

STUDIES ON INDIAN ITONIDIDAE (CECIDOMYIDAE :
DIPTERA).¹

II.—DESCRIPTIONS OF NEW MIDGES AND GALLS.

By M. S. MANI.

(From the Laboratories of the Zoological Survey of India,
Indian Museum, Calcutta.)

A.—DESCRIPTIONS OF NEW MIDGES.

Subfamily HETEROPEZINAE.²

Genus **Meinertomyia** Felt.

1870. *Pero*, (*pre-occ. Pero*, Schaffer), Meinert, *Naturhist. Fidskr. Copenhagen* (3) VI, p. 463.
1898. *Pero*, Kieffer, *Synop. Cecid. Europe et Algerie*, p. 54.
1911. *Meinertomyia*, Felt, *Journ. N. Y. Entomol. Soc.*, XIX, p. 37.
1911. *Meinertomyia*, Felt, *Bull. N. Y. St. Mus.*, No. 147, p. 85.
1913. *Meinertomyia*, Felt, *Bull. N. Y. St. Mus.*, No. 165, p. 214.
1913. *Meinertomyia*, Kieffer, *Gen. Ins.*, fas. 152, p. 139.
1925. *Meinertomyia*, Felt, *Bull. N. Y. St. Mus.*, No. 257, p. 139.

This monotypic genus is being recorded for the first time from India. The genotype, *M. fasciata* (Mein.), described from Denmark, is reported to occur on the European hornbeam. I describe below two new species from the material received from the Forest Entomologist, Forest Research Institute, Dehra Dun.

The genus is recognised by the following characters: Palpi triarticulate. Antennae moniliform, segments 14 in female and 23 in male, flagellate segments with two whorls of hairs in female and a single whorl in male. Wings acuminate, hyaline, finely haired, with three longitudinal veins, third vein reaching margin near the apex of the wing, fifth vein simple and sometimes not fully reaching the wing margin. Tarsi quinque-articulate, metatarsus shorter than the second tarsal segment. Claws simple, short, empodium³ very short. Terminal clasp segment large. Ovary simple, short, never longer than half the length of the body.

Key to Indian species.

- I. The three palpal segments of equal length or nearly so ;
terminal flagellate segments trinodose, moniliform ;
empodium about three fourths the length of the claws *M. aequipalpis*, sp.
nov.
- II. The three palpal segments of unequal lengths ; terminal
flagellate segments rather short and pyriform ; empodium
about half the length of the claws *M. inaequipalpis*, sp.
nov.

¹ Part I of this paper was published in *Rec. Ind. Mus.*, XXXVI, pp. 371-451, (1934).

² Midges belonging to this subfamily have not previously been recorded from India.

³ Pulvillus of Felt's key. Empodium is the name applied to the cushion-like pad between the claws, while pulvillus is a similar pad on the sides of the claws.

Meinertomyia aequipalpis, sp. nov.

Female.—1 mm. long. Body pale reddish brown in the dry condition, moderately setose. Palpi triarticulate, short, segments slender, subequal. Antennae brownish, about one third the length of the body, setose; segments 14, third and fourth segments short, rather subglobose; fifth onwards elongated, subcylindrical, subequal and somewhat attenuated apically; terminal segment trinodose, moniliform; setae about twice as long as the segments. Mesonotum reddish brown, submedian lines moderately setose. Wings hyaline, densely and finely covered with dark brown hairs; costa interrupted behind its union with third vein; fifth vein rather faint terminally. Legs dark brown, thickly scaled. Claws simple, slender, strongly curved. Empodium about three fourths the length of the claws. Scutellum prominent, brick-coloured, setose; post scutellum pale reddish brown. Abdomen reddish brown. Ovipositor about one fourth the length of the abdomen, yellowish brown; terminal lamellae small, linear-oblong and with a few long setae.

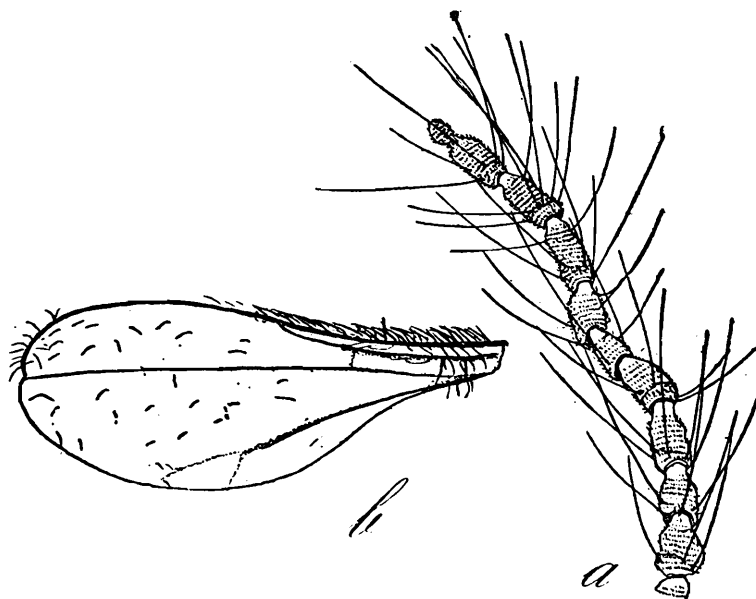
Cotypes.—One female partly dissected on slide No. $\frac{1063}{H 6}$. One female dry on card No. $\frac{1064}{H 6}$. In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Nos. 60-64. In the collections of the Forest Research Institute, Dehra Dun.

Type-locality.—Jhajra, Dehra Dun. (U. P.), Coll. N. C. Chatterji, 4-6.xii.1924.

Habitat.—*Ficus rumphii*.

Meinertomyia inaequipalpis, sp. nov.

Female.—0.75 mm. long. Body pale reddish brown in the dry and deep red in the fresh specimens, densely setose. Palpi moderately long, sparsely covered with short setae; first segment longest, with a length about twice its diameter; second segment a little shorter than the first and nearly as stout; third segment a little longer and stouter than the



TEXT-FIG. 1.—*Meinertomyia inaequipalpis*, sp. nov. a. antenna; b. wing.

second, broadly ovoid. Antennae about half the length of the body, setose, dark brown; segments 14; first two segments large, globose; third, fourth and fifth segments subequal and subcylindrical; sixth

segment a little longer and subconical; tenth and eleventh subequal and subcylindrical; thirteenth shorter and napiform; terminal segment rather small and pyriform. Mesonotum black in front and dark reddish brown behind, submedian lines setose. Wings hyaline, more densely clothed with long, black hairs than in *M. aequipalpis*; anal margin fringed with very long, slender, black hairs; costa interrupted behind its union with the third vein; fifth vein faint terminally. Legs dark brown, rather darker and somewhat longer than in *M. aequipalpis* and rather very thickly clothed with scales. Claws simple, somewhat relatively more slender, moderately sharply bent. Empodium half the length of the claws. Scutellum prominent, light brick red in colour and finely pubescent, post scutellum darker. Abdomen deep reddish. Ovipositor somewhat long, terminal lamellae linear-elliptic and sparsely setose.

Cotypes.—Two females partly dissected on slides Nos. $\frac{1065}{H 6}$ and $\frac{1066}{H 6}$. In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta.

Also several examples dry on card No. $\frac{1067}{H 6}$. In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta.

Type-locality.—Srimangal, Sylhet, Assam. Coll. D. J. Atkinson, 27-x-1927, ex. *Odina wodier* Roxb.; Kotdwara, Lansdowne, (U. P.), Coll. B. M. Bhatia, 19-x-1934, ex. green shoots of Bamboo.

Other localities.—Moiyanala, Jubbulpore, (C. P.), Coll. S. N. Chatterji, 20-29.x.1934, ex. *Odina wodier* Roxb., and *Buchnaniania latifolia*; Samsingh, Kalimpong, Bengal, N. C. Chatterji, 24-x-1934, ex. *Polyantha simiarum*; New Forest, Dehra Dun, R. N. Mathur, 7-25.xi.1932, ex. *Morus alba* hin.

Subfamily ITONIDIDINAE.

Tribe PORRICONDYLIARIAE.

Genus *Bainidiplosis*, nov.

This new genus, with which I associate the name of Dr. Baini Prashad, Director, Zoological Survey of India, is erected to accommodate a series of midges received from the Forest Entomologist, Forest Research Institute, Dehra Dun. This genus falls in Felt's key to the genera in the series having the cross vein forming a well marked angle with costa. It resembles *Winnertzia* Rond. and its allies in having four longitudinal veins and a free sixth vein, but differs in having the fifth vein forked. Its relationship to the known genera of the *Winnertzia* series of Porri condylariae is shown in the key below which is modified from Felt.¹

- | | |
|--|----------------------------------|
| I. Four long veins, fifth vein obsolete or if present simple, sixth vein free. | |
| A. Fifth vein arising from the third vein near the cross vein; a supernumerary vein at the basal third of subcosta | <i>Diallactes</i> Kieff. |
| B. Fifth vein arising from the base of wing; no supernumerary vein. | |
| 1. Fifth vein well developed, circumfili horse-shoe-shaped | <i>Winnertzia</i> Rond. |
| 2. Fifth vein obsolete basally and apically | <i>Gonioclema</i> Skuse. |
| 3. Fifth vein absent | <i>Parwinnertzia</i> Felt. |
| II. Four long veins, fifth vein well developed, forked, sixth vein free | <i>Bainidiplosis</i> , gen. nov. |

¹ Felt, E. P., *Bull. N. Y. St. Mus.*, No. 257, p. 139, (1925).

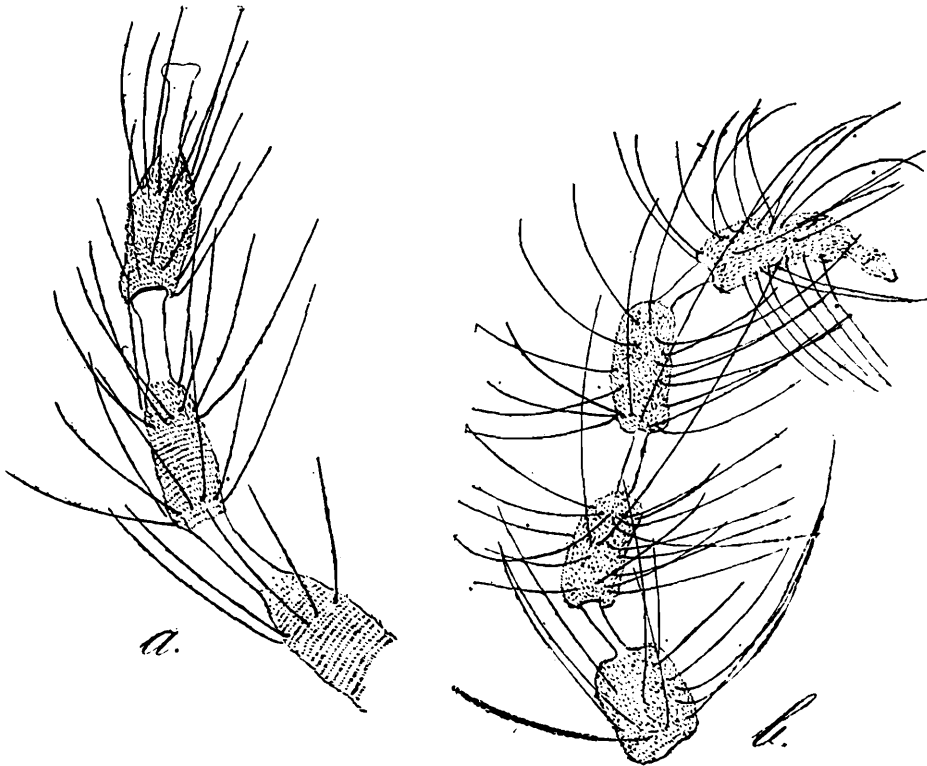
The following are the characters of this genus :

Palpi quadriarticulate. Antennal segments 14 in female, cylindrical, with moderately long stems and circumfilum normal, *i.e.*, not horse-shoe-shaped as in the genus *Winnertzia* Rond. Wings hyaline, with four longitudinal veins ; costa well developed ; cross vein forming a large acute angle with costa ; third vein reaching margin beyond the apex of wing ; fourth and fifth veins well developed, the latter broadly forked, branches of the fork unequal and faint apically ; sixth vein moderately developed and free, reaching to about three fourths the length of the fifth vein. Claws unidentate. Ovipositor short. Male genitalia moderately large ; dorsal plate small, divided into two subtriangular lobes with rounded sides ; ventral plate a little longer ; harpes shorter than style, but longer than both dorsal and ventral plates, truncate apically ; style moderately stout, about one fourth longer than the basal clasp segment ; latter not very large of almost uniform thickness ; terminal clasp segment as long as the basal clasp segment and bidentate apically.

Genotype.—*Bainidiplosis championi*, sp. nov.

***Bainidiplosis championi*, sp. nov.**

Female.—1.5 mm. long. Body brownish yellow, moderately setose and somewhat hunch-backed with the head partially hidden under the thorax. Frons pale yellowish. Palpi brownish, moderately densely setose, quadriarticulate ; first segment cylindrical, with a length about four times its diameter ; second segment subfusiform, almost as long

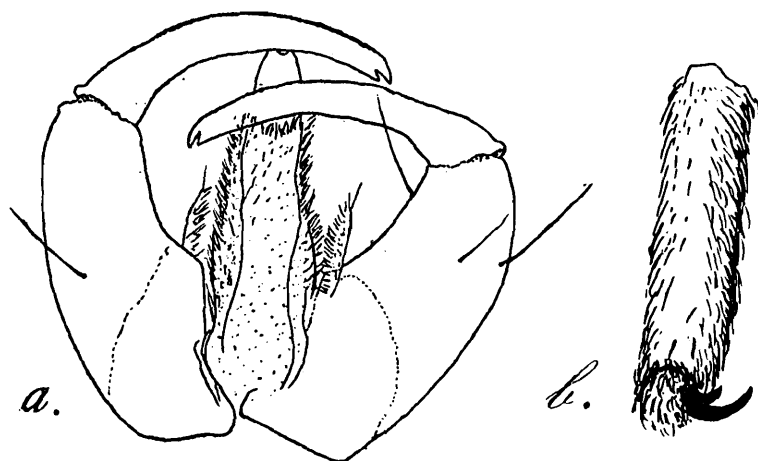


TEXT-FIG. 2.—*Bainidiplosis championi*, sp. nov. a. basal antennal segments of female ; b. apical antennal segments of female.

as and somewhat stouter than the first, length also about one and a half times its own diameter ; third segment a little longer and more slender than the second ; fourth segment a little longer and more slender than the third and rounded at the tip. Antennae about as long as the body,

yellowish brown, moderately hairy, with 14 cylindrical segments; scape large, pale yellowish, flagellate segments brownish; third segment long, fused with the fourth, with a stout stem about three fourths the length of the enlargement; fourth segment a little shorter than the third, stout basally and somewhat slender apically, stem slender, about one fourth the length of the enlargement; fifth segment a little shorter than the fourth, enlargement slightly more slender, of uniform thickness, stem about two thirds the length of the enlargement; sixth segment nearly equal to the fifth; seventh somewhat shorter, enlargement stouter apically than basally, stem about one fifth shorter than the enlargement; eighth segment similar to the seventh; tenth segment with a stem about half the length of the enlargement; thirteenth segment similar to the tenth; terminal segment slender, about twice the length of the thirteenth, enlargement uniformly thick, broadly rounded apically, with the prolongation roughly one half more slender and shorter than the enlargement. Mesonotum yellowish brown, submedian lines sparsely haired. Scutellum pale yellowish. Wings hyaline, moderately long and narrow, moderately hairy; costa thickly haired; proximal branch of the fork of the fifth vein reaching the posterior margin of wing before the basal half, distal branch reaches the margin with the fourth vein beyond the basal three fourth. Legs mostly pale straw-coloured and moderately setose. Claws unidentate on all legs, slender, moderately long, sharply bent; tooth long and moderately stout and curved. Pulvilli and empodium well developed, as long as claws. Abdomen somewhat longer than the rest of the body, slender, depressed, yellowish ventrally and grayish dorsally, moderately hairy. Ovipositor short.

Male.—1.5 mm. long, yellowish brown. Palpi presumably quadriarticulate long, pale yellow; first segment very stout, long, conical; second segment more slender and about one half longer than the first segment. Antennae lost. Mesonotum yellowish. Halteres short and slender. Genitalia moderately large. Dorsal plate small, deeply divided into two subtriangular lobes with rounded outer margins. Ventral plate a little



TEXT-FIG. 3.—*Bainidiplosis championi*, sp. nov. *a.* male genitalia; *b.* terminal segment of tarsus of fore leg with claw.

longer than the dorsal plate, bilobed, hairy and apparently emarginate. Harpes about three fourths the length of the style, rather broadly emarginate near the apex and somewhat deeply truncate. Style projecting a little beyond the basal clasp segment, with a length roughly five times

its diameter, somewhat constricted just above the base and swollen at about the basal three fourth and broadly rounded at apex. Basal clasp segment with a length roughly twice its breadth, very slightly narrowed near the apex, sparsely setose. Terminal clasp segment nearly as long as the basal clasp segment, somewhat stout basally, slightly curved and bidentate at the moderately chitinised apex.

Cotypes.—One female partly dissected on slide No. $\frac{1068}{H 6}$. One female on pin, No. $\frac{1069}{H 6}$. One male partly dissected on slide No. $\frac{1070}{H 6}$. In the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta, and one male partly dissected on slide No. $\frac{1071}{H 6}$. In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta.

Type-locality.—Mundali, 8,600 ft., Chakrata, Coll. H. G. Champion, 1-13.xii.1927.

Habitat.—Ex. *Quercus dilatata*.

Genus *Colpodia* Winn.

1934. *Colpodia*, Mani, *Rec. Ind. Mus.*, XXXVI, p. 385.

The one Indian known species of *Colpodia*, *C. fletcheri* Felt, recorded in my previous paper was provisionally referred to this genus by Felt. In this species the cross vein is not at right angles to the costa as in the other species of the genus but runs almost parallel to it.

I describe here one new species, under the name *C. dhakae* from the material received from the Forest Entomologist, Dehra Dun. This new species resembles *C. fletcheri* Felt in its 15 antennal segments but differs in having the cross vein forming a right angle with costa. These two Indian species fall between *C. pratensis* Felt and *C. maculata* Felt in Felt's key to the American species¹; and they may be separated from each other by the key given below.

Key to Indian species.

- | | |
|---|-----------------------------|
| I. Cross vein almost parallel with costa | <i>C. fletcheri</i> Felt. |
| II. Cross vein not parallel with costa but forming a right angle with costa | <i>C. dhakae</i> , sp. nov. |

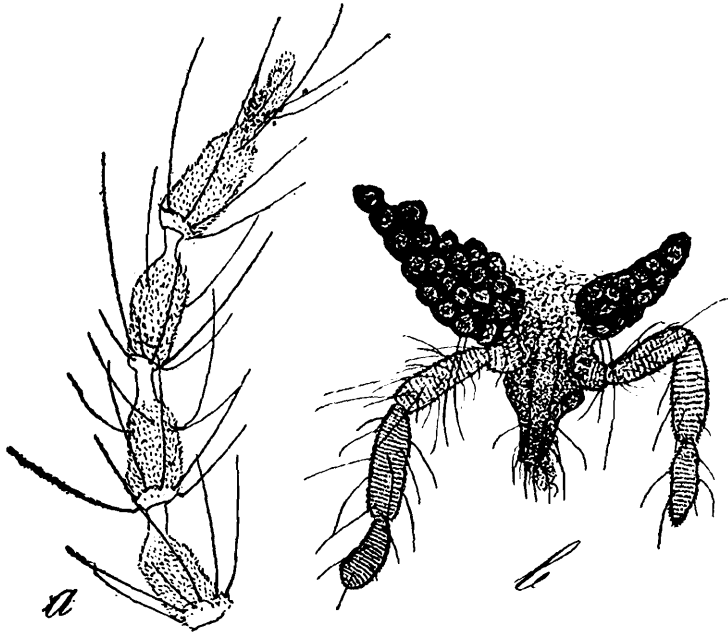
Colpodia dhakae,² sp. nov.

Female.—About 1.5 mm. long. Body yellowish brown and moderately setose. Palpi quadriarticulate, somewhat long and brownish; first segment short; second segment about twice the length of the first, apparently slender basally and clothed with denser and longer setae than the other segments; third segment about as long as the second and moderately setose; fourth segment about half the length of the third but somewhat more setose. Mouth parts somewhat prolonged and about as long as the first two palpal segments. Antennae about

¹ Felt, E. P., *Bull. N. Y. St. Mus.*, No. 124, p. 416, (1908).

² *Dhakae* from *dhak* the vernacular name of the plant *Butea frondosa*, on which the species was taken.

half the length of the body ; segments 15 ; third segment short, slender, somewhat attenuated beyond its basal half ; fourth segment one fourth longer than the third, stout, reduced up to the basal one sixth, sub-cylindrical beyond, with a stem about one fourth the length of the segment ; fifth a little shorter than half the length of the fourth, some-



TEXT-FIG. 4.—*Colpodia dhakae*, sp. nov. a. antennal segments ; b. mouth parts.

what more slender, with a stem about as long as the enlargement ; sixth about one and a half times the fifth, somewhat more slender, with a stem about one fifth the length of the segment, *i.e.*, a little longer than one third the enlargement ; segments nine and ten with stout enlargements and slender stems ; eleventh nearly equal in length to the tenth, somewhat more slender, with a stem a little shorter than that of the tenth ; twelfth one half longer and somewhat more slender than eleventh, stem about one fourth the length of the enlargement ; thirteenth nearly equal to twelve, somewhat stouter, stem nearly equal to but more slender than that of the twelfth ; fourteenth fused with the fifteenth, a little shorter than thirteenth, stem almost suppressed ; the terminal segment apparently three fourths the length of the fourteenth, swollen basally, with a prolongation about twice the length of the enlargement. Mesonotum brown, submedian lines haired. Wings long, narrow, moderately thickly setose ; cross vein at right angles to costa. Legs dark brown, densely hairy. Claws simple, slender, strongly curved. Pulvilli absent. Empodium rudimentary. Scutellum yellowish brown, post scutellum lighter. Halteres brown and moderately setose. Abdomen more than twice the length of the thorax, yellowish brown, sparsely setose. Ovipositor apparently aciculate, moderately long, yellowish ; terminal lobes very short.

Holotype.—One female partly dissected on slide, No. $\frac{1072}{H 6}$. In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta.

Paratypes.—Two examples dissected on slides, Nos. $\frac{1073}{H 6}$, $\frac{1074}{H 6}$. In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta.

Type-locality.—Lachiwala, Dehra Dun (U. P.), Coll. Forest Entomologist, 9-xii-1928.

Habitat.—On *Butea frondosa* (*dhak*).

Tribe OLIGOTROPHIARIAE.

Genus *Misopatha* Kieff.

1913. *Misopatha*, Kieffer, *Bull. Soc. Hist. Nat. Metz*, XXVIII, p. 48.

1913. *Misopatha*, Kieffer, *Gen. Ins.*, fas. 152, p. 44.

1925. *Misopatha*, Felt, *Bull. N. Y. St. Mus.*, No. 257, p. 150.

1934. *Misopatha*, Mani, *Rec. Ind. Mus.*, XXXVI, p. 405.

This genus, not previously recorded from India, comprises about sixty species, distributed all over Asia, Europe, Africa and the Americas. Most of the species of this genus appear to breed in shoot galls of various plants chiefly sturdy herbs, shrubs and small trees.

The genus is closely related to *Rhopalomyia* Kieff. and *Panteliola* Keiff., recorded in my previous paper but is distinguished by its uniarticulate palpus. Numerous species referred to the genus *Rhopalomyia* by Felt¹ have been transferred to *Misopatha* by Kieffer in his monograph in the *Genera Insectorum*.

The genus is recognised by the following characters :

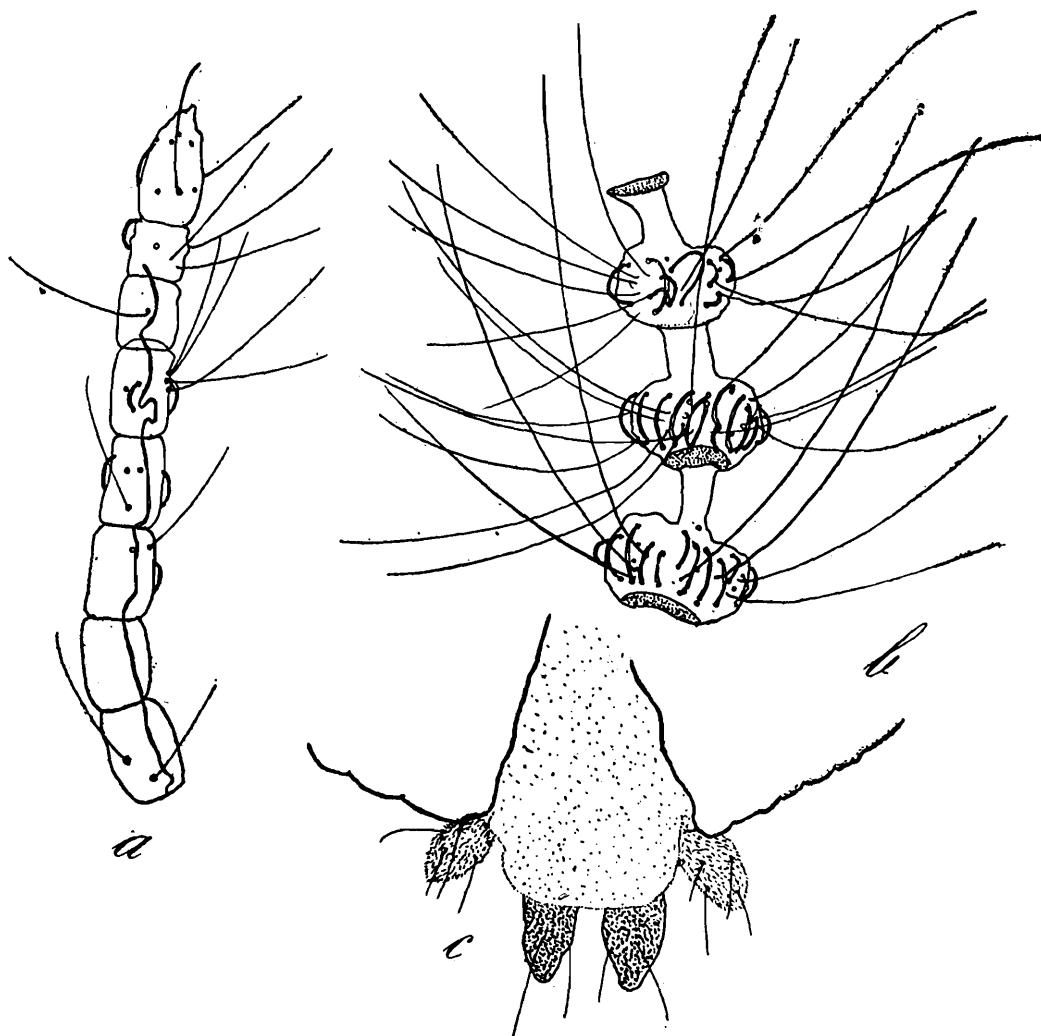
Palpi uniarticulate. Antennae with variable number of (generally numerous) segments ; flagellate segments short, stout and long-stemmed in male ; subsessile or sessile in female ; circumfila not reticulated ; third flagellate antennal segment not heavier and with no more circumfili than the rest of the segments. Wings broad, costa moderately finely haired, third vein united with costa a little beyond the apex of wing. Claws simple, stout, as long as the empodium or nearly so, pulvilli distinctly shorter than empodium. Ovipositor more or less constricted, not aciculate, not strongly chitinised, protractile, terminal segment pouch-like, with a ventral lobe at base. Terminal clasp segment of male genitalia large and swollen ; dorsal plate bilobed.

Misopatha tamaricis, sp. nov.

Female.—2.75 mm. long. Body brownish black and sparsely setose in the dry specimen. Palpus uniarticulate, elongate, subcylindrical, with a length about four times its diameter, one fourth longer than the trophus, reduced to a rounded tip beyond the basal three fourth, densely scattered with groups of stout stiff hairs. Antennae very short, not very much longer than the height of the head, brown, sparsely setose with 14 segments, segments seven to eleven subequal, with lengths roughly two fifths greater than their diameters ; twelfth segment a little shorter than eleventh ; thirteenth segment about half the length of eleventh ; fourteenth segment about twice the length of the thirteenth, rather stout in the middle and somewhat abruptly reduced to a blunt apex beyond. Mesonotum brownish black, submedian lines naked. Wings hyaline,

¹ Felt, E. P., *Bull. N. Y. St. Mus.*, No. 180, pp. 127-288, (1915).

finely and densely hairy, anal margin fringed. Legs mostly brownish straw-coloured, densely setose. Claws simple, slender, slightly curved.

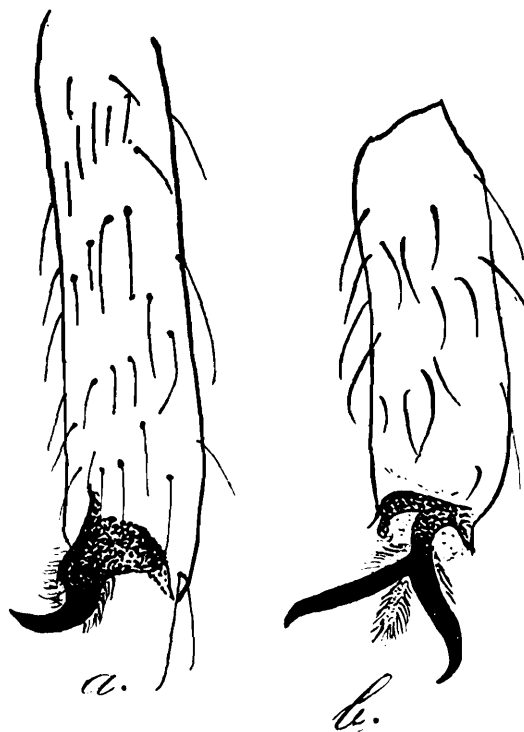


TEXT-FIG. 5.—*Misospatha tamaricis*, sp. nov. a. terminal antennal segments of female; b. basal antennal segments of male; c. mouth parts of male.

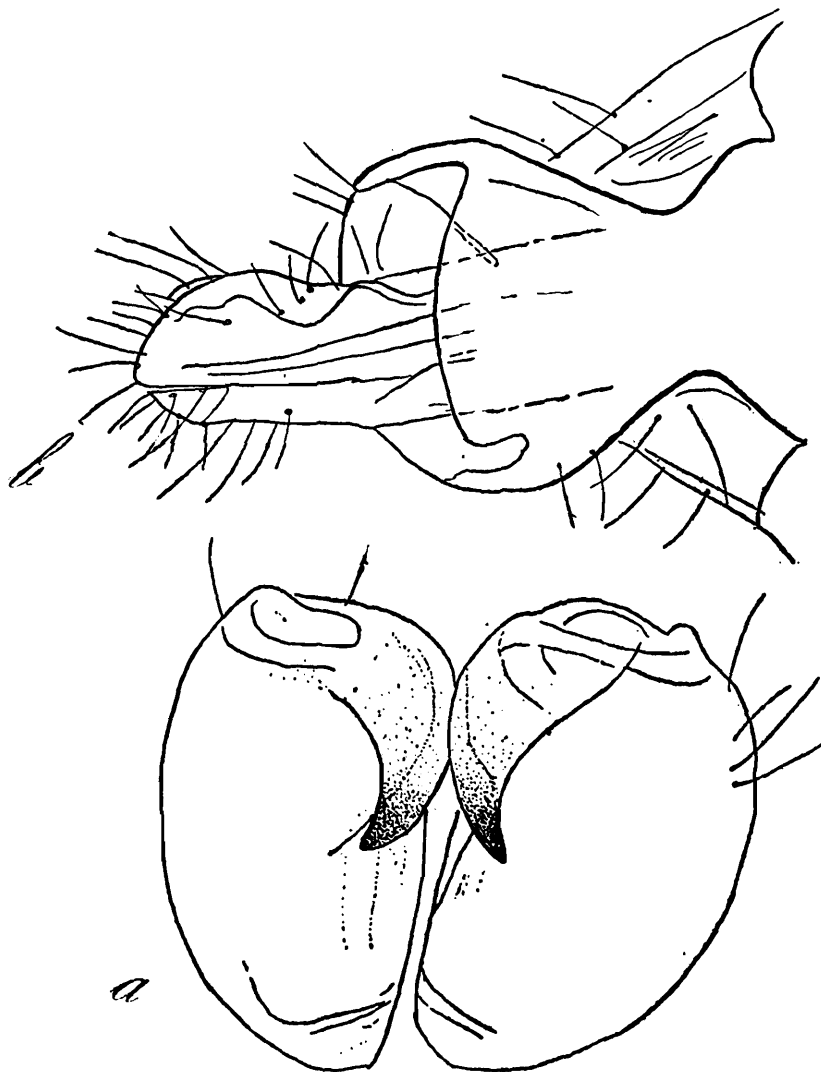
Pulvilli somewhat shorter than empodium, the latter being short and rounded at tip. Scutellum dark brown, with long setae. Post scutellum brownish. Halteres setose. Abdomen about two thirds the length of the body, stout, conically and abruptly reduced posteriorly, dark brownish and moderately setose. Ovipositor strongly constricted, moderately long, finely and shortly setose.

Male.—About 3.25 mm. long. Has the same general body colour as female in the pinned specimen and also appears to be somewhat less hairy. Palpus uniarticulate, somewhat shorter and stouter than that of female, subovate, truncate apically, with a length roughly twice its greatest diameter in the middle and about one fourth shorter than trophi and with a few long setae in addition to short stiff ones. Antennae less than half the length of body, segments presumably 18; segments three to seven rather stout, shortly cylindrical, with slender stems nearly equal to the enlargements; rest of the segments relatively more slender, elongate-cylindrical, with rather stout, somewhat conically tapering stems nearly equal to the enlargements; segments fifteen and sixteen

subequal ; segment seventeen a little shorter, with a very long stem ; terminal segment a little shorter than the one immediately preceding it,



TEXT-FIG. 6.—*Misospatha tamaricis*, sp. nov. *a.* terminal segment of tarsus of male with the claw ; *b.* terminal segment of tarsus of female with the claw.



TEXT-FIG. 7.—*Misospatha tamaricis*, sp. nov. *a.* male genitalia ; *b.* ovipositor.

broadly conic-ovate, rounded at tip ; circumfili not very low. Mesonotum, scutellum, post scutellum and abdomen apparently similar to those of female. Halteres densely setose. Legs sparsely setose, terminal tarsal segments somewhat stouter than the others. Claws simple and moderately stout. Pulvilli less than half the length of the empodium, which latter is ovate and as long as or somewhat longer than claws. Genitalia dark brown, densely clothed with long setae and rather *strongly* chitinised ; basal clasp segment roughly forming a square, emarginate basally and strongly chitinised apically ; terminal clasp segment dark reddish brown, slender and reduced towards the tip, which latter is black and moderately setose.

Cotypes.—One female partly dissected on slide, No. $\frac{1075}{H 6}$. One female dry on pin, No. $\frac{1076}{H 6}$. Two males partly dissected on slides, Nos. $\frac{1077}{H 6}$, $\frac{1078}{9 H}$. In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta, and four females on pins in the collections of the Forest Research Institute, Dehra Dun.

Type-locality.—Ghazighat, Multan, Punjab, Coll. R. N. Mathur, 15-ii-1929.

Habitat.—In galls of *Tamarix dioica*.

Galls.—About 5 to 10 mm. Globose or irregular, hard, woody, corticose (?) multicellular, acystiferous growths on branches. Cell proliferation apparently takes place in the cortex of the branches. Dry galls are brownish black in colour.

Tribe *ITONIDIDINARIAE*.

Subtribe BIFILA.

Genus *Odinadiplosis*, nov.

This new genus is erected for a midge which I bred from very remarkable solid galls on leaves of *Odina wodier* Roxb. described below. The genus is readily distinguished from all others of the Bifila group of the Itonididinarieae by the biarticulate palpi. This is the first record of midges with biarticulate palpi in the aforesaid group ; and possibly many more forms with a similar character await discovery. The genus would run in Felt's key (*loc. cit.*) between the series of genera with triarticulate palpi and the series with uniarticulate palpi.

The following is a full description of the genus :

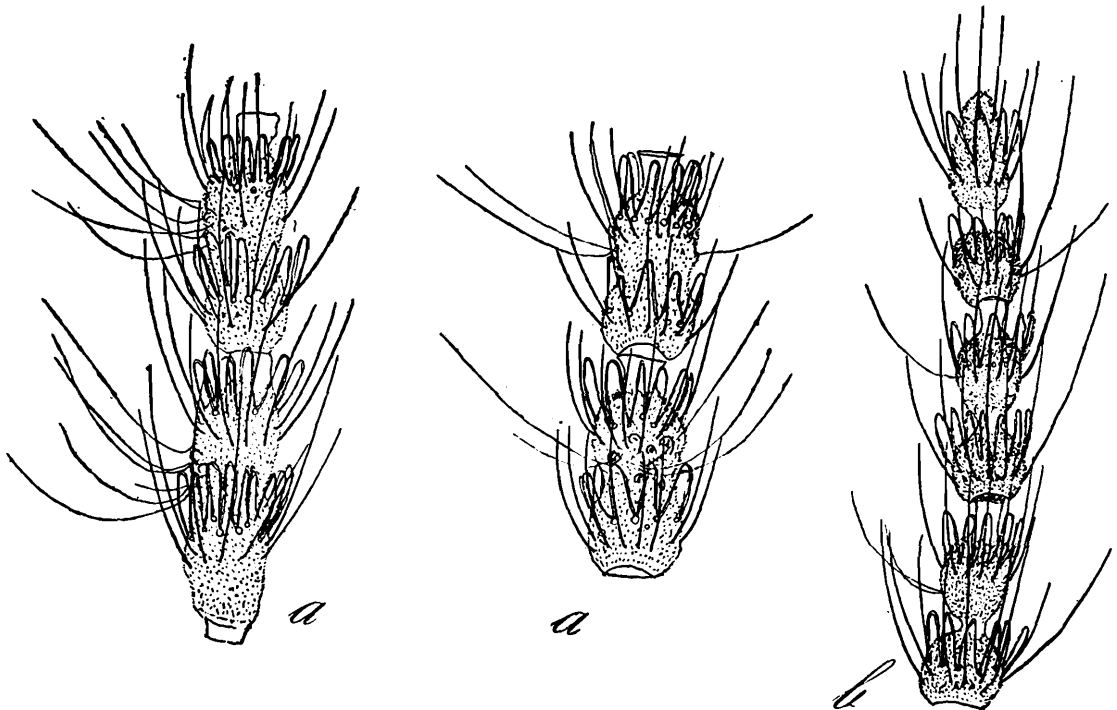
Palpi biarticulate. Antennal segments 14 in both sexes, basal four segments of the flagellum of the male subcylindrical and more or less constricted in the middle, rest of the segments binodose, circumfili in two equal moderately long whorls. Wings hyaline, with three long veins, third vein uniting with margin a little behind the apex, forks of the fifth vein rather faint. Claws simple on all legs. Ovipositor subaciculate, moderately long and exerted. Male genitalia rather densely hairy. Dorsal plate small, broadly and roundly bilobed. Ventral plate moderately large, entire, emarginate apically and a little longer than the dorsal

plate. Basal clasp segment large, slightly emarginate internally. Terminal clasp segment short, with a heavily chitinised, pectinately dentate apex and subapical striations.

Genotype.—*Odinadiplosis odinae*, sp. nov.

***Odinadiplosis odinae*, sp. nov.**

Female.—Length 3.5-4.0 mm. Body moderately hairy, mostly golden yellow in colour before, and brownish yellow after oviposition. Antennae about one third the length of body, segments 14; flagellate segments brownish yellow, densely hairy and with long stems. Palpi biarticulate, short, stout, sparsely setose; first segment slender, elongate, cylindrical; second segment relatively stouter, conic-ovate, almost as long as first segment. Mesonotum black. Scutellum dark brown.

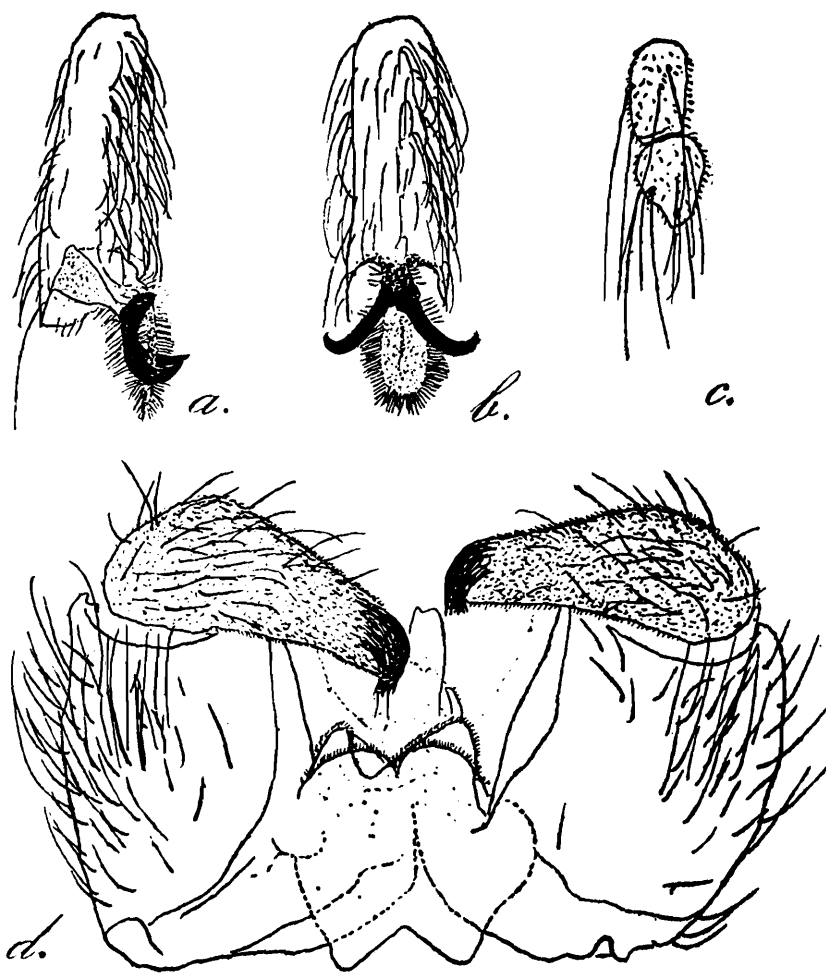


TEXT-FIG. 8.—*Odinadiplosis odinae*, sp. nov. a. basal antennal segments of male; b. terminal antennal segments of male.

Post scutellum darker. Wings hyaline, with three long veins, third vein uniting with margin just behind the apex of wing, fifth vein obsolete apically. Legs mostly brown. Claws simple on all legs, moderately curved in hind legs and somewhat strongly curved in the fore legs. Empodium large and nearly as long as claws. Halteres long. Abdomen about five eighths the length of body, stout, deep golden yellow, segments 1-3 a little black dorsally. Ovipositor exerted, about one eighth the length of body, slender, somewhat smoothly curved downwards, basal lamellae rather very long, terminal lamellae about one tenth the length of basal lamellae.

Male.—Length 3.0 mm. Body black and sparsely haired; dark brown in old specimens. Palpi short, moderately densely clothed with long setae; first segment subcylindrical, with a length about twice the thickness; second segment cordate-pyriform, broadly rounded basally and bluntly pointed apically, with a length about one fifth greater

than the thickness. Antennae about half the length of body, brownish, thickly haired, segments 14; third segment with a length about four times its diameter, stem about one eighth the length of segment; fourth, fifth and sixth segments subequal and nearly three fourths the length of third, with stems about one fifth to one sixth the segments, constricted in their middle; seventh a little longer than sixth, distinctly binodose, with a stem about one fourth to one fifth the segment; segments eight to thirteen subequal (and of the same length as the seventh), binodose, basal and apical enlargements of equal diameters, stems one tenth and one fifth the segments; terminal segment distinctly longer than the preceding segments, with a basal pyriform swelling, apical subconical swelling about twice the length of the basal enlargement, and a stem about one fifth the length of basal enlargement; circumfila equal, as long as the stems of enlargements. Mesonotum pale brown, with the submedian lines haired. Scutellum dirty white and rather thickly haired. All legs dirty white and somewhat densely setose. Claws simple on all legs, moderately curved. Empodium somewhat longer than claws. Wings hyaline, with three long veins, third vein uniting with margin just behind the apex of wing, fifth vein obsolete apically. Abdomen somewhat shorter than the rest of the body. Genitalia rather densely clothed



TEXT-FIG. 9.—*Odindiplosis odinae*, sp. nov. a. claw of the fore leg of male; b. claw of the mid leg of male; c. palpus; d. male genitalia.

with long setae. Dorsal plate short, with two broadly rounded lobes. Ventral plate a little longer than dorsal plate, emarginate. Harpes

about as long as the basal clasp segment. Basal clasp segment with a length about twice its breadth, emarginate basally and on the inner side, densely hairy behind and on the outer side. Terminal clasp segment a little over half the length of basal clasp segment, apex heavily chitinised, black and longitudinally striate, ending in numerous pectinate teeth.

Cotypes.—One female partly dissected on slide and several females in spirit. Nos. $\frac{1079}{H\ 6}$, $\frac{1014}{H\ 6}$, $\frac{1080}{H\ 6}$. Two males partly dissected on slides Nos. $\frac{1081-86}{H\ 6}$. In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta.

Type-localities.—Borstal School Farm, Tanjore, Madras Presidency, Coll. M. S. Mani, 19-xii-1928; Tollygunj, Calcutta, Coll. M. S. Mani, 21-vii-1935.

Distribution.—Tanjore, Vellore, Calcutta.

Galls.—The galls are local or extensive tumescence of the rachides, petioles, midribs and veins of the leaves. They have not been described so far; this is also the first record of any galls on *Odina wodier*.

10-15 mm. in diameter. Regular, simple, globose; or much larger, ranging from 10-20 mm., irregular, compound, ovoid, moniliform; yellowish brown, glabrous when young and covered with minute patches of scattered brownish scales when mature; solid, carnosous, succulent, cystiferous, indehiscent; cysts L-shaped, the opening of the cyst to the surface closed by the thin epidermis before the escape of the adult midges, rather thick and moderately hard. Minute circular holes are found on the surface of the galls from which the adults of the midges have escaped. Generally a single midge develops inside one simple gall, though two to three midges issue from the compound ones.

The epidermis surrounds a large parenchyma of concentric layers of oblong cells, which become rounded ones towards the centre of the gall. There is no cortex or medulla comparable to that of the normal stem. The cells in the immediate neighbourhood of the larva in young galls are small and meristematic, while in the older galls they tend to become collenchymatous. The cyst consists of closely packed, thick walled, sclerenchyma cells; the innermost layer often has the cavity of the cells completely blocked up. Irregular groups of vascular bundles, occasionally with portions of normal cortex of the part attacked, are generally found near the surface immediately below the epidermis of gall, sometimes however rather deep in the interior. The seat of cell proliferation is the cortex of the parts attacked.

The number of galls on one leaf averages from about one to ten. Galls form abundantly from June to March, when the tree is in leaves.

Biology.—The adult female midge rests near the veins on the under side of the leaflets, curves down the posterior end of the abdomen, feels the surface of the leaf with the tip of ovipositor, drops an egg, jumps a little forward and repeats the egg-laying. Now and then it flies from one spot to another and rapidly covers several leaflets, rachides, etc., with about one hundred eggs within about ten minutes. After oviposition the abdomen shrinks considerably in size, becomes darker in colour, while the midge itself becomes exhausted and finally drops on some leaf dead.

The eggs are golden yellow in colour, oblong-ovoid, smooth and shiny, about 0.25 mm. long, and are placed on their ends, cemented by some secretion from the mother. The larvae hatch from these eggs in about two days. Soon after hatching the larvae are colourless, transparent, cylindrical and pale yellow. They readily bore into the soft cortex of the veins or rachides thus giving rise to cell proliferation in those parts and consequent formation of galls. A well grown larva is orange yellow in colour, about 3.5 mm. long, somewhat flattened dorso-ventrally, with a well developed sternal armature at the anterior end. The larval period appears to extend from four to five weeks. Just before pupating the larva bores its way to the surface of the gall, but does not quite make a hole to the exterior, leaving the epidermis of the gall intact, so as to facilitate the easy escape of the adult when it emerges from the pupa and at the same guarding against exposure. It then retreats to the bottom of the L-shaped cyst, where it subsequently turns into a pupa and is further protected by a thin circular membrane. The pupa is found with the anterior end (cephalic end) pointing towards the external opening of the cyst. The immature pupa is about 3 mm. long and white in colour. When mature it is 3 mm. long and dirty brown in colour, with the dorsal surface arched and the ventral side rather flat. Prominent cephalic horns are present. When the adult is about to emerge from the pupa the latter wriggles to the opening of the cyst, pierces the thin epidermis with the help of the cephalic horn and sticks out on the surface of the gall. The adult comes out by bursting the anterior end of the puparium. Pupal period appears to extend to about ten days. There appear to several generation in the year. The adult seems to hibernate during the hot months when the tree is devoid of leaves. The larva is extensively parasitised by a minute Chalcidid. The galls are bored by a Lepidopterous larva, which completely eats away all the soft parts, leaving the gall a hollow bag, inside which it pupates later on.

Subtribe TRIFILA.

Genus **Horidiplosis** Felt.

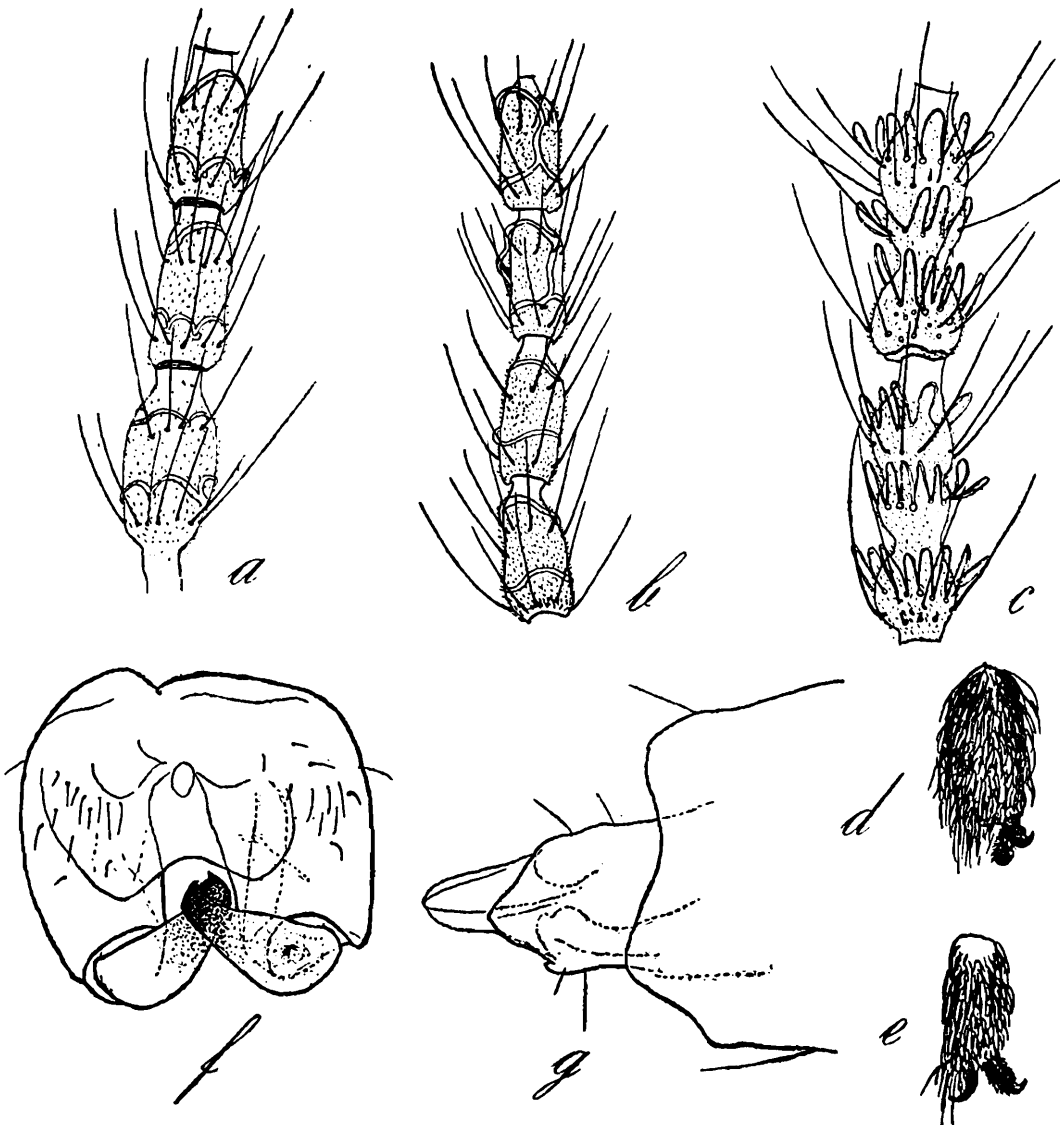
1934. *Horidiplosis*, Mani, *Rec. Ind. Mus.*, XXXVI, p. 442.

I describe below one new species under the name *H. mathuri*, from a series of midges received from the Forest Entomologist, Forest Research Institute, Dehra Dun. This new species can be easily distinguished from *H. fici* Felt., recorded in my previous paper by reference to the key given below.

- I. Body fuscus yellow in female and dark brown in male ;
antennae about three fourths the length of body in female
and as long as body in male ; stem of fifth antennal
segment one fifth the length of enlargement, which latter
has a length three and a half times its diameter in female ;
palpus simple, long and tapering in both sexes ;
empodium about two thirds the length of claws . *H. fici* Felt.
- II. Body reddish brown in both male and female ; antennae
about half the length of body in both male and female ;
stem of fifth antennal segment about one seventh the
length of enlargement, which latter has a length about
twice its diameter ; palpus swollen very much basally,
empodium about three fourths the length of claws . *H. mathuri*, sp. nov.

***H oridiplosis mathuri*, sp. nov.**

Female.—2 mm. long. Body reddish brown, setose. Palpi swollen basally, slender truncate, apically; with a length about three times the length of the swollen portion; covered with very short, stiff hairs. Antennae about half the length of body, reddish brown, thickly haired; segments 14; third segment fused with fourth, with a length a little over twice its diameter, stem one fifth the length of the cylindrical enlargement; fourth a little shorter and stouter than third (the length also about twice its own diameter), stem about one seventh the length of enlargement, circumfila with a low basal transverse band connected by three longitudinal bands with an apical low transverse band; fifth segment a little shorter than fourth, the enlargement with a length somewhat less than twice its diameter, stem a little shorter than that of fourth and about one eighth the length of enlargement, circumfila as in fourth;



TEXT-FIG. 10.—*Horidiplosis mathuri*, sp. nov. a. b. antennal segments of female; c. antennal segments of male; d. claw of male; e. claw of female; f. male genitalia; g. ovipositor.

sixth a little shorter, enlargement with a length about twice its diameter, stem one seventh the length of enlargement; seventh similar to sixth, circumfila with the apical transverse band apparently a little higher than in the rest of the segments; segments eight and nine similar to sixth; tenth a little shorter and rather stouter than ninth, stem about

one sixth the length of enlargement; eleventh a little longer, more slender, stem a little shorter; twelfth equal in length to tenth, stem one twelfth the enlargement; thirteenth one sixth shorter than twelfth, stem almost obsolete, enlargement long and slender; terminal segment one sixth longer than thirteenth, somewhat swollen at basal and apical one fourths of the enlargement, with a subcylindrical, subtruncate, semi-transparent apical prolongation about one-fifth the length of the enlargement, apical band of circumfila a little higher than the basal band. Mesonotum reddish brown, with submedian lines sparsely haired. Scutellum and post scutellum concolourous with mesonotum. Wings hyaline, densely hairy, anal marginal fringes moderately long. Halteres long, reddish brown, thickly setose. Legs dark brown, thickly haired. Claws simple, heavily chitinised, slightly curved subapically. Pulvilli about half the length of claws. Empodium about three fourths the length of claws. Abdomen reddish brown. Ovipositor short, stout, conical, yellowish brown; basal lobe reddish brown, moderately chitinised, sparsely setose; terminal lobe roundly subtriangular with a few short, stout, stiff setae at the tip.

Male.—About 2 mm. long. Body reddish brown, densely haired. Palpi short, moderately stout and tapering towards apex. Antennae presumably about half the length of body, dark brown, thickly haired, segments 14. Mesonotum dark reddish brown, submedian lines sparsely setose. Scutellum reddish brown. Claws simple, heavily chitinised, slender, somewhat curved at tip. Empodium over three fourths the length of claws. Pulvilli rudimentary. Abdomen reddish brown and densely hairy. Genitalia brownish, densely hairy. Dorsal and ventral plates almost as in *H. fici* Felt. Basal clasp segment moderately long, stout, very densely covered with long setae. Terminal clasp segment less than half the length of basal clasp segment, short, stout, napiform, setose, heavily chitinised and bidentate apically. Harpes dark brown, small and subtriangular.

Holotype.—One female partly dissected on slide, No. $\frac{1087}{H 6}$. In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta.

Paratypes.—Two males partly dissected on slides, Nos. $\frac{1088-89}{H 6}$. In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta, and several examples on pin, Nos. $\frac{1090}{H 6}$. In the collections of the Zoological Survey of India (Ind. Mus.), Calcutta.

Type-locality.—New Forest, Dehra Dun (U. P.). Coll. R. N. Mathur, 23-iii-1932, 10-xi-1934.

Habitat.—Minute pustule-like galls on the leaves of *Ficus glomerata* Roxb.

B.—DESCRIPTIONS OF NEW MIDGE GALLS.

Natural Order CAPPARIDAE.

Cadaba indica Lank.

Bud and leaf galls.—An unknown midge lays eggs on the buds and the tender leaves and the larvae hatching from them give rise to spongy

gall similar to those produced by *Cecidomyiella crataevae* Mani¹ on *Crataeva religiosa* Forst. differing, however, in its smaller size and relatively more spongy texture. Axillary buds generally turn into regular, globose, greenish, glabrous, unicellular, acystiferous, indehiscent galls, about 3 mm. in diameter. Generally a single maggot inhabits the gall. The gall formation on leaves is more complex, several galls forming close together, fusing into large irregular, tubercular, multicellular masses, binding the blade of leaf along its mid rib and thus causing folding up of leaf, with swollen portions. On old galls are found large, circular holes, through which the adult midge escaped.

Several examples in formalin in the collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Coll. Miss M. Meenakshi, Girls' Christian High School Garden, Tanjore, Madras Presidency, 12-ix-1932.

Capparis sepiaria (?)

Spongy leaf gall.—An unknown midge lays numerous eggs in the fold of the tender leaves of an evolving bud, causing very extensive cell proliferation of the leaf parenchymae. The folds are thus bound together and an oval, flattened, spongy, multicellular, acystiferous, indehiscent mass, about 20 mm. long, 10 mm. broad and 5 mm. thick is formed in the place of normal leaves. This gall looks like a common leguminous fruit, especially on account of the prominent side veins and the mid rib, which closely simulate the veins and the dorsal rib of a legume. Externally the gall is pale yellowish green and glabrous but the substance of the gall is soft, fleshy and beautiful pinkish in colour. Numerous maggots are found in the small oval cavities in the flesh of gall. There is complete degeneration of the palisade parenchyma of the leaf and the real spongy parenchyma lying just beneath the epidermis of gall turns into a sort of palisade tissue and functions as such. The midge larva is very heavily parasitized by two different Chalcids.

Two examples in formalin in the collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Coll. M. S. Mani, Sivaganga Garden, Tanjore, Madras Presidency, 21-ix-1928.

Natural Order TILIACEAE.

Grewia orientalis Linn.

Tricho-cecidia on leaves.—This hairy gall resembles the 'capsule gall' on the leaf of Turkey Oak, *Quercus cerris*, produced by *Cecidomyia cerris* and the hairy galls on leaf of *Ficus nervosa* produced by *Dynopsylla grandis* Craw. recorded by Ramakrishna Ayyar² from North Malabar.

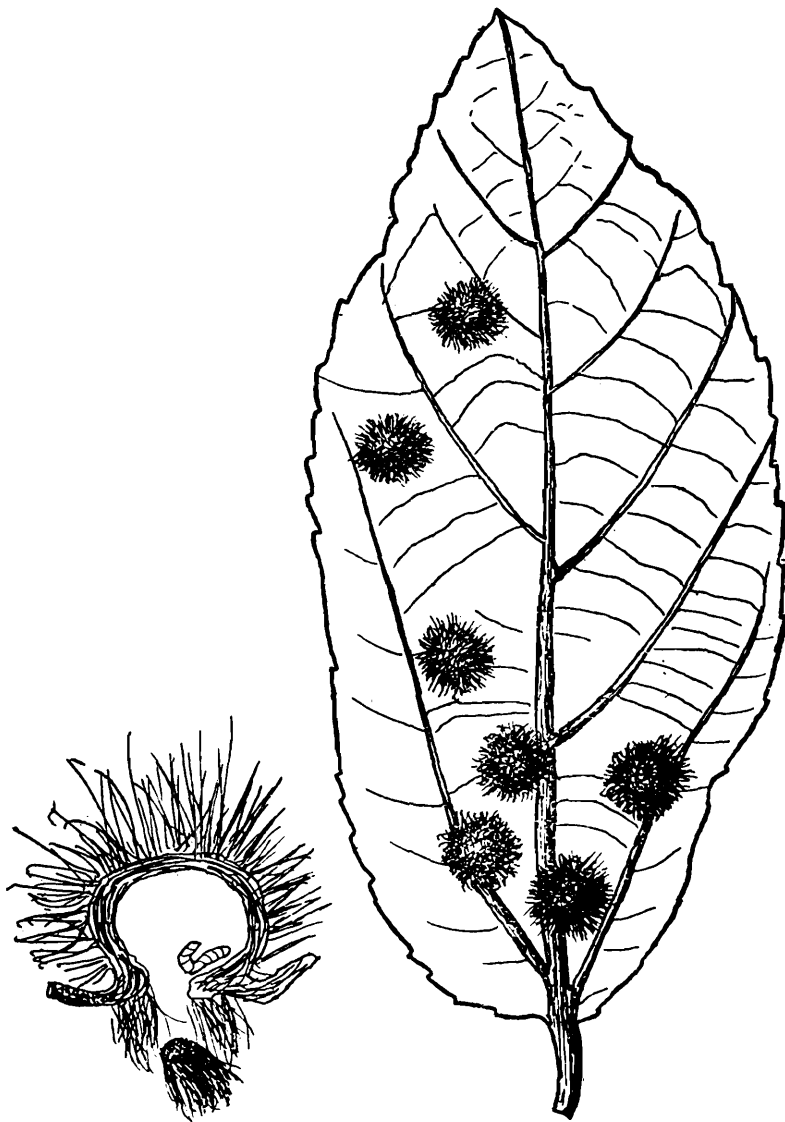
An unknown species of *Cecidomyia* lays eggs on the upper side of the tender leaves near the mid rib or some of the larger veins. The larvae hatching from these eggs produce an invagination and tumescence of the leaf, thus giving rise to a ball-like bulging on the under side of the leaf. The remarkable feature of this gall is that its cavity opens to the outside on the upper surface of the leaf by means of a stoma,

¹ Mani, M. S., *Rec. Ind. Mus.*, XXXVI, p. 428 (1934).

² Ramakrishna Ayyar, T. V., *Rep. Proc. Third Entomol. Meeting, Pusa*, pp. 1030-1031, pl. 173, fig. 1.

which is closed by a small, circular operculum. The adult midge pushes away this operculum when escaping from the gall. The whole gall is covered by a dense growth of long, villous hairs. The galls are more conspicuous on the under than on the upper surface of the leaf.

3-5 mm. in diameter. Regular, globose, pyriform, rarely ovoid, simple, free, sessile, acystiferous, indehiscent, unilocular; with a narrow neck-like stoma opening on upper side of the leaf; the stoma closed by a small, circular operculum before the escape of the adult midge and with a dense fringe of peristomal hairs rising from the edges of the stoma; when young covered with short, stout, whitish, long hairs; when old



TEXT-FIG. 11.—Tricho-ecidia on leaves of *Grewia orientalis* Linn.

densely clothed with stellate fascioles of long, villous, simple, ferrugineous hairs rising from minute carnosse tubercles on the outer surface; walls coriaceous, greenish, smooth on the inner side. The cavity generally contains a single stout, pale yellowish maggot in a doubled up posture and sometimes two or more larvae and pupae of Chalcid parasites of the midge. When a very large number of galls form on a single leaf reduction and deformation of the latter results.

Several examples in formalin in the collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency, 24-ix-1931.

Natural Order RUTACEAE.

Murraya exotica Koen.

Vermiform gall on leaflets.—An unknown midge lays eggs on leaflets towards the end of August or beginning of September and the maggots hatching from them produce peculiar worm-like, fleshy galls on them.

Regular, cylindrical, vermiform, stout, free swellings in large numbers on the surface of the leaflets, 10 mm. long and 1-2 mm. thick; finely tubercular, transversely sulcate, with a long, deep, longitudinal slit, opening into the long tunnel of the gall; whitish, shiny, solid, soft entirely carnose when young; dry, brown, cicatrised and brittle when old; and containing a single, minute whitish maggot in the interior.

The gall comprises entirely parenchymatous cells. Veins of the leaflets entering the gall retain their integrity. The seat of cell proliferation is the parenchyma of the leaflet. The gall forms as a local tumescence of the invaginated leaflets.

Several examples in formalin in the collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency, 10-ix-1928.

Aegle marmelos Corr.

Univalve gall.—An unknown midge lays eggs in the opening bud about July and thus occasions numerous pouch-like growths. Instead of opening into normal trifoliate leaves, the bud turns into a cluster of three egg-shaped, ventricose, follicular, reddish brown, thick-walled galls. The galls are really the leaflets, which become folded, with their margins applied valvately together, thus leaving a slit which opens to the outside. Inside the gall often one to two maggots are found. Pupa-tion seems to take place in the soil.

Several examples in formalin in the Collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Coll. M. S. Mani, 24-i-1929.

Natural Order SAPINDACEAE.

Cardiospermum halicacabum Linn.

Solid floral gall.—An unknown midge lays eggs in the flower buds towards September and produces solid fleshy galls.

Irregular, globose, ovoid, or discoid, lobed, free and highly tubercular swellings at the tip of the pedicels of the flowers; about 5-8 mm. in diameter; green or greenish yellow on the surface and greenish white within; irregularly thrown into numerous furrows and ridges, each ridge being finely tubercular and hairy, the basal part often partly enclosed in the enlarged, membranous, smooth sepals, which are closely adherent at the base to the inner swollen parts; punctae when old; solid, spongy, soft and with numerous clefts, passages and cavities, each cavity containing a single larva.

Really the galls are the irregular flowers of the umbellate panicles. The seats of cell proliferation are calyx, corolla, stamens and pistils, each lobe of the gall representing one member of the floral leaves. Enlarged sterile anthers may sometimes be found on the gall. The floral

envelopes and the essential organs of reproduction of the flower are thus completely degenerated.

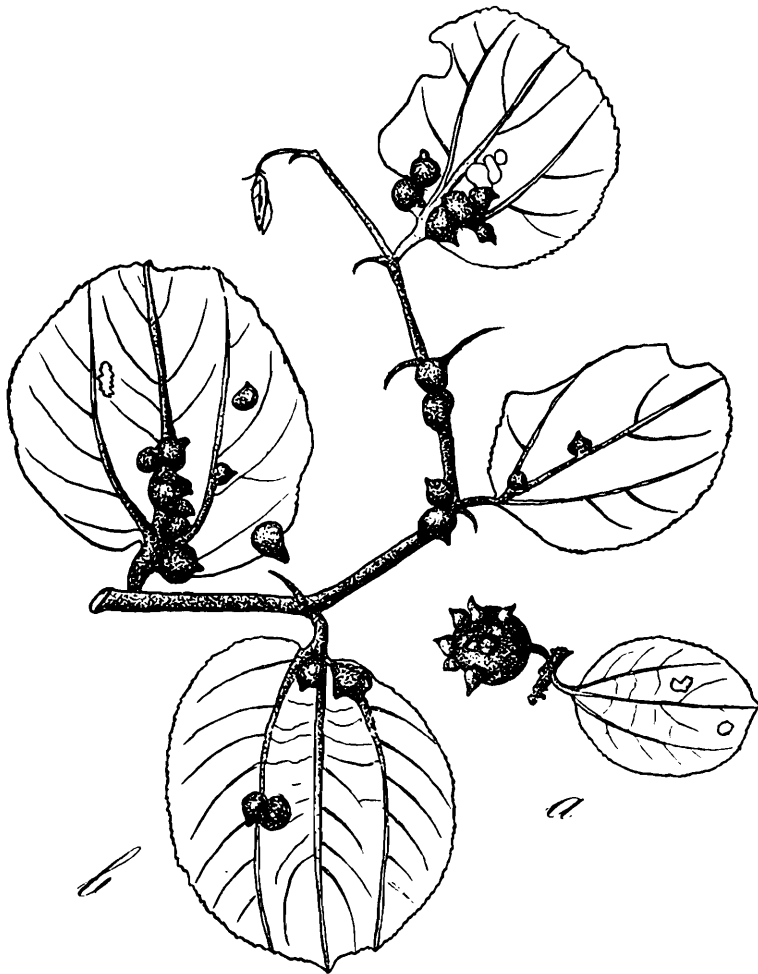
Several examples in formalin in the collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, 20-x-1930.

Natural Order RHAMNACEAE.

***Zizyphus jujuba* Lamk.,**

Capsule gall.—Towards October an unknown midge lays eggs on the tender leaves, shoots, etc., and the larvae hatching from them penetrate the outer cortex, giving rise to hollow galls. By January the larvae bore their way out of the gall, drop to the ground and pupate in the soil, probably emerging as adults in about three or four days.

3-4 mm. in diameter. Regular, simple, globose, pyriform or conic-pyriform, free, sometimes resembling a rather blunt and swollen thorn; clustered or compound; hollow, capsular, unilocular, acystiferous,



TEXT-FIG. 12.—Galls on *Zizyphus* spp. *a*. epidermal galls on fruits of *Z. xylopyra* Willd.; *b*. epidermal galls on leaves and branches of *Z. jujuba* Lamk.

indehiscent; yellowish green, glabrous or with a sparse yellowish brown tomentum; visible on both sides of the leaf. The galls on the branches are merely epidermal processes.

Several examples in formalin in the collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle, Pilliarpatti, 5 miles south of Tanjore, Madras Presidency, 30-x-1928.

Zizyphus xylopyra Willd.

Epidermal gall.—An unknown midge (probably identical with that producing the capsule gall of *Z. jujuba* Lamk.) lays eggs on the developing fruits. The maggots penetrate the subepidermal tissues and thus occasion the formation of hollow galls, very much resembling prickles with swollen bases. The seat of cell proliferation is the cortical tissue immediately beneath the epidermis.

4-5 mm. in diameter. Regular, simple, pyriform, conical, sessile, capsular, unilocular, indehiscent, acystiferous, yellowish green when young, brown and sparsely pubescent when old; free, clustered or compound. One to ten galls may form on a single fruit.

Several examples in formalin in the collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle about 3 miles east of Tanjore, Madras Presidency, 5-vii-1932.

Zizyphus sp.

Leaf gall.—An unknown midge gives rise to minute, globose, unilocular, pustule-like galls on leaves. The galls are visible on both sides of the leaves and are about 1-2 mm. in diameter.

A single leaf in formalin in the collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency, 27-ix-1932.

Natural Order ANACARDIACEAE.

Mangifera indica Linn.

Echinate gall.—There is no previous record of the very remarkable echinate galls on leaves of the Mango, on which at least six galls are known from India.¹ An unknown midge produces globose, spiny galls, very much resembling a miniature sea urchin.

5-7 mm. in diameter. Regular, simple, globose, free, sessile, clustered, or compound; dark green when young, brownish black when old; solid, uni- or bi-ocular, cystiferous, indehiscent; densely covered with numerous soft, fleshy, spinous processes. About a dozen galls develop on the upper side of a single leaf. Large holes, through which the adult midges escaped, are found on older galls.

Several examples dry and in formalin in the collections of the Zoological Survey of India (Ind. Mus.), Calcutta. Coll. M. S. Mani & C. P. Sharma, Narkelgunj, near Shalimar, Howrah, 29-xii-1934.

Natural Order LEGUMINOSEAE.

Desmodium biarticulatum Benth.

Flower gall.—An unknown species of *Asphondylia* lays eggs on the tender flower buds and thus occasions the formation of simple, globose, sometimes pyriform, solid, fleshy, acystiferous, indehiscent galls about 3-5 mm. in diameter and enclosed in the inflated calyx. Corolla, stamens, pistil, etc., are completely degenerated. A single maggot or pupa may be found inside the gall. The adult midge bores its way to the outside (?)

¹ Sundar Raman, A. H., *Journ. Ind. Bot. Soc.*, IV, pp. 38-39 (1924).

Several examples in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency, 28-x-1930.

***Indigofera aspalathoides* Vahl.**

Utricular gall.—An unknown midge attacks the flower; and the ovary turns into a cucumber-shaped, utricular gall.

A few examples in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency.

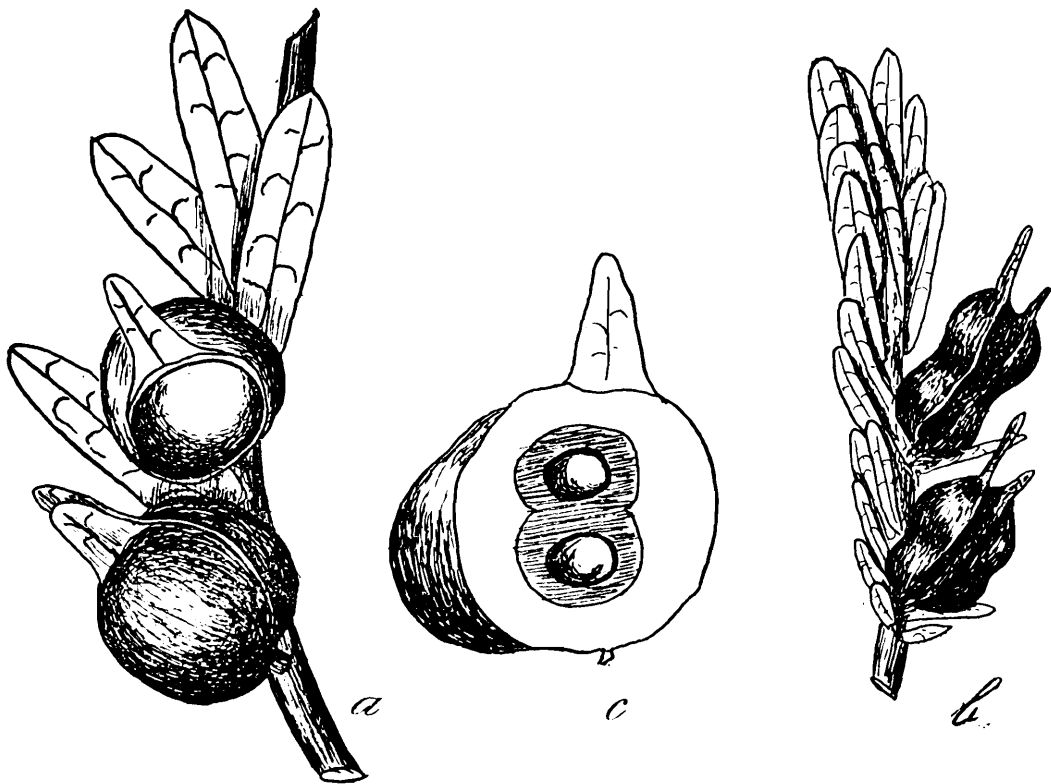
***Hopea wightiana* Wall.**

Echinate gall.—Numerous eggs are laid by an unknown midge in the flowers and this occasions the formation of large, globose, hard, woody, cystiferous, simple, spiny galls, about 10-15 mm. in diameter. The spines are slender basally and stout subapically. Similar galls on *H. parviflora* have been recorded by Van Leeuwen from the Netherlands East Indies. A few specimens are preserved in the Madras Herbarium, Agricultural Research Institute, Coimbatore, (Sheet Nos. 3384-3389, 3391 and 3395; S. Canara).

Two dry examples in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, Coimbatore, 11-viii-1927

***Acacia* sp.**

Bivalve gall.—An unknown midge lays eggs on the tender leaf buds. As a result of the irritation produced by the developing larvae hatching from these eggs cell proliferation takes place in the leaflets. Two leaflets



TEXT-FIG. 13.—Galls on *Acacia* spp. a. bivalve gall; b. legumiform gall; c. legumiform gall cut open.

from opposite sides of the pinna swell out basally into cup-shaped, thick hollow valves, which together form a globose, winged hollow gall. The two valves are not equal in size but one is large and the other is small; the two do not fuse with each other so that a slit is left between them, *i.e.*, they are applied valvately by their margins.

2-2.5 mm. in diameter. Regular, globose, glabrous, green, hard, brittle, bialate, bibrachypedicellate, unilocular, acystiferous, indehiscent, free, simple; about a dozen or so on each pinna; the major valves about three times the size of the minor valve. The outer surface of the gall corresponds to the spongy side of the normal leaflet, while the inner surface is really the palisade surface of the normal leaflet. The outer surface of the minor valve has a strong longitudinal ridge. One (sometimes two) larva is found in the cavity of the gall.

Several examples in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, Walayar Forest, Palghat Gap, Western Ghats, south of the Nilgris, Madras Presidency, 18-xii-1926.

***Acacia leucophloea* Willd.**

Legumiform gall.—An unknown midge lays eggs on the tender leaf buds. As a result of the irritation occasioned by the larvae hatching from these eggs two adjacent leaflets from the same side of the pinna are bound together due to cell proliferation and galls resembling a biarticulate legume are produced.

2-2.5 mm. long and 1 mm. in diameter. Regular, simple, biconvex, ovoid, hour glass-shaped or lomentum-like; rarely globose; stout, or subcompressed, sessile or with very short stalks; green, hispid, hard, brittle, thick-walled, bilocular; apically bialate. About a dozen galls are placed obliquely on the pinna. A sulcus bordered by a ridge indicate the place of fusion of the two adjacent leaflets in the course of the formation of the gall. The surface of the gall is formed by the palisade side of one leaflet and the spongy side of another leaflet, but in the gall both sides have palisade tissue. The real palisade tissue of one leaflet is completely degenerated. Below the epidermis there is a cortex of parenchymatous cells surrounding an inner cyst comprising meristematic cells. A single maggot is found in each cavity of the gall.

Several examples in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency, 16-xii-1928 and 3-viii-1932.

Pubescent gall on leaf.—An unknown species of midge lays eggs between two adjacent leaflets in the leaf bud. This gives rise to cell proliferation in the expanding leaflets; the two leaflets grow thicker, meet and fuse with each other, forming a globose, fleshy gall. Cell proliferation is as a rule confined only to the basal portion of the leaflets, the apical portions remaining normal.

4 mm. in diameter. Regular, simple, globose, sessile; irregularly and sinuately lobed on the upper side; the sulci between the lobes rather deep and sometimes with brown lanate hairs; smooth on the under side, pale green or yellowish green, pubescent, bibrachypedicellate;

a broadly sagitate, green, glabrous wing on the upper side, about one fourth the length of gall. Galls arranged alternately or scattered to the extent of about 15 per leaf. There are two cysts inside. In general, structure of this gall is very similar to the tomentose gall on *A. leucophloea* Willd. produced by *Schizomyia acaciae* Mani described in a previous paper.¹ This gall is easily distinguished from it by the absence of the dense tomentum.

A single leaf with numerous galls in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency, 7-iv-1932.

Solid gall on shoot.—An unknown midge lays eggs on the developing young shoot towards the beginning of spring. The maggots hatching from these eggs penetrate the tissues of the plant and give rise to large, globose, solid, woody galls. The maggots and pupae are found in the cortical layer of the gall. The galls are really the suppressed branches.

10-15 or 25-30 mm. in diameter. Regular, simple, globose, oblate, or pyriform; or irregular, compound, with large globose tubercles; grayish or brownish yellow; with a flattened, cup-shaped, ethmoid surface, the numerous holes on this surface being covered with tubercular operculum and opening into the cysts in which the maggots are found; hard, woody, solid, indehiscent; with an outer softer cortex and an inner hard woody core in which are found numerous ligneous, sclerenchymatous and vascular elements. Occasionally vestiges of leaves may be found on the surface of the younger galls. The galls form in such huge numbers that whole trees are heavily laden with them and actually branches bend with the weight of the galls. The midge is very heavily parasitised by several Chalcids.

Several examples preserved dry in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, 9-xii-1928.

***Prosopis spicigera* Linn.**

Solid leaf gall.—An unknown midge gives rise to solid galls on the leaflets and rachides in large numbers.

Galls on leaflets: globose, simple or aggregate, about 1-2 mm. in diameter, yellow or yellowish brown, sessile, solid, hard, on the upper or under sides of leaflets from 1-2 or 10-15, with one minute cavity and entirely parenchymatous.

Galls on the rachides: Globose, fusiform, local or extensive, about 7 mm. in diameter, brownish and covered with irregular patches of squamae, solid, hard, woody; with circular holes when old.

Several examples in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, Ammathottam on the bank of the River Vadavar near Tanjore, Madras Presidency, 2-ix-1931.

¹ *loc. cit.*, p. 406, pl. vii, fig. 1.

Natural Order CUCURBITACEAE.

Mukia scabrella Arn.

Shoot gall.—An unknown species of *Lasioptera* lays eggs on the tender shoots and the larvae hatching from these eggs penetrate the vegetable tissues and cause a swelling of the vine. This gall is similar to the shoot gall of *Momordica charantia* Linn. produced by *Lasioptera falcata* Felt recorded in my previous monograph (*loc. cit.*, p. 394).

Regular, simple, globose, ovoid, ellipsoid, fusiform, cucumiform or moniliform, local or subextensive, terminal or basal, general tuberous swellings, about 30-45 mm. long and 10-15 mm. in diameter; pentagonal in cross-section; rough, irregular, scabrid, longitudinally ridged, often grooved, green, solid, carnosose and spongy; multicystiferous, indehiscent. When galls are terminal the further growth of the affected shoot is completely arrested; on the radical galls, however, leaves and tendrils may be found. The anatomy differs very little from that of the normal stem except in the superabundance of the cortex and the medulla. The epidermis is densely covered with multicellular hairy outgrowths and encloses a large parenchyma, in which the vascular bundles are scattered irregularly. This parenchyma comprises large polygonal cells which are relatively smaller in the deeper layers. Cysts are longitudinal and are found both in cortex and the medulla. The seats of cell proliferation are the cortex and the medulla of the stem.

A single example in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. Miss M. Meenakshi, Tanjore, 4-i-1932.

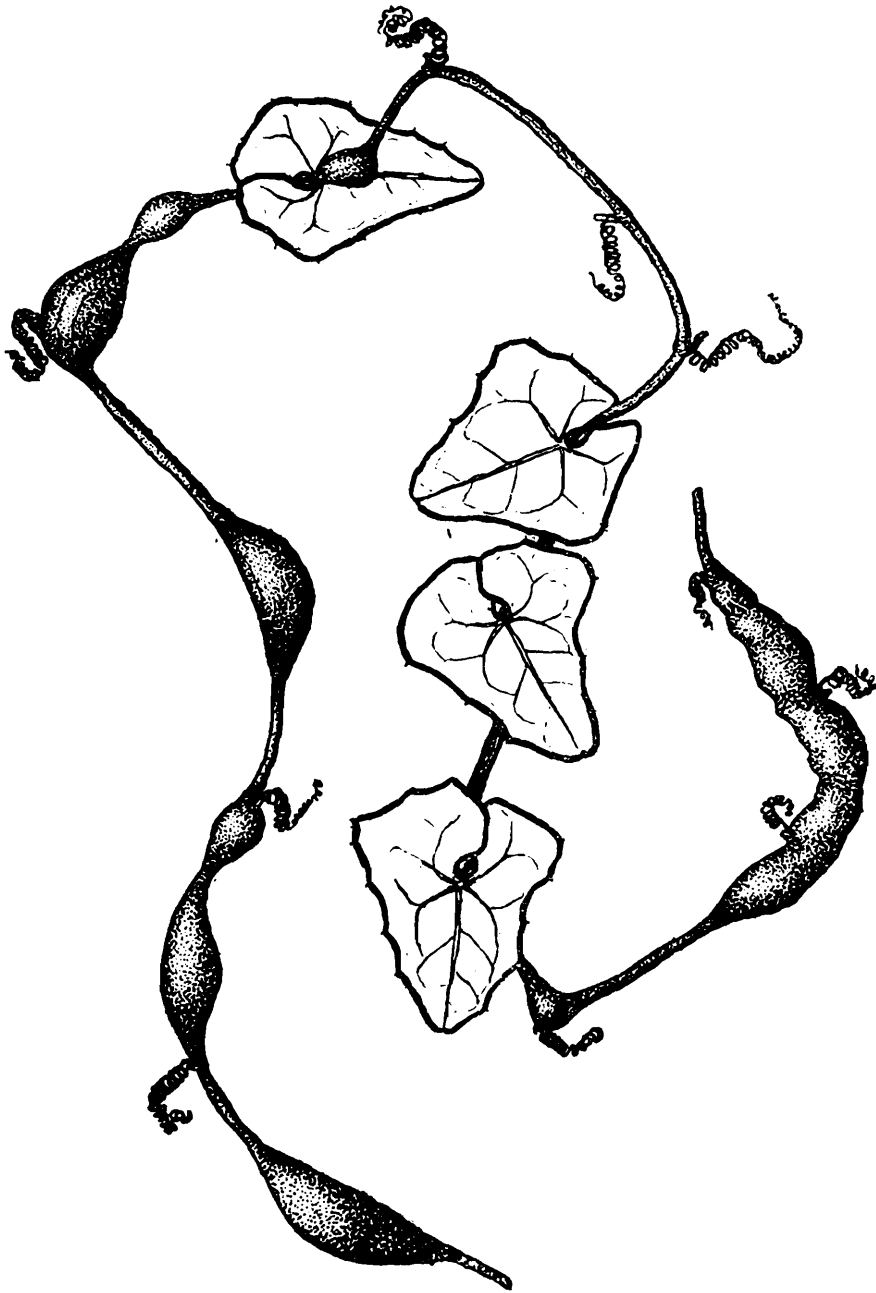
Melothria amplexicaulis Cogn.

Shoot gall.—An unknown species of *Lasioptera* lays numerous eggs on the tender vines and the larvae hatching from them penetrate the tissues of the plant and thus give rise to the formation of extensive swellings.

Regular, simple, fusiform, cucumiform, local or extensive, subcylindrical, sometimes compressed tumescence, generally about 25 mm. long, 10-15 mm. thick; longitudinally striate and somewhat sulcate, otherwise smooth and glabrous, rarely with diffuse small tubercles; yellowish green or yellowish brown; solid, hard, fibrous, with superficial or deep-seated, longitudinal cysts, which in the old specimens open to the outside by minute holes. Sometimes the galls are articulated and branched. The surface of the gall occasionally bears leaves, tendrils, etc., which may be rather small. Really the galls are swellings of the vine produced by the cell proliferation of the cortex. Anatomically the gall differs very little from a normal stem except in the greater abundance of the parenchymatous tissues and in the presence of the meristematic tissue.

Galls form both on the staminate and the pistillate plants of this species. The galls are allied to those described on *Cephalandra indica* Naud. produced by *Neolasioptera cephalandrae* Mani recorded in my previous monograph (*loc. cit.* p. 397) and *Mukia scabrella* Arn. described above.

A few examples in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle,



TEXT-FIG. 14.—Shoot gall of *Melothria amplexicaulis* Cogn.

Orattanad-Vetticaudu, 25 miles South-east of Tanjore, Madras Presidency, 20-x-1930 and 15-x-1931.

***Melothria heterophylla* Cogn.**

Shoot gall.—An unknown midge, probably the same species producing gall on *M. amplexicaulis*, gives rise to shoot galls very similar to those described above.

A few examples in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency 21-xi-1932.

Natural Order BIGNONIACEAE.

Stereospermum chelonoides (D. C.).

Fruit gall.—Probably an unknown midge lays eggs on the tender developing fruits and thus produces the rather remarkable galls, which resemble a young bird at rest. The galls are 25 mm. long and 15 mm. thick, subcompressed, bicarpellary, capsular, unilocular, punctate and brownish in colour in the dry material. The normal fruits are generally about a foot or so long.

A few examples on sheets Nos. 36879, 5874, in the collections of the Madras Herbarium, Agricultural Research Institute, Coimbatore, Madras Presidency. Coll. Herbarium collector, Anamalay Hills, Western Ghats, South of the Palghat Gap, 13-v-1903.

Natural Order LOGANIACEAE.

Strychnos potatorum Linn.

Leaf gall.—An unknown midge lays eggs on the young leaves. The larvae hatching from them penetrate the leaf tissues and thus give rise to solid galls on the leaves.

3 mm. in diameter. Regular, simple, globose, pyriform or turbini-form, button-like, free or compound, hard, solid, pale green or yellowish white, glabrous above and rugose below; forming to a greater extent on the upper surface of the leaf than on the under surface.

Several examples in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency, 26-xii-1930 and 31-viii, 14-ix-1932.

Natural Order CONVULVULACEAE.

Ipomea sepiaria Koen.

Solid flower gall.—These galls are similar to the ones on *Rivea hypocrateriformis* Choisy, recorded as caused by *Asphondylia rivoecae* Mani in my previous monograph (*loc. cit.*, p. 411).

Several examples in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, from a plant growing over hedges in a kitchen garden in Tanjore, Madras Presidency, 5-x-1929.

Natural Order ACANTHACEAE.

Asystasia coromandeliana Nees.

Cortical gall.—An unknown midge lays eggs on the shoot and the larvae hatching from them penetrate the cortex and thus occasion the formation of globose, or fusiform, local or extensive, solid galls, with a spongy inner substance and a hard outer rind.

Two examples in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency, 12-xii-1932.

Natural Order NYCTAGINEAE.

Boerhaavia spp.

Capsule floral gall.—An unknown midge lays one or two eggs in the flower buds. The larvae hatching from them attack the developing flower, which fails to open but turns into a remarkable gall.

For a proper understanding of the structure of this gall, it is necessary to describe briefly the normal flower of *Boerhaavia*. The small pinkish red flowers are collected together in small heads, which are arranged in loose panicles. The perianth is gamophyllous and inferior. The monocarpellary, unilocular, uniovular ovary is superior. Immediately above the level of the ovary the perianth tube is constricted, the constriction dividing it into a thick, basal part completely enclosing the ovary (to which it is not adherent) and a thin, membranous, coloured, expanding upper part. After flowering, the upper part of the perianth tube withers and separates at the constriction, while the basal part persists, enlarges, becomes more or less hardened and forms an outer envelop for the fruit. This enlarged basal portion develops externally a large number of short, stout, stigmatic, viscid hairs, which are of great importance in the dispersal of the ripe fruit.

In the course of gall formation this basal part of the perianth tube (*i.e.*, the part below the characteristic constriction) becomes swollen, inflated and turns into the gall. On hatching from eggs the larvae find their way into the basal part of the perianth tube through the passage in the constriction. This gives rise to cell proliferation in the basal part of perianth.

5 mm. in diameter. Regular, simple, globose, discoid, or flask-shaped, inflated, free, subsessile; pinkish red, longitudinally five ridged, sticky and covered with numerous, short, stout, stigmatic, viscid, simple hairs; hard, coriaceous, cavate and surmounted on the top by the dry unopened or sometimes opened vestiges of the upper part of the perianth tube. The aborted ovary is found at the bottom of the spacious, hairy cavity of the gall. Inside the dried upper part of the perianth tube may be found the vestigial stamens and style. The thick wall comprises parenchymatous cells.

Several examples in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, Madras Medical College Grounds, Madras, 11-xi-1929.

Natural Order URTICACEAE.

Ficus bengalensis Linn.

Echinate gall.—This remarkable gall, resembling a rather miniature sea urchin, is produced by an unknown midge which lays eggs on the under side of the leaves. The gall is easily mistaken for a scale-insect.

4 mm. in diameter. Regular, simple, globose or subglobose, bright or dark red, rough, echinate, sessile, free, solid, cystiferous; fleshy, soft, entirely solid when young; partly fleshy, succulent and partly woody, hard when old; one to four celled when old; scattered in very large numbers on the under side of the leaves. The galls are easily

broken away from the leaf. The seat of cell proliferation is the parenchyma of the leaf. In the young galls a cortex and a distinct medulla are distinguishable in the cross section. There is no proper epidermis. The medulla consists of large, parenchymatous, round or hexagonal cells. The cortex consists of smaller rectangular cells. The spiny tubercles, which give the characteristic appearance to the gall, comprise bundles of rectangular cells arranged end to end in several radial rows, projecting from the cortex, evidently a part of the cortex itself. There are no vascular bundles in the gall. When old, the outer parenchymatous cortex encloses a hard, woody, thick-walled, one-to four-celled cyst. The spiny tubercles are pyramidal in shape but have an irregular section.

Several examples dry in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, a scrub jungle near Tanjore, Madras Presidency, 18-xii-1930.

***Ficus religiosa* Linn.**

Leaf gall.—An unknown midge attacks the leaf veins and gives rise to solid swellings.

10-50 mm. long and 5 mm. thick. Regular, ovoid to fusiform, extensive, tuberous, often unilateral and cortical, general, simple or branched swellings of the midrib or side veins of the leaves; greenish yellow and glabrous when young; brown, cicatrised, sulcate, often fissured and longitudinally striate when old; solid, ligneous, with one or more longitudinal cysts. The galls are more conspicuous on the under than on the upper side of the leaf. Minute holes, through which the adult midge escaped, are found on the surface of the old galls.

Several examples both dry and in formalin in the collections of the Zoological Survey of India, (Ind. Mus.), Calcutta. Coll. M. S. Mani, Palace Garden in front of the Saraswathi Mahal Library, Tanjore, Madras Presidency, 20-iv-1931; also Calcutta Maidan, near Chowringhee Road, on different dates.