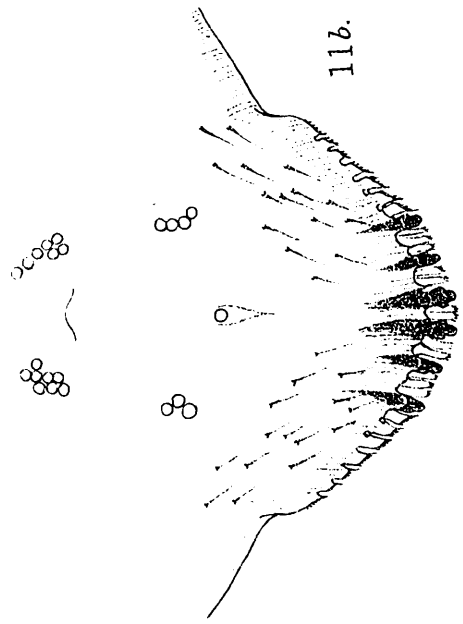
9.



10.



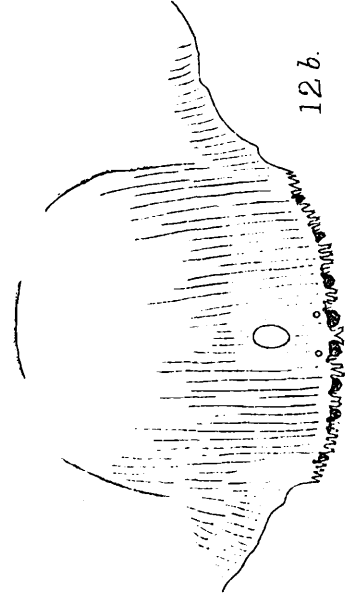
11 a.



11 b.



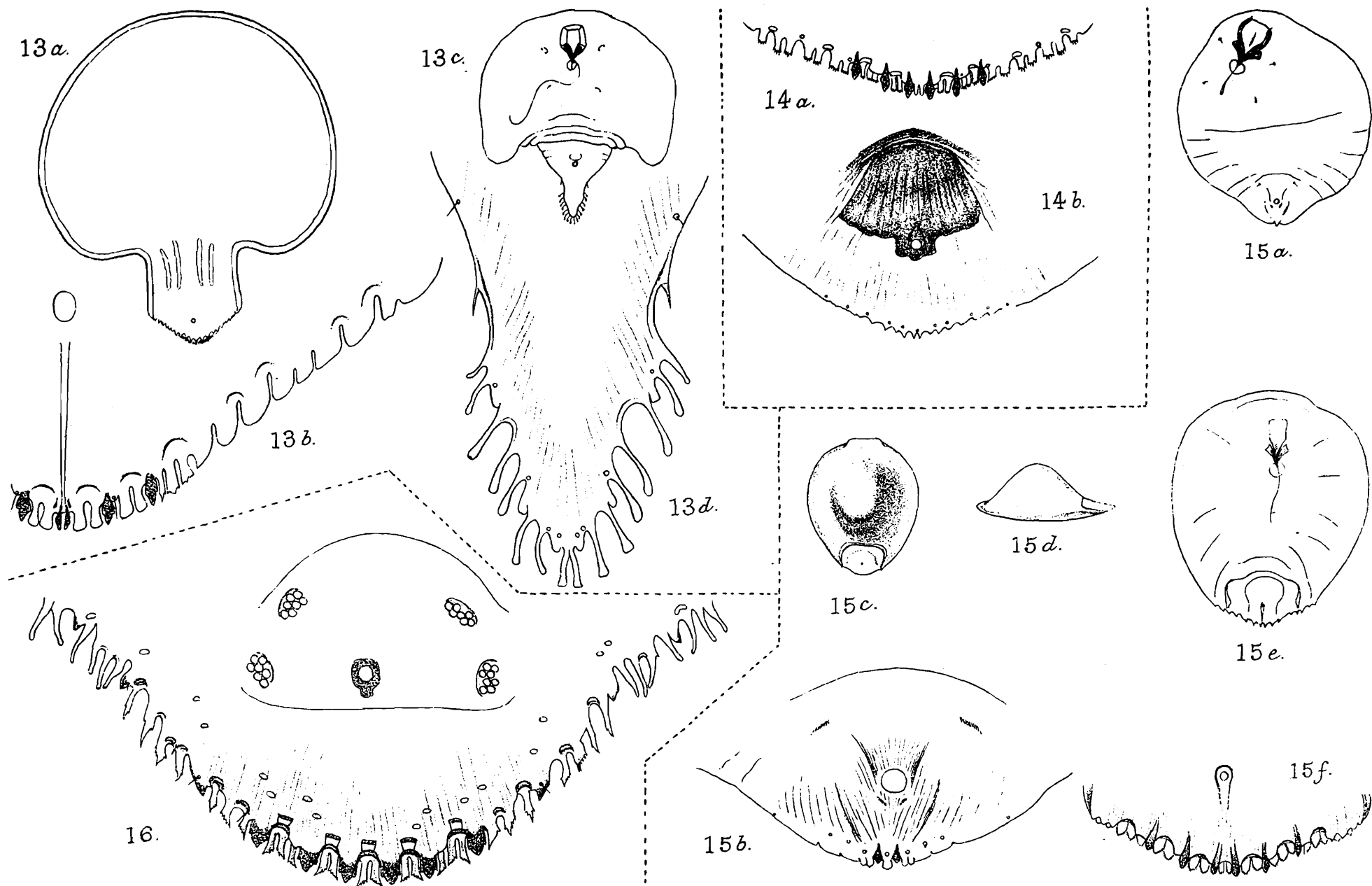
12 a.



12 b.

EXPLANATION OF PLATE XXIX.

- FIG. 13.—*Aonidia tentaculata*, n. sp. *a.* Nymphal pellicle, $\times 50$.
b. Margin of posterior extremity of nymph, $\times 450$.
c. Adult female, $\times 50$. *d.* Posterior extremity of adult ♀, $\times 450$.
- ,, 14.—*Gymnaspis ficus*, n. sp. *a.* Posterior margin of nymphal pellicle, $\times 280$. *b.* Pygidium of adult ♀, $\times 280$.
- ,, 15.—*Gymnaspis ramakrishnae*, n. sp. *a.* Adult ♀, $\times 100$.
b. Pygidium of adult ♀, $\times 450$. *c.* Nymphal pellicle, from above, $\times 50$. *d.* Nymphal pellicle in profile, $\times 50$. *e.* Nymph, $\times 100$. *f.* Nymph, posterior extremity, $\times 450$.
- ,, 16.—*Parlatoria artocarpi*, n. sp. Pygidium of adult ♀, $\times 280$.

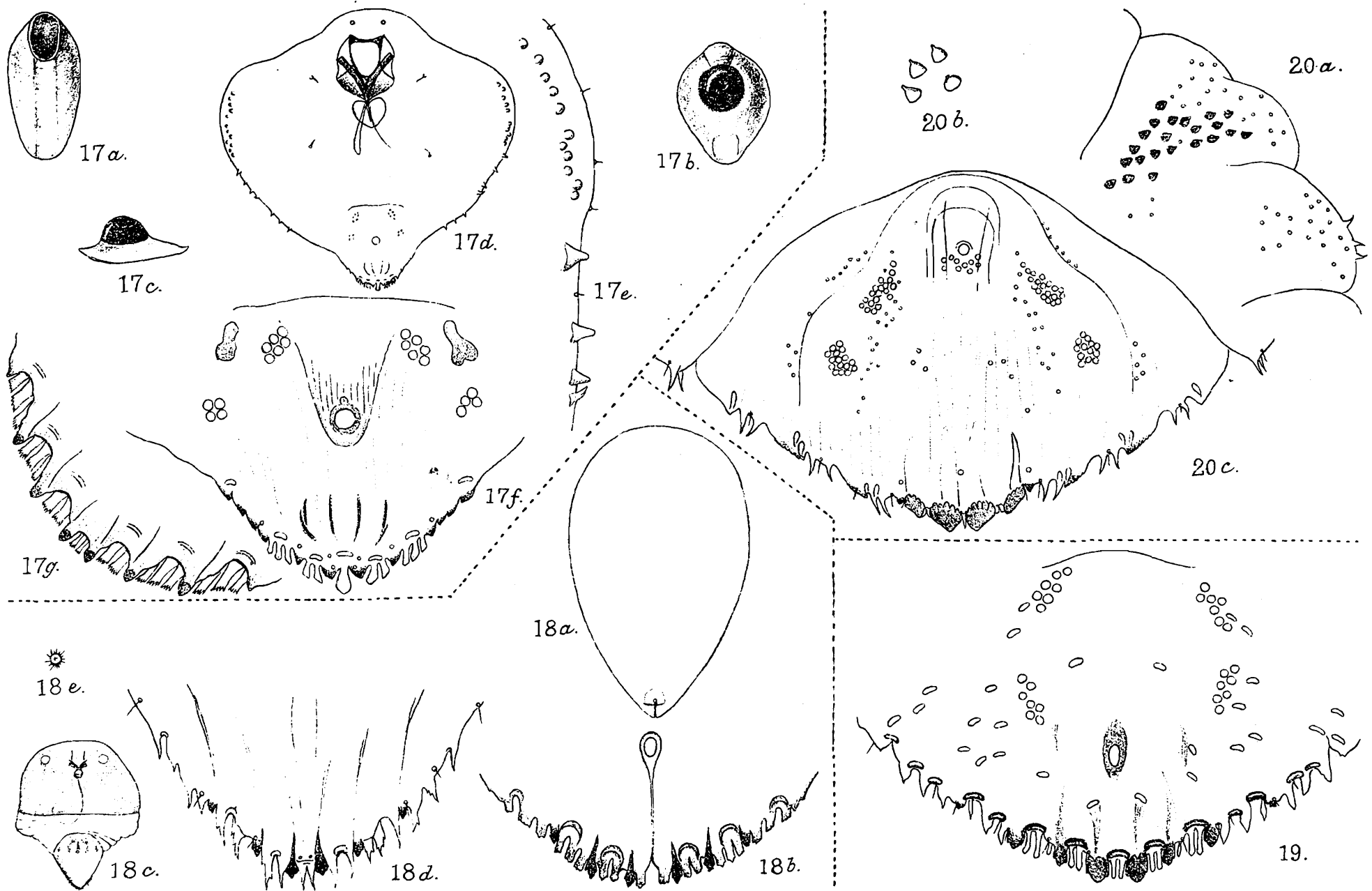


E. E. Green del.

A. Chowdhary lith.

EXPLANATION OF PLATE XXX.

- FIG. 17.—*Parlatoria (Websteriella) papillosa*, n. sp. *a.* ♂ puparium, $\times 30$. *b.* ♀ puparium, $\times 30$. *c.* ♀ puparium, side view, $\times 30$. *d.* Adult ♀, $\times 130$. *e.* Thoracic margin of adult ♀, $\times 450$. *f.* Pygidium of adult ♀, $\times 450$. *g.* Posterior extremity of nymphal pellicle, $\times 450$.
- „ 18.—*Parlatoria vateriae*, n. sp. *a.* Nymphal pellicle, $\times 50$, *b.* Nymphal pellicle, posterior extremity, $\times 450$. *c.* Adult ♀, $\times 50$. *d.* Adult ♀, posterior extremity, $\times 450$. *e.* Adult ♀, antenna, $\times 450$.
- „ 19.—*Parlatoria calianthina*, Berl. and Leon. Pygidium of adult ♀, $\times 280$.
- „ 20.—*Lepidosaphes meliae*, n. sp. *a.* Marginal area of second and third abdominal segments, $\times 220$. *b.* Secretory spines from 2nd segment, $\times 450$. *c.* Pygidium of adult ♀ (opt. sect.), $\times 220$.

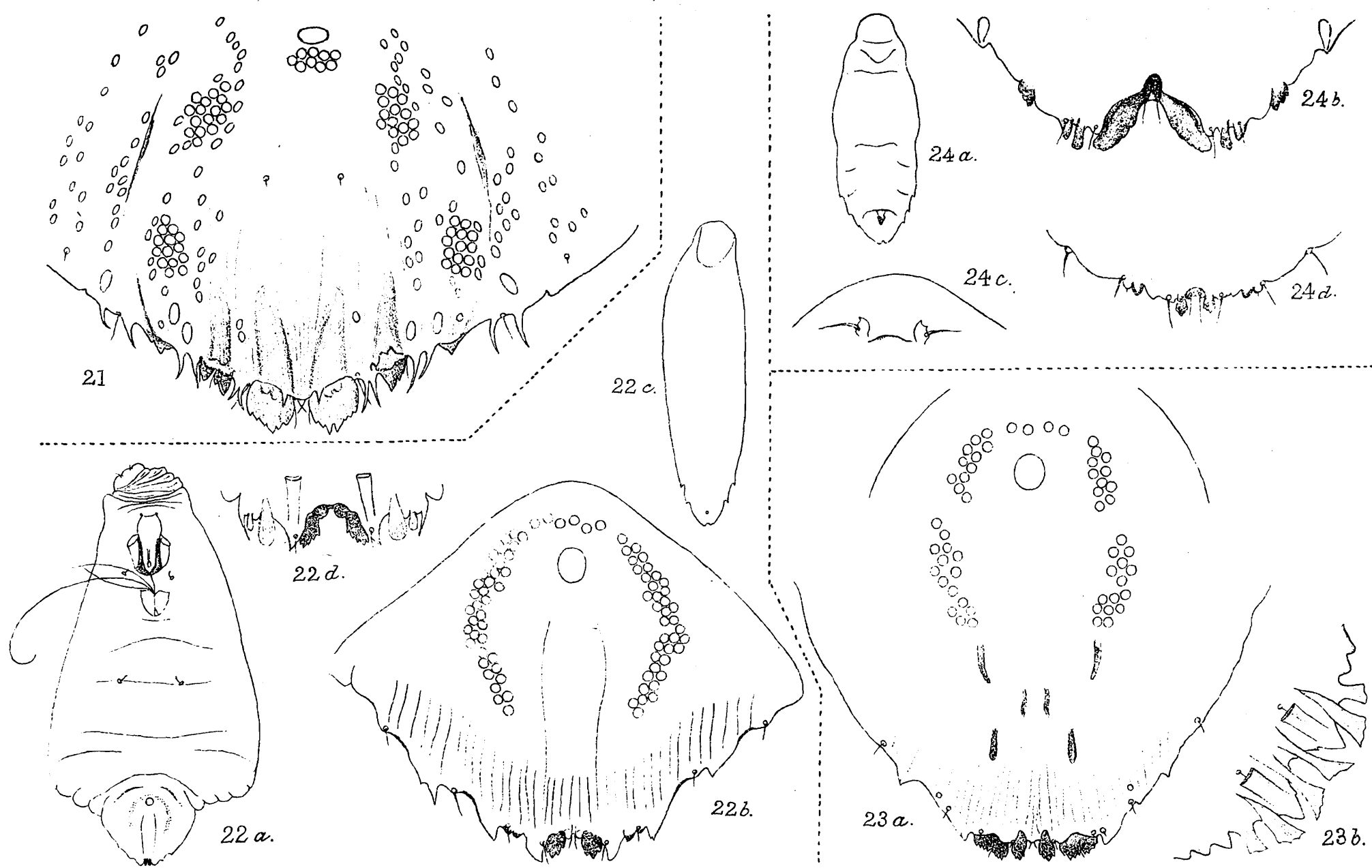


E. E. Green del.

A. Chowdhary lith.

EXPLANATION OF PLATE XXXI.

- FIG. 21.—*Lepidosaphes retrusus*, n. sp. Pygidium of adult ♀, × 450.
- „ 22.—*Fiorinia frontecontracta*, n. sp. *a.* Adult ♀, × 80. *b.* Pygidium of adult ♀, × 450. *c.* Nymphal pellicle, × 30. *d.* Posterior extremity of nymphal pellicle, × 450.
- „ 23.—*Fiorinia plana*, n. sp. *a.* Pygidium of adult ♀, × 450. *b.* Posterior extremity of nymphal pellicle, × 450.
- „ 24.—*Fiorinia sapindi*, n. sp. *a.* Nymphal pellicle, × 30. *b.* Posterior extremity of nymph, × 450. *c.* Frons of adult ♀, × 450. *d.* Posterior extremity of adult ♀, × 450.



E. E. Green del.

A. Chowdhary lith.

XXXI DESCRIPTIONS OF FOUR NEW INDIAN ODONATA

By MAJOR F. C. FRASER, I.M.S.

All four of the new species belong to the subfamily Agrioninae, two belonging to the tribe Argiini and two to the tribe Agrionini.

Species of the former tribe are easily distinguished from the latter by the relatively shorter petiolation of the wings.

Genus *Argiocnemis*.

Argiocnemis gravelyi, sp. nov.

i ♀, Saugor, Central Provinces, India, 19—30-3-19. (*F. H. Gravely*), 1326/H2.

Female.

Head.—Eyes olive green above, greenish yellow beneath; labium and clypeus flesh coloured, the former with a small, triangular, black mark at its base and the latter with three black spots about its middle; remainder of head black, with no markings.

Prothorax black, with a sky-blue collar anteriorly and two similar coloured spots on each side, the anterior of which is much the largest.

Thorax black on the dorsum; a broad, humeral, black line, enclosing between it and the black of the dorsum, a greenish fascia, which is itself traversed by an irregular, black line, incomplete anteriorly. Below the humeral line, the sides pale sky-blue with a minute dot and black streak posteriorly. Tergum spotted with blue.

Legs creamy white, streaked with black on the extensor surfaces.

Wings very shortly petiolated; *ac* falls on to *ab* nearer the first antenodal nervure than the 2nd and *ab* meets the border of the wing opposite the 1st antenodal. Postnodals 7 and 6 respectively in the two wings. Stigma olive brown.

Abdomen sky-blue, paler anteriorly and deepening markedly in the last three segments. A broad, black fascia runs the whole length of the dorsum as far as segment 8, where it is continued on to the dorsum of segment 9 as a tongue-like process which does not attain to the apical border; tenth segment entirely blue, as also are the anal appendages.

Length of abdomen 22 mm. Length of hind-wing 15 mm.

Argiocnemis dyeri, sp. nov.

i ♂, old bed of Nerbudda, North of Babai, Hooshangabad Dist., Central Provinces, India, 15-3-19 (*F. H. Gravely*). (A

single male of this insect was also taken by myself at Poona, 1-4-19, in Mr. Thistleton Dyer's compound, near the Moolah River. I have named it after Mr. Thistleton Dyer, who is a son of the eminent Kew botanist.) 1325/H2.

Head black; labium and clypeus sky-blue; two pyriform, blue, postocular spots; eyes deep sea-blue above, greenish beneath. (In Mr. Gravely's specimen the postocular spot is enclosed on one side only, but in my own specimen the spots are present on both sides.)

Prothorax blue marked with black in a somewhat elaborate pattern. The black, which is bordered all round with blue, narrowly at the sides and posteriorly, encloses a small, blue geminate spot at its middle, and a larger, subdorsal spot each side.

Thorax sky-blue, with narrow, dorsal and humeral, black lines.

Legs pale blue, streaked with black on the extensor surfaces.

Wings as in the first mentioned species; the petiolation of the wings is extremely short; *ac* falls on to *ab* opposite the 1st antenodal nervure. Postnodals 8 and 7 respectively in the two wings. Stigma pale sepia or cinereous. Apex of wing closely reticulated.

Abdomen blue marked with black, as follows:—a black spot on the basal half of segment I and a transversely linear, triangular spot on its apical border, followed distally by a blue annule. A broad, black, dorsal fascia on the 2nd segment, extending from the apical to the basal border, connecting up at the former with a black annule. Segments 3 to 7 with a black, dorsal streak expanding apically and pointed basally, where it fails to attain the basal border of segment. Apically these streaks are connected with black annules; eighth and ninth segments all blue but with an apical row of fine, black spines; tenth segment blue, with a small, hour-glass shaped, black spot on the dorsum.

Anal appendages very minute and simple, the inferior scarcely visible. Length of abdomen 23 mm. Length of hind-wing 16-17 mm.

It is possible that these two insects are the sexes of a common species of *Argiocnemis*, but after a careful comparison of the two I do not think that this is so.

Genus *Himalagrion*, gen. nov.

The genus has some of the features of *Agriocnemis* but differs chiefly in its large size, in the large number of postnodals and in the position of the arc, which is opposite the 2nd antenodal nervure.

Node placed at the junction of the middle and basal thirds of the wing, quadrilateral irregular, its distal angle sharply acute, no intercalated sectors, stigma short, rhomboidal, *ac* midway between the two antenodals, *ab* present, commencing just proximal to *ac*, arc opposite the second antenodal, *Cu2* normal, postnodals numerous, reticulation moderately close.

The venation is identical with *Zoniagrion*, Kennedy, but there the resemblance begins and ends, there being no bifid, dorsal elevation on the 10th abdominal segment of the male, nor spine on the ventral surface of segment 8 in the female.

***Himalagrion exclamationis*, sp. nov.**

4 ♂♂, 4 ♀♀, Sitong, *ca.* 4,000 ft., near Manghphe, Darjiling Dist., 6-7-18 (S. Kemp). 1314H2.

Male.

Head black, marked with wedge-wood blue as follows:—large, subtriangular, postero-internal ocular spots; a blue fascia across the vertex and clypeus in front of the anterior ocellus; the whole of the labium except for a black, basal border which extends on to the anteclypeus. Eyes dark brown above, pale olivaceous beneath, the two colours being sharply contrasted at the equator of the eyes.

Prothorax black marked with wedge-wood blue of which there is a fine, blue collar anteriorly and an irregular patch laterally.

Thorax matt black marked with the same coloured blue as sharply defined streaks and spots as follows:—a blue, humeral stripe, broadest anteriorly and constricted at the junction of its middle and posterior thirds, the sides broadly blue and traversed low down by an irregular, black stripe which begins at the base of the posterior trochanter. Tergum and bases of wings spotted with blue.

Legs pale blue, the femora streaked with black on the extensor surfaces and the tibiae similarly on the flexor surfaces.

Abdomen: 1st segment blue marked with an irregular, black streak, which runs obliquely backwards from the dorsum to the ventrum, a black annule incomplete on the dorsum, apically; 2nd segment blue with an irregular, oblong, black marking on the side, which fuses with a black, apical annule. A triangular, black mark on the posterior part of the dorsum, somewhat like a blunt arrow-head, looking forward; 3rd segment blue with a broad, black annule just in front of the apex and a narrow one at the apical border, lower part of sides and ventrum black; 4th segment similar but the apical annules have fused, enclosing a mere speck of blue laterally; 5th segment similar but the blue spot is absent and the annules have extended forward, especially on the dorsum, where there is a triangular projection into the blue, basally the apical, black annule of the 4th segment has extended slightly on to the dorsum of the 5th; 6th segment entirely black save for a fine blue, basal annule, incomplete on the dorsum; 7th segment black, its dorsum marked for the posterior three fourths with blue, this marking narrowing from behind forward and with a lateral indentation at the apical end; 8th and 9th segments entirely blue, but in some specimens the 8th has a finely stippled, black, lateral line; 10th segment black marked laterally with a small, blue spot

and presenting a narrow, shallow notch on the dorsum, posteriorly, which is blue.

Anal appendages. Superior shorter than the 10th segment and also than the inferior, slightly bifurcate in profile; inferior nearly as long as the 10th segment, broad at the base and narrowing rapidly to form a robust hook which is curved strongly down and inwards.

Female.

Very similar to the male, but the blue markings on the abdomen much less extensive. Head, prothorax and thorax scarcely differing from that of the male.

Abdomen. The oblique, black marking on the 1st segment covers the basal half of the dorsum; the triangular, black marking on the dorsum of the 2nd segment extends forwards as far as the base and encloses between itself and the lateral marking a blue, hook-shaped marking; the 3rd to 6th segments are black and each has a sharply-defined streak and dot on the sides, resembling a note of exclamation; the 7th may or may not have a faint indication of a similar marking; 8th segment black, with an apical, blue annule, confluent laterally with a largish, blue spot; 9th blue, marked basally with a black spot shaped like a coronet, and in some with a fine, dorsal, triangular, apical, black spot; 10th segment entirely blue.

Anal appendages very small, black.

Wings as for genus; postnodals 14, stigma black, covering one cell; length of hind-wing 22 mm. Length of abdomen 32 mm.

The position of the arc and the shape of the anal appendages suggest *Ceriagrion* but there is no ridge on the frons and the colour scheme is totally unlike anything seen in that genus, in fact I know of no parallel to the clear-cut, cameo-like effect of the markings in this beautiful insect, at least not in the subfamily Agrioninae.

Genus *Agriocnemis*.

Agriocnemis d'abreu, sp. nov.

i ♀, Lamta, Balaghat Dist., Central Provinces, India, 1,300 ft., 23-3-18. (*E. A. D'Abreu*.)

Head black, marked with sky-blue, post-ocular spots and a blue streak across the vertex in front of the anterior ocellus; labium blue, the base narrowly black; anteclypeus blue, traversed by a fine, black line with a pointed projection at its middle, directed forward; eyes deep olive green above, paler beneath.

Prothorax black, with two small, blue, subdorsal spots in front.

Thorax sky-blue, the dorsum and a broad, black, humeral fascia black; the tergum spotted with blue.

Legs pale blue, streaked with black on the extensor surfaces.

Abdomen blue, marked with black as follows:—the dorsum broadly black throughout its whole length, the black on each segment from 2 to 7 expanding at the apical end and then contracting again to join an apical black ring; black, lateral streaks

on the same segments, broadest apically and becoming obsolete basally. On the 2nd segment this streak joins up with the black on the dorsum basally, and on the 7th similiary but apically. Blue annules follow the 1st, 7th, 8th and 9th segments. No spine on the ventral surface of segment 8.

Wings : postnodals 6 ; arc distal to the 2nd antenodal ; *ac* falls on to *ab* about midway between the two antenodals ; stigma light brown, covers half a cell.

Length of abdomen 15 mm. Length of hind-wing 10 mm.

The specimen bears a slight resemblance to *A. splendidissima*, Laidlaw, but the insect is a more robust species. The lateral abdominal spots are not connected up with the dorsal black, except on the 7th segment, and lastly the head markings are quite different.



XXXII NOTES ON FRESHWATER SPONGES.

By N. ANNANDALE, D.Sc., F.A.S.B., Director,
Zoological Survey of India.

No. XVII.—A NEW RACE OF *TROCHOSPONGILLA LATOUCHIANA* FROM CHINA.

In my recent account of the freshwater sponges of China I assigned specimens of *Trochospongilla* from Soochow to *T. latouchiana*, mihi, but pointed out that there were differences in the proportions of the gemmule-spicules. Mr. Gee has since sent me a large number of additional specimens, in which the differences are so constant and so marked that I now think they are worthy of nominal distinction.

Trochospongilla latouchiana subsp. *sinensis*, nov.

1918. *Trochospongilla latouchiana*, Annandale, *Mem. As. Soc. Bengal* IV, p. 203.

The sponge appears to have formed small cushions of a greyish colour on sticks or water-plants, but is imperfect in all the specimens examined. The skeleton is compact and contains a considerable amount of horny material by means of which the spicules in the vertical spicule-fibres are fastened together tightly. These fibres are well defined and vary considerably in thickness. As a rule, however, they are not very thick. They are connected transversely by an irregular network of single spicules and bundles of spicules joined together at the nodes by horny substance. The sponge is frequently so intermixed with that of *Spongilla geei*¹ that it is impossible to separate the two species, and confusion is liable to occur unless the spicules are carefully sorted out.

The skeleton spicules are very like those of *T. latouchiana*² (s.s.) but are rather more slender and more subject to the slight irregularities of outline. They vary considerably in size and proportions but are always quite smooth. The gemmule-spicules are minute. As a rule the outer rotule is slightly smaller than the inner one. The former is rather deeply concave and its margin is very slightly sinuous. The upper end of the shaft is conspicuous as seen from above but the surface of the rotule is not sculptured. The different rotules do not overlap on the surface of the gemmule. The shafts of these spicules are relatively slender and at least as long as

¹ Annandale, *op. cit.*, p. 202 (1918).

² Annandale, *Faun. Brit. Ind., Freshw. Sponges*, etc., p. 114, fig. 23A.

the diameter of the upper rotule. The gemmules are small, sub-spherical but somewhat produced round the single foraminal aperture.

Measurements :—

Diameter of gemmule	0.26 × 0.28	mm.
Length of skeleton spicule	0.22 – 0.31	„
Diameter of skeleton spicule	0.01 – 0.012	„
Length of gemmule-spicule	0.012 – 0.015	„
Diameter of lower rotule	0.012 – 0.015	„

Type-specimen.—No. P $\frac{95}{1}$ Zool. Survey of India (*Ind. Mus.*) dry.

The race differs from the *forma typica* mainly in the longer shaft of the gemmule-spicules and the greater concavity of their upper rotules.



XXXIII DESCRIPTIONS OF NEW INDIAN ODONATE LARVAE AND EXUVIAE

By MAJOR F. C. FRASER, I.M.S.

(With Plates XXXII—XXXVII).

The following descriptions of Odonate larvae have been made from specimens sent to me through the kindness of Dr. N. Annandale and from others collected by myself. The former were mostly collected by Messrs. S. Kemp and F. H. Gravely. The latter were collected around Poona and the types or paratypes have now been sent to the Indian Museum.

Only two specimens of *Epophthalmia* were collected and one of these has since been partly destroyed, the perfect specimen going to the Museum.

Very little has been written on individual Odonate larvae and not more than 10 per cent of the Indian forms have hitherto been described. Still less is known of their habits. As more descriptions become available, they may be expected to throw considerable light on the phylogeny of the race, and if only for this reason, are valuable. That this is so, is aptly illustrated by the descriptions of the three species of *Cyclogomphus* and by noting the close similarity of two of them,—*C. verticalis* and *heterostylus*,—to *Macrogomphus annulatus*. This similarity is much greater than that between the two species and a third,—*C. minusculus*, and raises doubts as to whether they are placed correctly. The curving and cupping of the antlered lobes of *Epophthalmia* foretells the evolution of the cupped mask of the Libellulines. One has only to web in the spaces between the elongated teeth to obtain such a mask. This bears out the theory that the Libellulinae are an offshoot of a Corduline stem. Other suggestive structures are the triquetral caudal gills of *Chloroneura quadrimaculata* and the cleft middle lobe of *Protosticta gravelyi*.

SYSTEMATIC.

Suborder ANISOPTERA.

Subfamily CORDULIINAE.

1. *Epophthalmia frontalis*, Selys.

(Pl. xxxii, fig. 1; pl. xxxiv, fig. 2.)

Poona, 7. 4. 19, 1512/H2.

Length 33 mm. Length of hind femora 16 mm. Length of abdomen 24 mm. Mask deeply cupped and curved to cover the

face as in Libellulinae. The cup formed by the interlocking of the long, spinous jaws of the lateral lobes, in a way similar to the interlocked fingers of two hands. Base of mask extending as far back as the mid pair of coxae. Lateral lobes long and curved, antler-like, furnished with 6-7 long, spinous teeth, the proximal 3 or 4 of which are half the length of the distal and the most distad furnished with a small, moveable hook on its inner side (pl. xxxiv, fig. 2).

Antennae long and filiform, 7 segments. Eyes stalked, crab-like in appearance but not retractile, moderately small in comparison to the size of the head. Synthorax saddle-shaped and bulky. Abdomen tumid, strongly carinated dorsally, the carina consisting of a row of backwardly imbricated spines, one on each of segments 5 to 9; spinous prolongations to the sides of segments 8 and 9. Legs very long and spidery, naked.

Hab.—Running streams amidst curtains or masses of water-weed.

Subfamily *LIBELLULINAE*.

2. *Tholymis tillarga*, Hagen.

(Pl. xxxii, fig. 2; pl. xxxiv, fig. 1.)

Poona, 9. 5. 18, 1513/H2.

Length 26 mm. Length of hind femora 13 mm., of the hind leg 22 mm. Length of abdomen 15 mm.

Mask typically Libelluline, the lateral lobes meeting flush, by the close interlocking of bordering rows of small saw-like teeth to the number of 11. Mask deeply cupped (pl. xxxiv, fig. 1).

Antennae long and filiform. Eyes bluntly conical, the functioning part comparatively large. Posterior to the eyes, the head bears some coarse hairs.

Synthorax stout, abdomen tumid, not carinated on the dorsum, the sides of the segments finely spined and ending posteriorly in stout spines, these being very long and robust on the last three segments. Internally the terminal spines are finely fringed with longish hairs. Apical border of all segments finely fringed with short, even hairs.

Anterior and middle pairs of coxae clothed with long, coarse hairs. Femora with 3 rows of minute, widely-spaced spines.

Hab.—Conceals itself amongst masses of coarse water-weed. Usually breeding in small tanks, disused granite quarries which have filled with water being favourite spots.

3. *Tamea limbata*, Kirby.

(Pl. xxxii, fig. 3; pl. xxxiv, fig. 3.)

Poona, 4. 5. 18, 1514/H2.

Length of body 26 mm. Length of hind femora 13 mm., of hind leg 32 mm. Length of abdomen 17 to 18 mm.

Similar to the last in most respects but of heavier build.

Mask typically Libelluline, very deeply cupped, lateral lobes with interlocking teeth to the number of 16. These teeth pigmented at the tips and turned sharply in so that the apposition of the lobes is not so flush as in *tillarga*. Mid lobe moderately straight, slightly crenate along the border and fringed with coarse hairs (pl. xxxiv, fig. 3).

Antennae long and filiform, 7 segments.

Eyes small and shaped as horn-like processes which project markedly out from the sides of the head. Two or three coarse hairs posterior to the eyes and a largish, horn-like process at the posterior, outer angle of the head.

Trunk stout, abdomen tumid, markedly carinated, the carination made up of a row of stout, backwardly directed spines, one on each segment, to the number of 6 and each overlapping the ensuing segment. The last four segments with stout spines on the postero-lateral corners and segments 7, 8 and 9 with smaller, but robust spines situated mesially on the borders.

Legs very long and spidery, naked.

Hab.—Similar situations to the last.

Subfamily GOMPHINAE.

4. *Macrogomphus annulatus*, Selys.

(Pl. xxxiii, fig. 3; pl. xxxiv, figs. 4, 4a.)

Poona, 1.8.19, 1515/H2.

Length 49 mm. Length of hind femora 7.5 mm. Length of abdomen 39 mm. Mask typically Gomphine, very flat, oblong, the basal half constricted, mentum square, lateral lobes kukri-shaped, jaws armed with five robust teeth on the inner border and a long, moveable hook on the outer. No setae. Mid lobe straight, not projecting, minutely crenate along its border (pl. xxxiv, figs. 4 and 4a).

Eyes globular, comparatively large. Head small. Antennae short, club-shaped, 4 segments, coated with coarse, short hairs.

Synthorax narrow, wing-cases very narrow, triquetral, abdomen tapering towards the anal end, cylindrical, not carinated, greatly elongated, especially the last two segments, the 9th being furnished with a robust, backwardly directed spine on the mid-dorsum.

Legs very short and robust, adapted for digging, the femora and tibiae strongly curved and the former furnished with a long fringe of hairs on the extensor surface.

Hab.—Burrows in mud, in running streams. The fringe of hairs on the femora serve to collect flocculent debris which further conceals the insect.

The syphon-like end of the abdomen projects from the mud and thus permits the easy inspiration of clear water for purposes of respiration.

They emerge from the water about the 2nd week in August, often in great numbers and then fly inland for long distances. Finally the imago comes to rest in low growing trees, on the terminals of branches on the leeward side of the trees. Babul trees seem to be their special selection in the Deccan and about the end of August very few of these trees can be found that have not one or two occupants.

5. *Cyclogomphus heterostylus*, Selys.

(Pl. xxxiii, fig. 1 ; pl. xxxiv, figs. 5, 5a.)

Poona, 10.9.17, 1516/H2.

Length 21 mm. Length of hind femora 4.5 mm. Length of abdomen 15 mm.

Mask very broad, almost square, the base constricted, very flat, the outer surface coated sparsely with short hairs. Mid lobe straight, not projecting, fringed with longish, fine bristles, the lateral lobes somewhat similar to those of *annulatus* but without a marked, kukri-like bend at the tip, the inner border furnished with blunt, molar-like teeth, the outer with a long, robust, moveable hook (pl. xxxiv, fig. 5 and 5a).

Antennae clubbed, four segments, the last minute. Head comparatively larger than in *annulatus*.

Abdomen tapering slightly, more torpedo-shaped and the end segments not prolonged as in *annulatus*. The 8th and 9th segments with a robust, mid-dorsal spine projecting back from the apical border, the 10th segment very short, unspined, the 7th to 9th segments with short spines laterally.

Legs moderately short (rather shorter than shown in pl. xxxiii), the femora bearing the same fringe of hairs as seen in *annulatus*.

Hab.—Found in running streams crawling on the surface of muddy bottoms or rocks.

6. *Cyclogomphus verticalis*, Selys.

Poona, 17.8.19, 1517/H2.

Length 21 mm. Length of hind femora 4.5 mm. Length of abdomen 15 mm.

Almost exactly similar to the last. Differs by having blunt, mid-dorsal spines on all abdominal segments except the 9th and 10th, the latter segment is more than twice the length of the same segment in *heterostylus*. This segment also hollowed on the upper surface. Mask scarcely differing from that of *heterostylus*.

7. *Cyclogomphus minusculus*, Selys.

(Pl. xxxiii, fig. 2 ; pl. xxxiv, figs. 6, 6a.)

Poona, 9.8.19, 1518/H2.

Length of body 15 mm. Length of hind femora 5 mm. Length of abdomen 10 mm.

Mask very flat, the mentum slightly rounded, the base furnished laterally with a projecting, robust spine and 4 spinous hairs posteriorly, its sides bearing 7 short spines and the antero-lateral corner bearing a single, stout spine, lateral lobes without any armature whatever save for a short, moveable hook. The inner border finely crenulate, the outer bearing two small spines at its base, the mid lobe projecting somewhat like that of an Agrionid, its border finely crenulate and fringed with short, stiff hairs. The outer surface of the mask coated sparsely with short hairs (pl. xxxiv, figs. 6 and 6a).

Head triangular, the fore part projecting well in front of the eyes which are rounded and somewhat large.

Synthorax small, wing-cases short, flat and broad. Abdomen very broad and greatly depressed as in fact is the whole body of the larva. Dorsal spines on all segments except the last. The three last segments spined laterally.

Legs robust, femora short, tibiae comparatively long, naked except for a few scattered hairs.

Hab.—Lies buried in the mud near the borders of running streams. Emerges in considerable numbers about the end of August.

8. *Onychogomphus lineatus*, Selys.

Poona, 9.3.18.

Length of body 25 mm. Length of hind femora 5 mm. Length of abdomen 17 mm.

Almost exactly similar to *verticalis*. Differs only in its larger size, the short 10th abdominal segment, which is not hollowed out above and is similar in size to that of *heterostylus*. Differs from the latter in having mid-dorsal spines on the same segments as in *verticalis*.

Hab.—As for *C. verticalis* and *C. heterostylus*.

Suborder ZYGOPTERA.

Subfamily CALOPTERYGINAE.

9. *Matrona basilaris*, Selys.

(Pl. xxxv, fig. 1; pl. xxxvii, fig. 1.)

Shillong, 4,500-5,000 ft., in streams, Khasi Hills, Assam, 16-20.4.18, N. Annandale, 1320/H2, 1321/H2.

Length 36 mm. Length of mask 6 mm. Length of caudal appendages 11 mm.

Head small, eyes globular, antennae typically Calopterygine, the 2nd segment greatly elongated and pigmented on the outer side. This band of brownish pigment is continued across the head and synthorax on to the wing sheaths. Ocelli visible in the last stage.

Synthorax long and narrow. Wing-cases flat, leaf-like, venation well marked. Abdomen very long and narrow, tapering very

slightly. Caudal appendages triquetral, very long, the middle one considerably shorter than the lateral and lying in a vertical plane.

Legs long and slim, spidery, no armature.

Mask typically Calopterygine; middle lobe very deeply cleft, the terminal halves minutely crenate on the outer borders, where they engage with the outer lobes, the ends with a small spine at the tip and the extreme edge curling over, the edge of the curled part furnished with minute teeth, 2 setae on the inner surface; lateral lobes with a long moveable hook, 2 setae situated just below it and 3 long robust spines of which the middle is the smallest; inner border minutely crenate where it engages the border of the middle lobe. Mask extends back as far as the hind coxae (pl. xxxvii, fig. 1).

Hab.—Generally concealed amongst debris, dead twigs, etc., or lying under cover of rocks. Movements sluggish. The insect is apt to be mistaken for a *Ranatra* to which it bears a close resemblance.

Subfamily *LESTINAE*.

10. *Lestes* sp.

(Pl. xxxv, fig. 2; pl. xxxvii, fig. 2, 2a.)

Jor Pokhri, Darjiling Dist., E. Himalayas, 6.8.18, S. Kemp, 1316/H2, 3 larvae.

Mask typically Lestine, very much elongated, very narrow, mid lobe projecting very slightly, 6 setae on either side of the middle line of the inner surface, lateral lobes foliate and branched, a moveable hook supported on one of the branches, from which spring 3 setae (pl. xxxvii, figs. 2 and 2a).

Head relatively large, eyes globular, antennae filiform, wing-case long and narrow, flattened, abdomen elongated, cylindrical, each segment bearing a lateral spine.

Caudal appendages 9 mm. long, spatulate, oar-shaped, of even width, flattened, crossed by broad bands of pigment. Tracheal vessels branching at right angles to the main vessel.

Legs long, armature 4 rows of fine spines on the femora.

Hab.—Running streams. Found on water-weeds or clinging to roots.

Subfamily *PLATYCNEMINAE*.

11. *Copera marginipes*, Ramb.

(Pl. xxxv, fig. 3; pl. xxxvii, fig. 6.)

Poona, 6.4.18, F. C. Fraser, 1519/H2.

Length 14 mm. Length of caudal appendages 5.5 mm. Length of abdomen 7 mm.

Mask pyriform, tapering sharply to the mentum, sides spined to the number of 11 or 12; mid lobe projecting sharply, armed with 4 setae, whose bases are in line at right angles to the middle line of the mask, the biting edge minutely dentate; lateral lobes finely spined on the outer border, minutely dentate on the inner,

5 long setae on the inner surface, a robust, moveable hook and a shorter, robust, terminal spine (pl. xxxvii, fig. 6).

Head large, eyes globular, projecting laterally, prothorax small, thorax angular, its shoulders projecting, its dorsum triangular, wing sheaths flat and elongated.

Abdomen short, each segment spined laterally.

Caudal appendages highly differentiated, 3 in number, all lying in the vertical plane, petiolated and nodate, the petioles spined laterally, terminal part expanding like a leaf, its edges deeply dentate. Peppered with brownish pigment.

Legs long and slim, barred with pigment, minutely spined.

Hab.—Found in shallow brooks, in dense, darkened jungle, clinging to pieces of dead twig or tree roots. When not disturbed, they stand well out from the resting place, with the abdomen curled well over the back and the large, caudal appendages waving freely in the current. When disturbed they swiftly crouch flush with the root or twig on which they happen to be. The abdomen and caudal appendages are lowered and if the insect be approached, it will continually manoeuvre so as to place the root or twig between itself and the point of danger.

12. *Calicnemis miniata*, Selys.

(Pl. xxxvi, fig. 4; pl. xxxvii, fig. 5.)

Jor Pokhri, Darjiling District, E. Himalayas, 6. 8. 18, S. Kemp, 3 larvae, 1316/H2.

Length 17 mm.

Mask typically Agrionine in shape, somewhat similar to the last but the base not tapering so markedly and there are only 9 spines on the outer border. On the inner surface, a row of setae, 4 in number, placed rather far back on each side of the middle line; mid lobe similar to the last; lateral lobe with 7 setae, no spines on the outer surface, moveable hook robust. Biting edges of lobes finely crenulate (pl. xxxvii, fig. 5).

Legs long and slim, bearing 4 rows of fine spines.

Abdomen cylindrical, strongly spined laterally.

Caudal appendages 3 in number, broadly sagittate, subnodate, the position of node only indicated by extent of a row of spines bordering the outer side of the petiole, tracheae branching, root-like from the main stem.

Appendages banded with 4 rows of pigment.

Hab.—Running streams.

Subfamily *PROTONEURINAE*.

13. *Protosticta gravelyi*, Laidlaw.

(Pl. xxxv, fig. 4; pl. xxxvii, fig. 7.)

Between Nierolay and Mettupalaiyam, Bhavani River, base of Nilgiris, ca. 1,500 ft., 2 exuviae, 24. 8. 18, N. Annandale, 1360/H2.

Mask very flat, ovate, resembling in some measure that of a Gomphine, the inner surface finely striated with rows of minute, transverse grooves; mid lobe with a well-marked cleft, the mouth of which is contracted so that the edges approximate and enclose a small fenestrum. The free biting edge of this lobe armed with a row of slightly irregular, fine teeth. Lateral lobes massive and short, ending in a blunt, molar-like tooth and furnished with a robust, moveable hook. No setae on the mask (pl. xxxvii, fig. 7).

Head moderately large, eyes globular, synthorax small. Abdomen not spined laterally. Caudal appendages in a very poor, shrivelled condition. They appear to be lanceolate and triquetral in shape and without node or spines. Legs long and slim.

Hab.—Found "breeding in a small, rocky stream," N. Annandale.

[Adults flitting about in mottled shadow and light in rather deep jungle at edge of rocky stream. Rendered extremely inconspicuous by the broken colouration of the body. Exuviae on rocks in stream.—N A.]

14. *Chloroneura quadrimaculata*, Ramb.

(Pl. xxxvi, fig. 3; pl. xxxvii, fig. 4.)

Bagra, Hooshangabad Dist., C.P., 3. 19, F. H. Gravely, 1 exuvia, 1333/H2.

Mask broadly pyriform in shape, its borders bearing about 18 spines, the foremost of which are the most robust; on the inner surface and immediately behind the middle lobe and on either side of the middle line is an oblique row of 4 setae; the mid lobe narrow and projecting sharply, entire, its edge finely crenulate; lateral lobes placed well away from the lateral border of the mask, reduplicated, the inner part ending in a blunt spine and furnished with 6 setae and a moveable hook, the outer part ending in a long and a short spine (pl. xxxvii, fig. 4).

Head moderately large, pentagonal, 4 small spines on the posterior border immediately posterior to the eyes. The eyes globular. Wing-cases long, flat and narrow.

Abdomen of moderate length, the last 3 segments with 2 or 3 spines laterally and the 10th with a row of dorsal spines on the apical border.

Caudal appendages 3 in number, triquetral, the broadest, flattened surface of the lateral ones, looking downwards, whilst the broadest surface of the middle appendage is uppermost, so that this appendage fits neatly between the lateral ones. Long, narrow and spined along their borders.

Legs longish, banded with pigment.

Hab.—Running streams.

Subfamily AGRIONINAE.

15. *Pseudagrion microcephalum*, Ramb.

(Pl. xxxvi, fig. 2.)

Hooshangabad, C.P., 12. 3. 19, F. H. Gravely, 1458/H2., and 16. 3. 19, 1456/H2. Pachmarhi, Satpuri Hills, C.P., 3,500 ft., F. H. Gravely, 1457/H2, 1461/H2, 1464/H2.

There are a large number of these larvae, which have been previously described by Dr. Laidlaw in the *Memoirs of the Indian Museum*, Vol. V, 1915, p. 179.

In regard to the caudal appendages, autotomy is a noticeable feature and what is of even greater interest, the power of replacing the lost appendages is aptly illustrated in several specimens. The replacement occurs at ecdysis, but even at the final instar the new appendage is never nearly as large as the originals.

The specimens differ considerably in the amount of pigmentation, this probably depending largely on environment.

The mask, which has been figured by Dr. Laidlaw (*loc. cit.*), has some inconspicuous teeth on the accessory lobe of the lateral lobe.

16. *Pseudagrion hypermelas*, Selys.

(Pl. xxxvi, fig. 1; pl. xxxvii, fig. 3.)

Hooshangabad, C.P., 3. 19, F. H. Gravely, 1438/H2, and at Burhanpur, C.P., 4. 3. 19, F. H. Gravely, 1466/H2.

Length 18 to 20 mm. Caudal appendages 4 mm.

Body usually darkly pigmented, rather stout and short.

Mask scarcely differing from that of *microcephalum*, but the accessory lobe of the lateral lobe absent and the setae numbering 5 (pl. xxxvii, fig. 3).

Abdomen much shorter than the former, the sides spined.

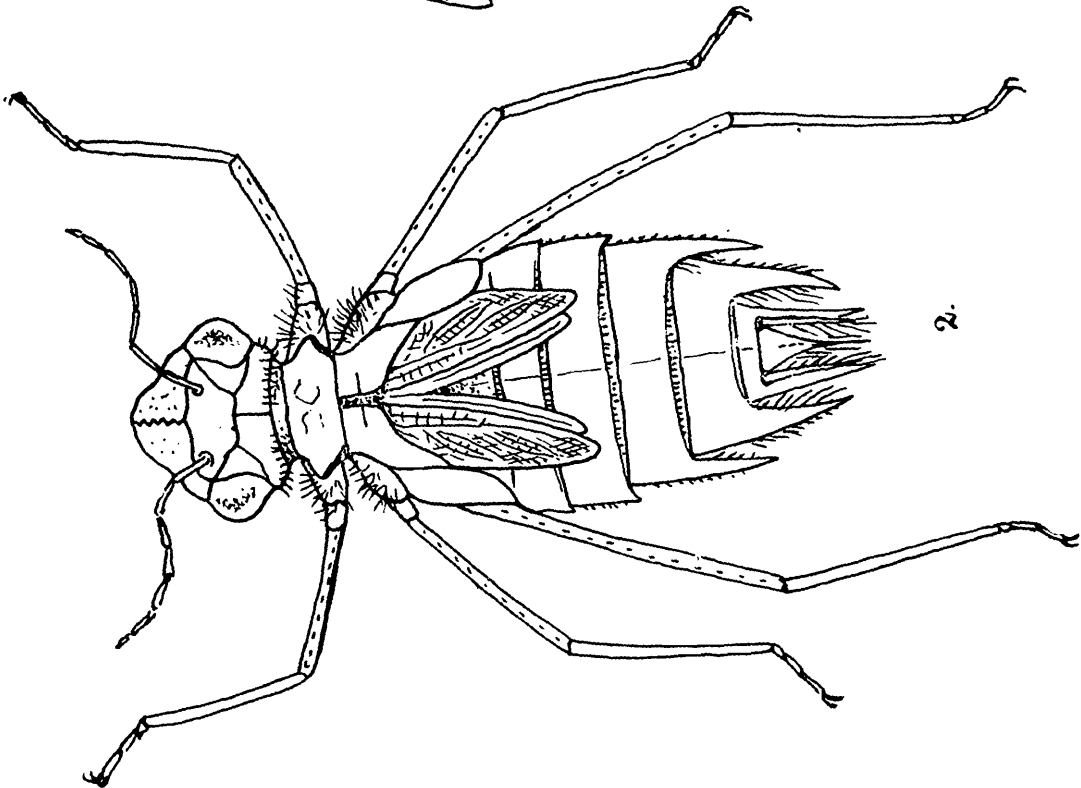
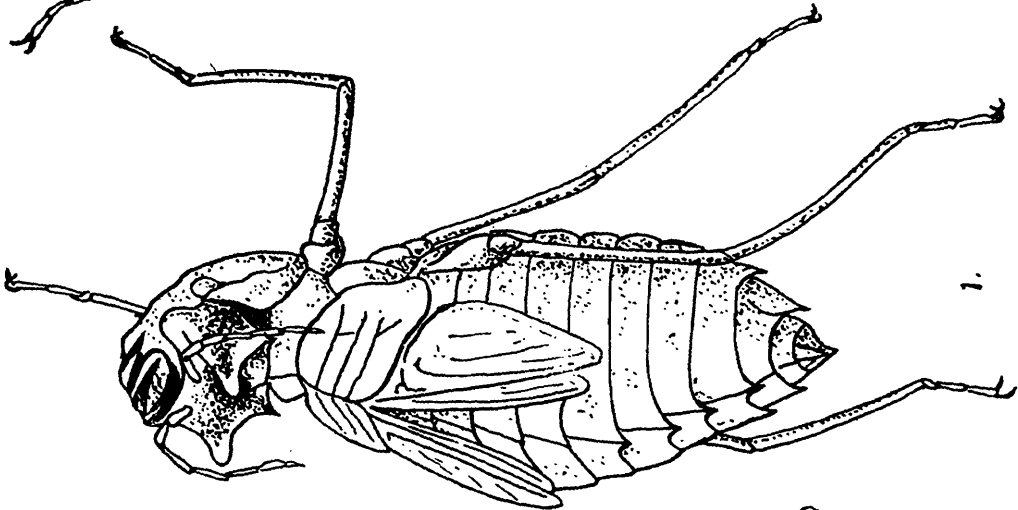
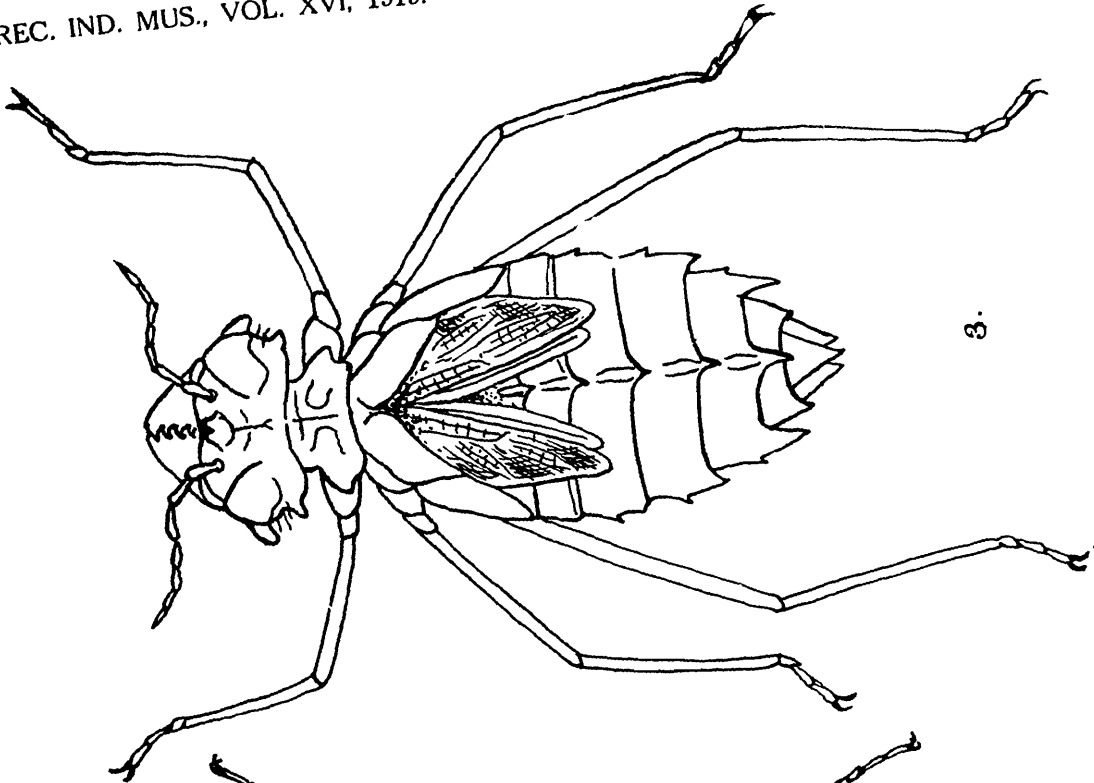
Caudal appendages pyriform in shape, blunt at the ends, subnodate, the proximal part spined laterally. Tracheae branching, root-like. A row of black, pigmented spots round the borders and some mottling elsewhere.

Legs long and slender, barred with pigment.

Hab.—Quiet running streams or large tanks, amongst weed.

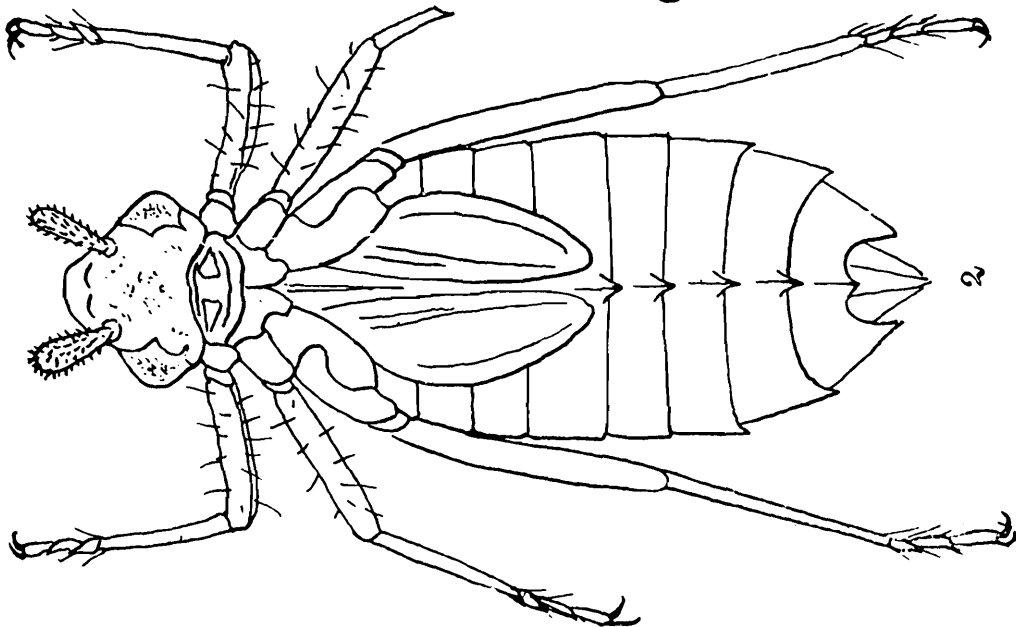
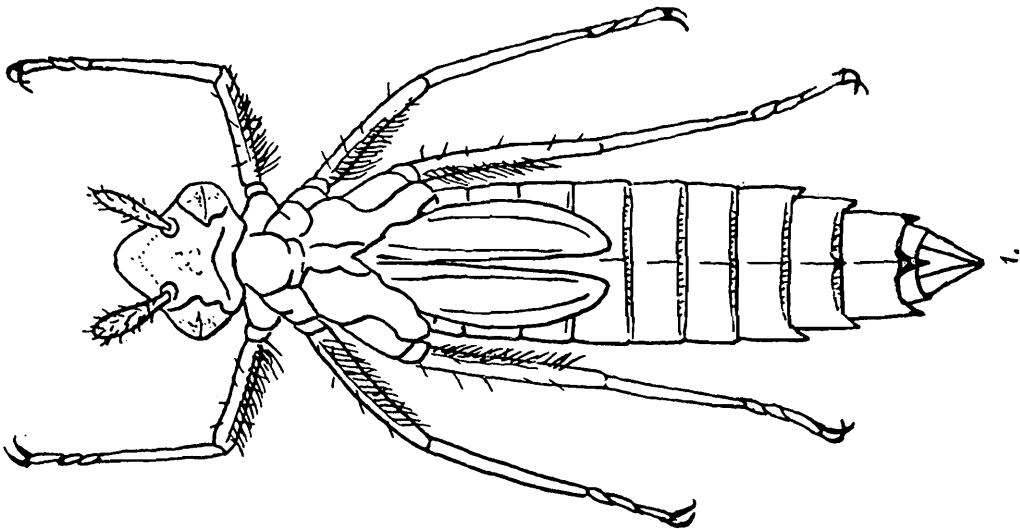
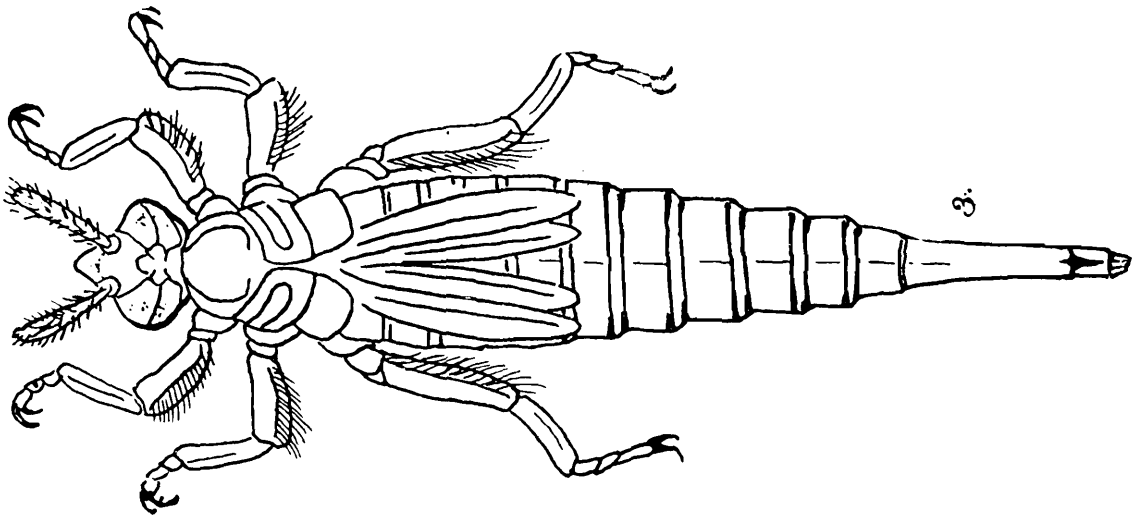
EXPLANATION OF PLATE XXXII.

- FIG. 1.—*Epophthalmia frontalis*, Selys.
,, 2.—*Tholymis tillarga*, Hagen.
,, 3.—*Tramea limbata*, Kirby.



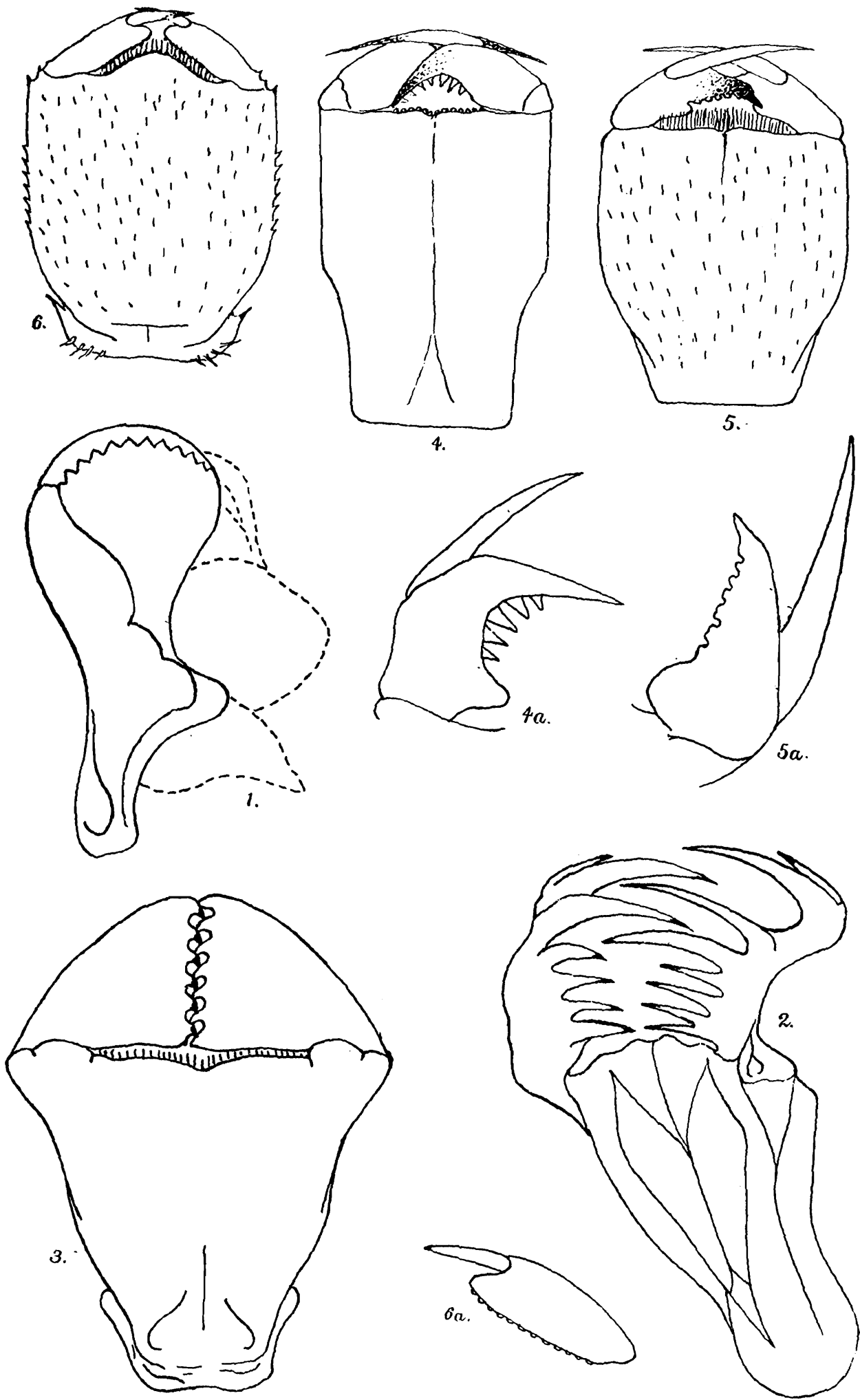
EXPLANATION OF PLATE XXXIII

- FIG. 1.—*Cyclogomphus heterostylus*, Selys.
,, 2.—*Cyclogomphus minusculus*, Selys.
,, 3.—*Macrogomphus annulatus*, Selys.



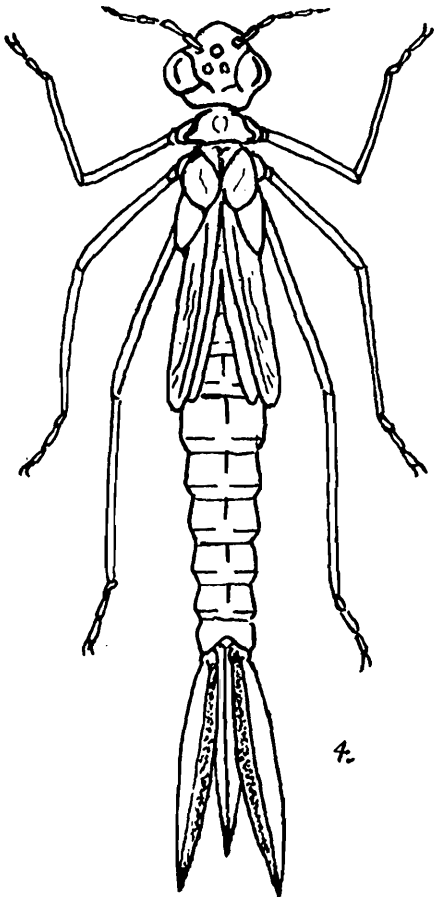
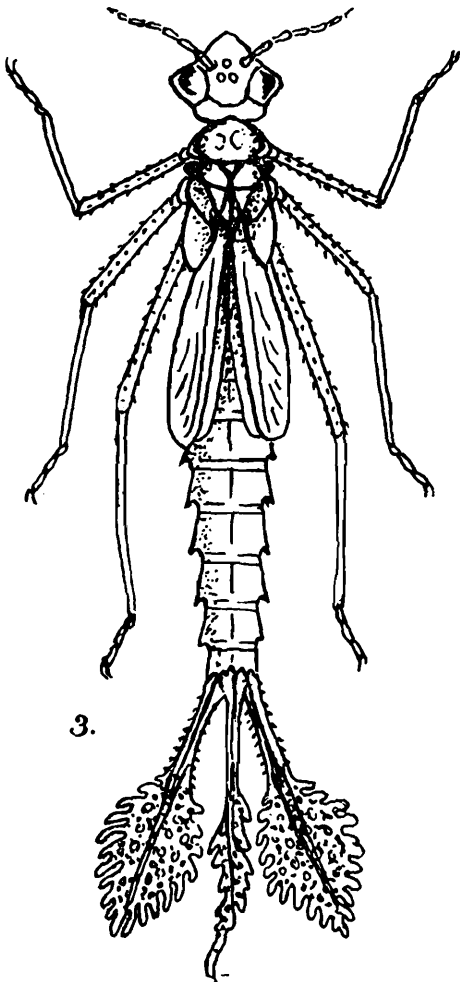
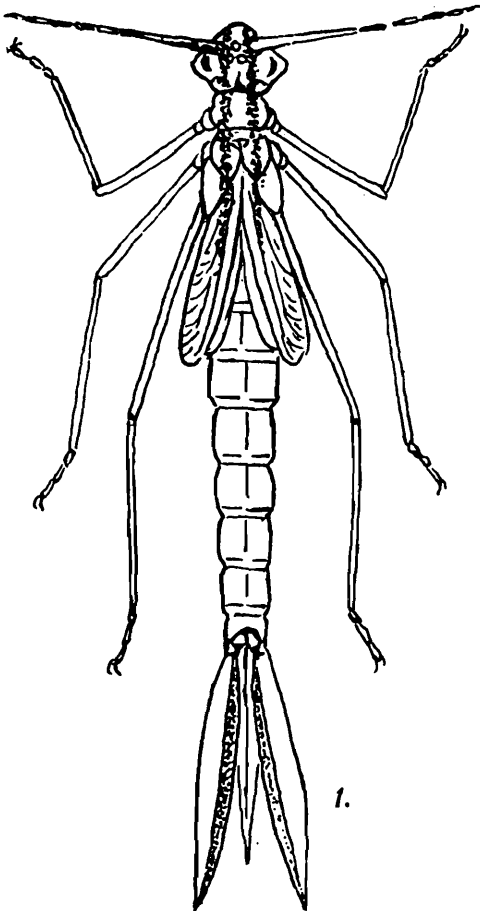
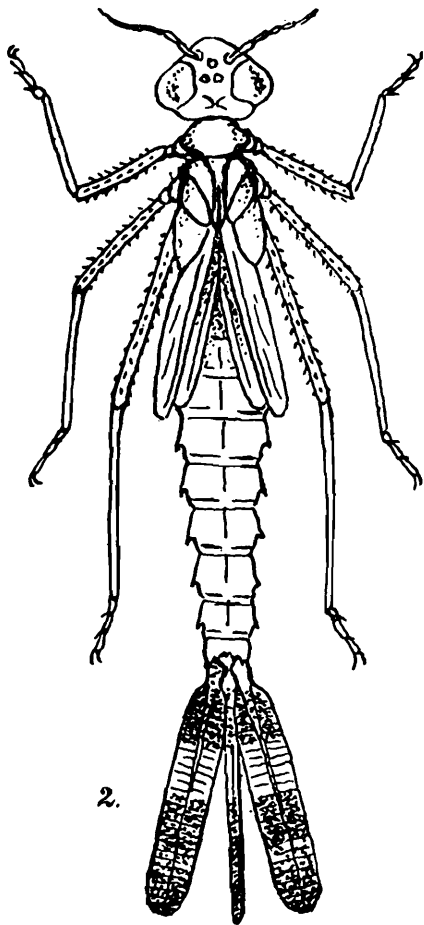
EXPLANATION OF PLATE XXXIV.

- FIG. 1.—Mask of *T tillarga*, Hagen. The dotted outline represents the head, the heavy outline, the mask.
Seen from the side.
- „ 2.—Mask of *Epophthalmia frontalis*, Selys.
- „ 3.—Mask of *T limbata*, Kirby. Seen from the front.
- „ 4.—Mask of *M annulatus*, Selys.
- „ 4a.—Lateral lobe of same.
- „ 5.—Mask of *C. heterostylus*, Selys.
- „ 5a.—Lateral lobe of same.
- „ 6.—Mask of *C. minusculus*, Selys.
- „ 6a.—Lateral lobe of same.



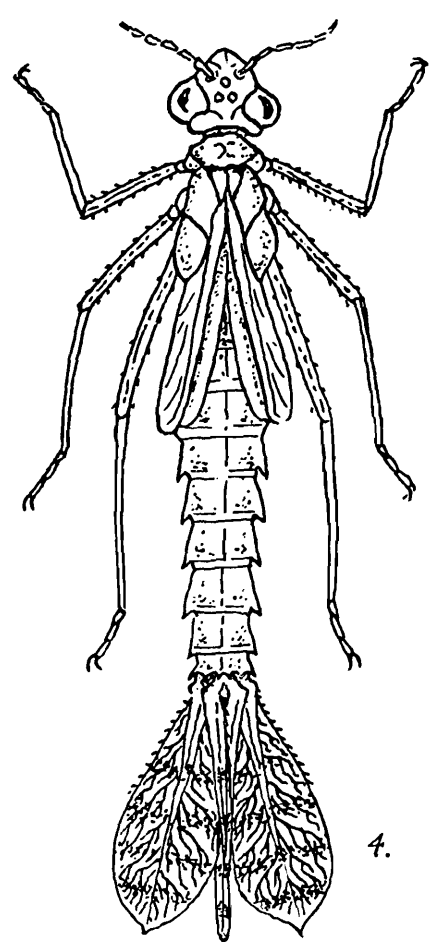
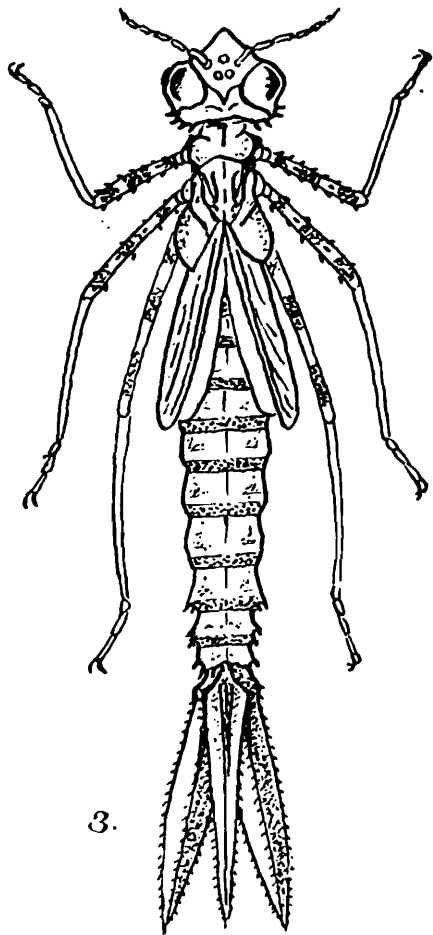
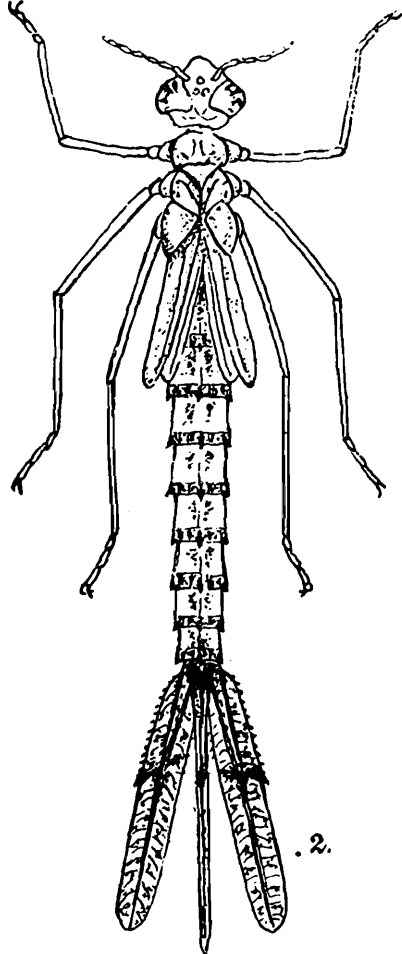
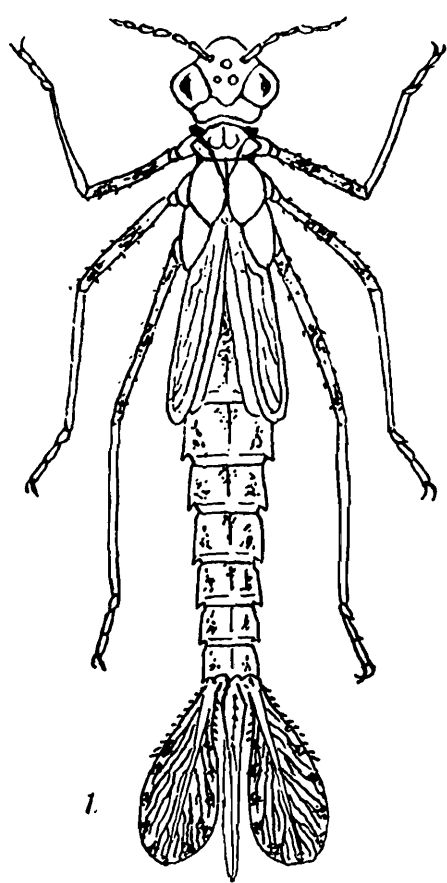
EXPLANATION OF PLATE XXXV.

- FIG. 1.—*Matrona basilaris*, Selys.
,, 2.—*Lestes* sp.
,, 3.—*Copera marginipes*, Ramb.
,, 4.—*Protosticta graveleyi*, Laidlaw.



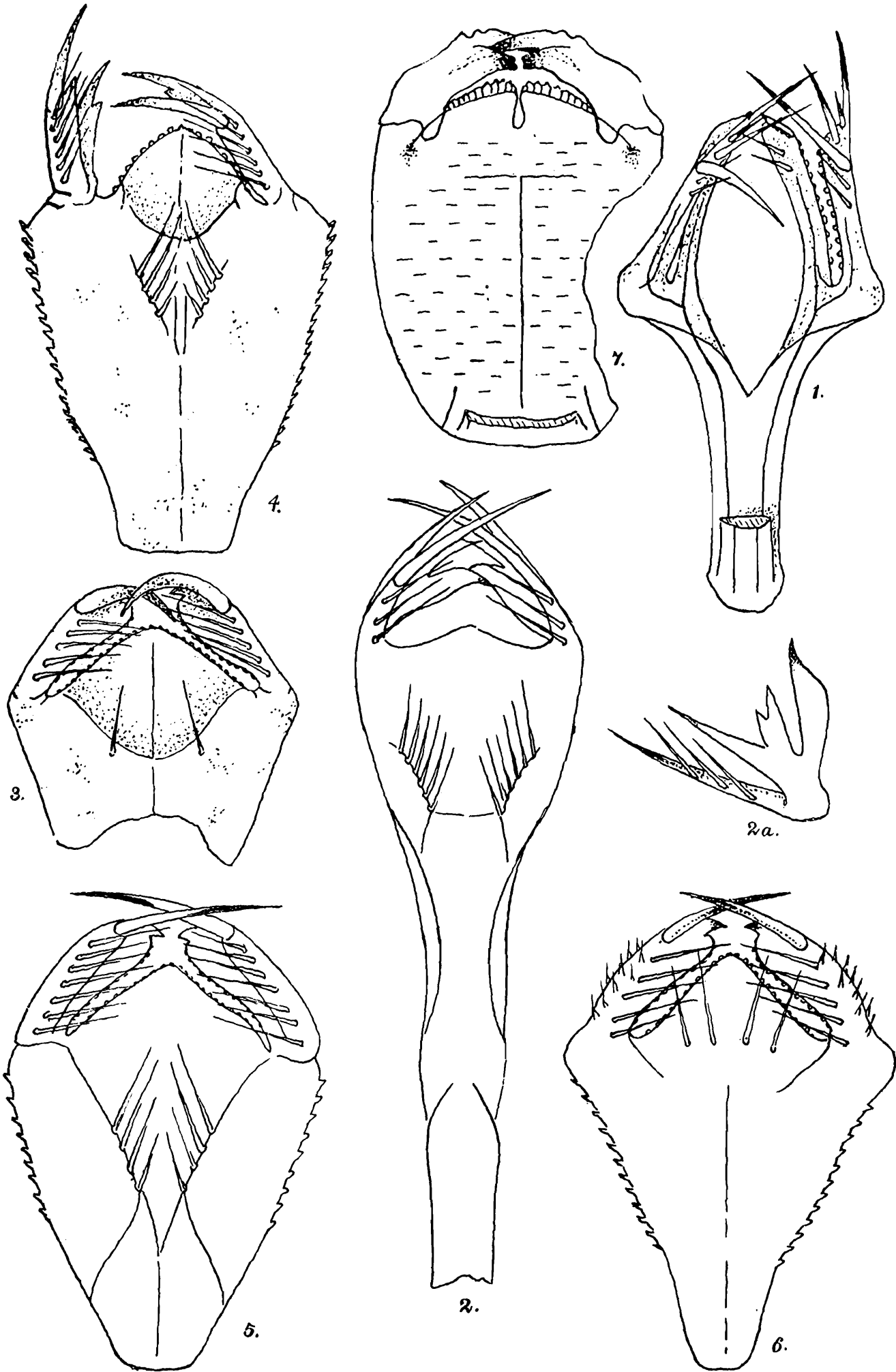
EXPLANATION OF PLATE XXXVI.

- FIG. 1.—*Pseudagrion hypermelas*, Selys.
,, 2.—*Pseudagrion microcephalum*, Ramb.
,, 3.—*Chloroneura quadrimaculata*, Ramb.
,, 4.—*Calicnemis miniata*, Selys.



EXPLANATION OF PLATE XXXVII.

- FIG. 1.—Mask of *M. basilaris*, Selys.
,, 2.—Mask of *Lestes* sp.
,, 2*a*.—Lateral lobe of same.
,, 3.—Mask of *P. hypermelas*, Selys.
,, 4.—Mask of *C. quadrimaculata*, Ramb.
,, 5.—Mask of *C. miniata*, Selys.
,, 6.—Mask of *C. marginipes*, Ramb.
,, 7.—Mask of *P. gravelyi*, Laidlaw.



XXXIV ON *AELUROPHRYNE MAMMATA*,
GÜNTHER, AN ADDITION TO THE BATRA-
CHIAN FAUNA OF KASHMIR

By G. A. BOULENGER, LL.D., F.R.S., Hony. Foreign Correspondent,
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When in the Ladakh Valley, Kashmir, in August 1917, my son Captain C. L. Boulenger found, at an altitude of 12,000 feet, under a stone, a single young toad, measuring 25 mm. from snout to vent and still bearing a stumpy vestige of the tail. This toad was at first a puzzle to me. Its vertical pupil, combined with the absence of teeth, suggested the curious forms, annectant to the Bufonidae and the Pelobatidae, which I have described under the names of *Cophophryne*¹ and *Ophryophryne*.² I am now convinced that it is the young of the toad described by Günther³ as *Bufo mammatus*, from the Kham Mountains in the Chinese province of Sze Chuen.

Günther's specimens were, as he admitted, in a poor state of preservation, and the shape of the pupil could not have been recognized. But an examination of the vertebral column and of the pectoral arch, which I have been able to make on one of the type specimens in the British Museum, shows the sacral vertebra to have unusually strongly dilated transverse processes and to articulate with the coccyx by a single condyle, as in *Pelobates* and *Megalophrys*, with both of which it agrees also in the structure of the pectoral arch (precoracoid strongly curved, sternum with a long bony style), thus confirming my first impression as to the affinities of the Kashmir specimen. *Bufo mammatus*, for which I now propose the generic name *Aelurophryne*, in allusion to the cat-like pupil, is closely allied to *Cophophryne*, differing from it in the absence of a notch in the posterior border of the tongue, which is oval in shape; the tympanum is present, though hidden under the skin, and the eustachian tube moderately large.

We are therefore now acquainted with three closely related generic types filling the gap between the Pelobatidae and the Bufonidae, and it may appear a moot point as to which of the two families they should be referred. As I am more and more losing faith in the importance of the presence or absence of teeth as a family character,⁴ I would suggest an alteration of the definition of

¹ *Ann. and Mag. N. H.* (5) XX, 1887, p. 406.

² *Op. cit.* (7) XII, 1903, p. 186.

³ *Ann. Mus. Zool. St. Pétersb.*, 1896, p. 10.

⁴ *Cf.* Boulenger, *Ann. and Mag. N. H.* (6) I, 1888, p. 188.

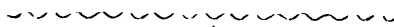
the Pelobatidae so as to include these toothless forms. Although the definition will then be very vague indeed, the group will at least be expressive of the natural affinities of its constituents, which may be described as lowly forms approaching the Discoglossidae and leading on the one hand to the Cystignathidae (through *Batrachopsis*, Blgr.), on the other to the Bufonidae.

ADDENDA.

Since this note was written, Dr. Annandale has submitted to me two specimens of a toad from high altitudes in Kashmir, sent to him quite recently by Mr. F. J. M. Mitchell, as representing the adult of the tadpole described by him in these *Records*, XIII, 1917, p. 417, figs. 1, 2, as that of *Rana pleskei*, Gthr. I have no doubt Mr. Mitchell's suggestion is correct, and as the toads belong to *Aelurophryne mammata*, the resemblance of the tadpole to that of *Pelobates*, with which I had been struck on reading Dr. Annandale's description, is accounted for, and affords a confirmation of the systematic position assigned to *Aelurophryne*.

[I have to thank Mr. F. J. Mitchell for sending me further specimens of the tadpole which I recently described as that of *Rana pleskii*, and also of the adult which he believed, on my identification of the larva, to belong to that species. It was quite clear from the most superficial examination of the adult that it was not *Rana pleskii*. Almost at the same time as I received these specimens from Kashmir I also received from Dr. Boulenger the manuscript of his paper on *Aelurophryne*. This coincidence led me to re-examine all the material in the Indian Museum referred to *Rana pleskii*, which includes specimens from Tibet named by Dr. Boulenger as well as those collected in that country by Capt. F. H. Stewart (*Rec. Ind. Mus.* II, p. 345) and the tadpoles from Kashmir described by me in *Rec. Ind. Mus.* XIII, p. 417.

The eye was concealed in most of the specimens, but I found that on dissecting off the lower eye-lid of some very young examples which had just lost their tails, the pupil appeared to be slightly vertical though it was contracted to so small a speck that its shape was hard to see, while in other young specimens it was certainly not vertical. I still had very great difficulty in distinguishing the two forms on any other external character, as the examples of neither were in good condition, but Mr. Mitchell's series of beautifully preserved tadpoles and young of the species common at high altitudes in Kashmir, leaves no possible doubt that I had confused the young of *Rana pleskii* with those of *Aelurophryne*, and that the tadpole which I ascribed to the former really belongs to the latter. N Annandale.]



XXXV RECORDS OF TRIGONALIDAE FROM SOUTH INDIA

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The Trigonalidae form a very small family of parasitic Hymenoptera and very little is on record regarding these interesting insects. As far as is known of the few European and American forms, the members of the family appear to be parasites or hyperparasites on species of Vespidae. So far as I know there is only a solitary example of this group of insects that has till now been recorded from the Indian Continent, and that is *Pseudogonalos harmandi*, Schulz, collected in Darjiling before 1907. In the *Genera Insectorum* volume on this family the author Schulz records three others from Burma and none from any part of India except the one noted at Darjiling. As such the following records might be of some interest.

In 1917 two undoubted specimens of this family were collected from South India. But their presence as representatives of this rare group was found out only when I was recently sorting out our Hymenoptera collection. These two forms have certain general resemblances to the Burmese species described by Westwood in the *Transactions of the Entomological Society* for 1868, p. 327, under the name of *Poecilogonalos (Trigonalys) pulchella*, but both are different in certain features and as such are, I believe new forms. Their general features are as below :—

1. *Poecilogonalos fulvoscutellata*, n. sp.

Head large, subquadrate, distinctly broader than thorax, vertex and frontal region closely punctured. Eyes large and situated sufficiently apart from each other. Antennae long and filiform. Ocelli clear; clypeus slightly emarginate; mandibles large and each provided with three well-developed teeth.

Prothorax large, broader than long; punctured in the same way as head. The anterior lateral region is drawn out into a flattened raised structure in front of the wing tegulae. Scutellum prominent, more or less spherical and gibbous. Median segment convex with the punctures at the basal region running into fine longitudinal striae; there is a short tubercle at each lateral angle of the base of the metanotum. Legs well developed; two spurs on the hind tibiae.

The abdomen is ovoid in shape. The first segment is small and triangular, the second largest, the posterior segments smaller and

curved downwards, the second and third segments finely punctured.

General colour dark with brown and yellow markings.

Head. Ground colour dark; the mandibles except the teeth, one oval spot on each side of the clypeus, one small spot at base of each antenna, the inner and outer orbits of the eyes (the outer somewhat broadly), a minute spot in front of the anterior ocellus, and the lateral margins of the occiput yellow. Antennae ferruginous; the scape and distal end of the flagellum slightly darker. The face, front and occiput dark in colour but the latter has a V-shaped reddish-brown mark, the two limbs of the mark diverging towards the eyes on each side of the ocellar region. In addition there is also a fulvous red streak on each side of this V-mark, and there is a faint small reddish spot just behind and between the two posterior ocelli.

Thorax. Prothorax dark ferruginous, two somewhat conical spots at the base near the head one on each side of the mid-dorsal line, the anterior lateral flattened region, and one prominent mark on each pleura yellow. Scutellum completely fulvous yellow. Three transverse lines on the post-scutellum (all three in a line but not touching each other, the middle one being longer and broader), two large irregularly oval spots on median segment one on each side of the median line, one small spot at the mesopleural region under the wings, and two slightly larger spots at the meta-pleural region also yellow. The legs—coxae black with yellow mark, trochanters fulvous; femora, tibiae and tarsi reddish to ferruginous brown.

Abdomen. The abdomen is dark ferruginous brown. One small triangular spot on the first segment near its junction with the second, a transverse stripe on its ventral side, a broad transverse band at the distal region of the second segment and similar ones on the following segments yellow; those on the posterior segments are broadly interrupted at the median line. There is a tinge of reddish-brown on the second and third segments in front of the yellow band.

Wings fuscotransparent with a fuscous spot at the radial region. Tegulae yellowish.

Length 8 mm.

Pulney Hills, 3600 feet, Madura district. Collected by P. Susainathan; May 1917.

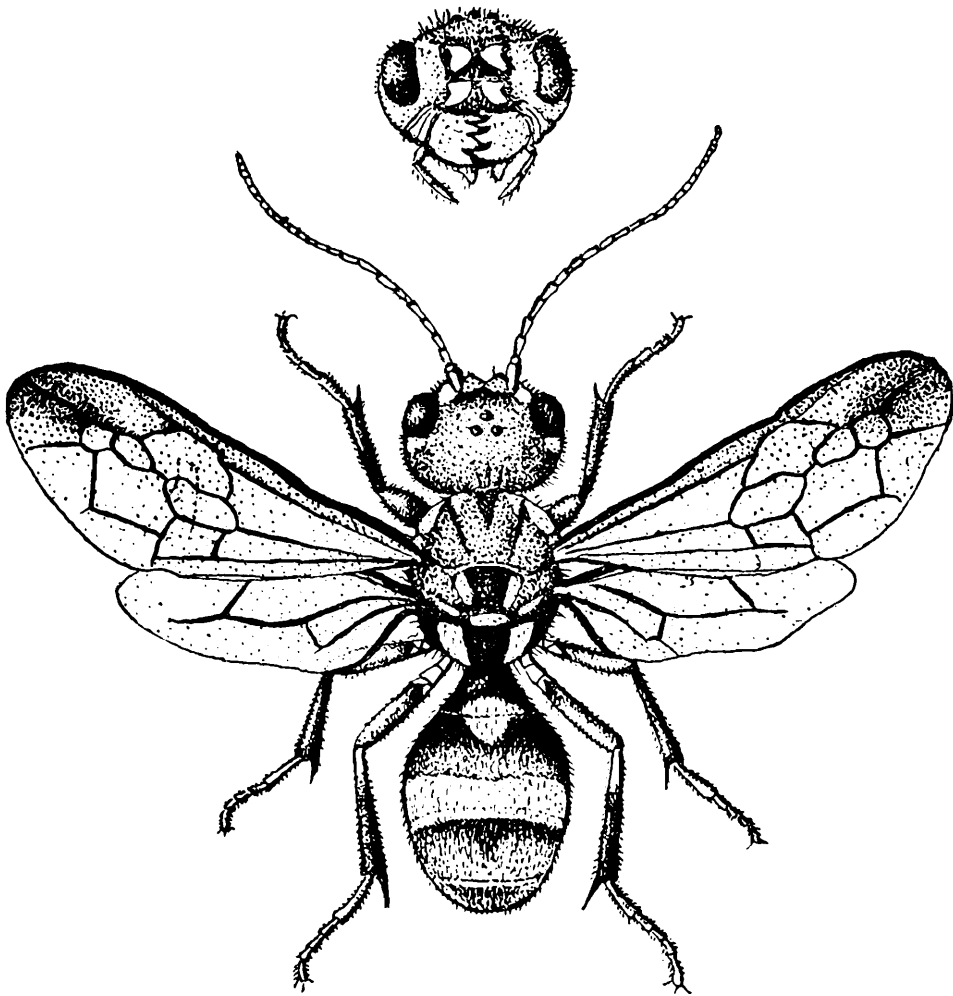
2. *Poecilogonalos kerala*, n. sp.

Though in some features this insect is similar to the above species from the Pulneys there are some marked differences which are as below.

It is quite different in general form and colour from *Poecilogonalos fulvoscutellata*. The head is very broad and appears shining and gibbous, although on closer examination it is found punctured very finely. The mandibles are prominent and show four big teeth. The dorsal grooves on the pronotum are some-

what more prominent. The tubercles in the median segment are less prominent. There are also colour differences. The general colour in this case is bright reddish-brown. The face and a narrow region of the front just above the antennae black; except the ocelli which are black the front and vertex are reddish-brown. The mandibles except the teeth, inner and outer orbits of eyes, one spot at the base of each antennae and a narrow portion along the posterior lateral region of occiput yellow; antennae reddish-brown.

Prothorax reddish-brown. One dark spot on the median line and one yellow spot on each side of the former, all three situ-



Poecilogonalos kerala, n. sp. $\times 6$.

ated at the base close to the head. The anterior lateral flattened portion yellow. Scutellum black with a narrow yellow spot on each side of it. The three yellow lines on the post-scutellum and the other yellow marks more or less similar to the previous species. There is a reddish tinge predominant at the sides of the thorax in this species. Legs—coxae and trochanters brownish yellow, femora brown, tibiae ferruginous brown and slightly fulvous at the base, tarsi ferruginous.

Wings. Costal cell slightly narrower in this species. The second and third cubital cells shorter and broader than in the last species,

and the boundary veins of these and adjacent cells different in arrangement. Fuscus spot on wing clearer; tegulae ferruginous.

The face, cheeks, sides of thorax and abdomen clothed with more of whitish glistening pubescence.

Length 8 mm.

Santhanathode, Western Ghats, Malabar district. Collected by T. V. Ramakrishna Ayyar; 7-10-1917.

These insects are easily mistaken for small bees and likely to be overlooked. There is no doubt several other forms will be met with in South India in course of time, when it will be possible to get more information regarding this very little-known family of insects.
