

*Some Asiatic Telenominæ (Hym., Proctotrupoidea).* By  
G. E. J. NIXON, B.A., Department of Entomology,  
British Museum (Natural History).

*Introduction.*

In the following pages I have discussed, among others, several species of *Telenomus* which are parasitic on the eggs of certain well-known lepidopterous pests of rice and sugar-cane. They are probably of considerable economic importance, for, to judge from the enormous numbers in which some of the species have been bred, they must provide a very effective check to the increase of their hosts.

The material has been received for determination from the Imperial Institute of Entomology, and the types of all new species have been deposited in the British Museum.

All the figures are from drawings prepared by me. Some of them, such as those of antennæ, show resemblances as well as differences; the purpose of these is not to supplement, but to take the place of, descriptive matter.

In conclusion, I wish to offer my thanks and appreciation to Dr. F. W. Muesebeck, of the United States Bureau of Entomology, for the gift of paratypes of *Telenomus rowani* Gahan and *T. dignus* Gahan, and also to Mr. A. C. Townsend, of the British Museum of Natural History, for the trouble he has taken to obtain for me the original reference to the description of *Telenomus beneficiens* Zehntner.

Subfamily *TELENOMINÆ*.

According to my last \* analysis of certain genera of the Telenominæ all the species dealt with in this paper fall within the genus *Telenomus* proper (♀♀ with 11-segmented antennæ).

The difficulties in the way of describing and classifying the numerous members of this genus seem at times almost insurmountable. They rarely show easily grasped points of difference, and a species is all too frequently characterized by a subtle blend of features not readily appreciated by an eye unaccustomed to the specific patterns evolved within the genus. I have tried to emphasize by means of outline figures that part of the facies which depends on mere shape, and thus whittle down a little the margin of error from which the naming of a species is seldom free.

The male genitalia are an invaluable aid towards identification, but the difficulty and tediousness of making satisfactory preparations is not likely to make this structure a popular criterion for the naming of species. Nevertheless from my own experience I am obliged to assert that it will be impossible to avoid many mistakes unless this part of the male insect be examined. It is, of course, very possible that the copulatory apparatus of closely allied species, forming compact species-groups, may not be distinguishable by the ordinary methods of examination. But so far, in a study of what admittedly is probably only a small fraction of the total number of species that exists, I have not found this to be the case.

*Telenomus* (females).

1. Large species of short, stout, build, at least .9 mm. in length; hind wings very broad, the fringe at greatest width of wing hardly

---

\* Ann. & Mag. Nat. Hist. (10) vol. xx. p. 113.

- more, or even less, than half the width of the wing there. (Species with the stigmalis long (fig. 12, e); striations of tergite 2 distinct over at least basal third.) . . . . . 2.
- Smaller species, rarely as much as .9 mm. in length, and then with the fringe of the hind wing longer than above, or of slender form. (Species with the frons smooth and shining virtually everywhere, except in *attaci*, sp. n.) . . . . . 4.
2. Vertex immediately behind the posterior ocelli completely margined from temple to temple . . . . . 3.
- Vertex immediately behind the posterior ocelli not thus margined. (Species with the radicle of the antennæ much less than one-third the length of the scape; funicle slender, more or less black throughout, segment 5 being hardly transverse; mesonotum dull, finely and evenly rugose all over.) . . . . . *cyrus*, sp. n.
3. Vertex between the ocelli with well-marked scaly-reticulate sculpture. (Species with the radicle distinctly less than one-third the length of the scape; first five segments of the funicle yellow; venation pale and indistinct.) . . . . . *lucullus*, sp. n.
- Vertex between the ocelli more or less smooth, with a few scattered punctures. (Species with the radicle fully one-third the length of the scape; first five segments of the funicle brownish; venation brown, well defined.) . . . . . *lelus*, sp. n.
4. Tergites beyond 2 with numerous longish hairs. (Elongate species with the abdomen fully twice as long as wide; frons, except the impression, very finely scaly-reticulate; shortest distance between the eyes clearly not greater than their width as seen from above; posterior part of the vertex somewhat characteristically hollowed out.) . . . . . *attaci*, sp. n.
- Tergites beyond 2 with only minute hairs or almost without hairs . . . . . 5.
5. Species of narrow build, with the abdomen usually fully twice as long as wide, or, if rarely shorter, then the legs predominately yellow. (Species with the legs, except the front coxæ, usually entirely bright yellow; hind wings very narrow beyond the nervature, almost parallel-sided; fringe at greatest width of wing hardly less than half the width of the wing there; stigmalis of fore wings short, the venation pale and not sharply defined.) . . . . . Group of *dignus*, 6.
- Species not of narrow build; abdomen considerably less than twice as long as wide . . . . . 11.
6. Tergite 1 virtually smooth all over, its costæ absent or reduced to an almost imperceptible row of minute foveæ at base. (Species with tergite 2 emarginate at apex.) . . . . . 7.
- Tergite 1 strongly and evenly costate except at extreme apical margin . . . . . 8.

7. Abdomen beyond middle abruptly, *cylindrically* narrowed ..... *sorus*, sp. n.  
Abdomen beyond middle evenly tapering to apex, somewhat flattened ..... *rowani* Gahan.
8. Thorax elongate, very distinctly longer than its greatest width. (Species with the head approaching a subcubical condition; the eyes close together, the shortest distance between them not at all greater than their width as seen from above.) ..... 9.  
Thorax hardly longer than its greatest width. (Species with the head not approaching a subcubical condition, rather markedly transverse; shortest distance between the eyes clearly greater than their width as seen from above.) ..... 10.
9. Eyes large, their greatest length fully twice as long as the malar space. (Species with the abdomen exactly twice as long as wide; mesonotum evenly convex; legs not bright yellow, the femora and the tibiae very slightly darkened.) ..... *pontus*, sp. n.  
Eyes small, their greatest length much less than twice as long as the malar space, about 11:8. (Species with the head rather large in proportion to the size of the thorax; mesonotum somewhat flattened; legs bright yellow; abdomen short, less than twice as long as wide.) ..... *beneficiens* Z.
10. Abdomen hardly twice as long as its greatest width ..... *dignus* Gahan.  
Abdomen nearly three times as long as its greatest width ..... *dignoides*, sp. n.
11. Very small species, .5-.55 mm. in length, with the scape and entire legs, except the front coxae, whitish yellow. (Brownish species with rather large wide head; vertex immediately behind the posterior ocelli, falling away very sharply (almost concave here) to the occipital foramen; no trace of an occipital margin; abdomen paler than the thorax; tergite 1 almost yellow.) ..... *perplexus*, sp. n.  
Species at least .6 mm. in length; if less than .6 mm., then the scape is black and the legs brownish ..... 12.
12. Scape yellow or yellowish; funicle 1 decidedly longer than wide, only a little shorter than the pedicel. (Large species, .9 mm. in length, of stout build; legs entirely yellow; tergite 2 striate at least over basal third.) ..... *triptus*, sp. n.  
Scape black or brownish; funicle 1 not at all, or hardly, longer than wide ..... 13.
13. Small species, about .55 mm.; hind wings not obviously widened beyond the nervature, more or less parallel-sided, the fringe at widest part of wing longer than, or fully as long as, the width of the wing there. (Dingy species with dark antennae and legs; striations of tergite 2 reduced to a row of minute foveae at base.) ..... 14.

- Larger species, about .7 mm.; hind wings clearly a little widened beyond the nervature, not at all parallel-sided; the fringe at widest part of wing distinctly not longer than the width of the wing there. (Species with funicle 5 very strongly transverse, obviously nearer in size (at least as regards length) to 4 than to 6, the club hence more or less 4-segmented.) . . . . . 15.
14. Head strongly transverse, clearly wider than the thorax . . . . . *remus*, sp. n.
- Head not (for the genus) strongly transverse, approaching a subcubical condition . . . . . *tirathabæ* F.
15. Vertex immediately behind the posterior ocelli with a very fine almost differentiated ridge, connecting the posterior eye-margins. (Species with the vertex between the ocelli in far greater part entirely smooth and unsculptured; hairs of the funicle rather long and conspicuous.) . . . . . *proditor*, sp. n.
- Vertex here without a ridge. (Species with the vertex between the ocelli, as in *proditor*, predominately smooth, but with a greater amount of transverse aciculation posteriorly; hairs of the funicle very short and inconspicuous.) . . . . . *manolus*, sp. n.

*Telenomus cyrus*, sp. n.

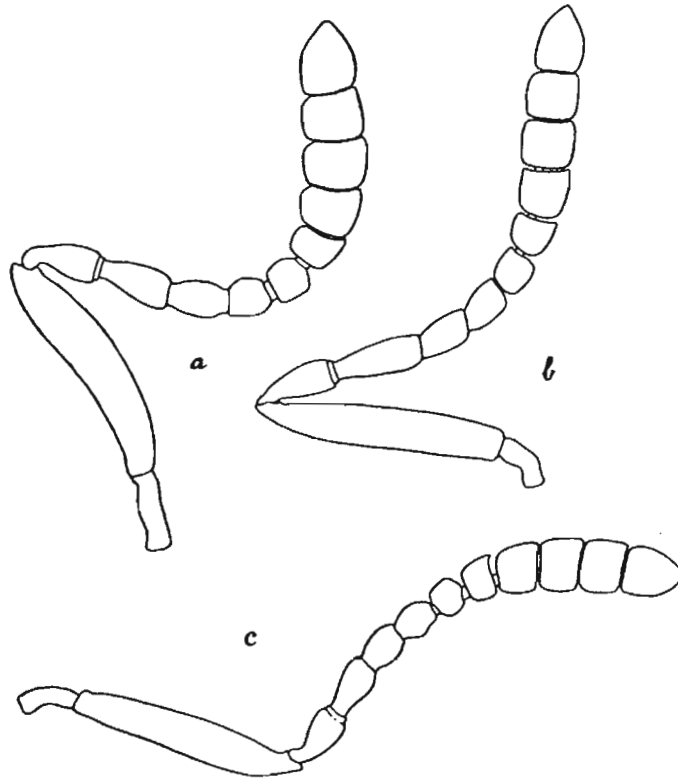
♀.—Black. Legs predominately yellowish, with the femora slightly infuscated; all the coxæ blackened. Antennæ virtually unicolorous, dark brown or blackish throughout.

Head of same shape as in *triptus*, sp. n. (cf. fig. 2, e). Vertex finely and evenly scaly-reticulate, with three or four punctures in the space between the anterior and posterior ocellus. Frons in far greater part entirely smooth and shining, becoming scaly-reticulate between the lower part of the eye and the antennal insertions. Shortest distance between the eyes only very slightly greater than their width as seen from above, about 10 : 9. Antennæ rather slender (fig. 1, b), without a clearly differentiated club; funicle 1 fully twice as long as apically wide; 3 distinctly longer than wide; 5 more or less spherical, intermediate in size between 6 and 4.

Thorax: mesonotum almost finely rugose, distinctly granulated in front, different from the sculpture of *triptus* only in being slightly stronger. Scutellum entirely smooth and shining. Postscutellum with a median, more or less semicircular, strongly rugose swelling. Fore wings: stigmalis long; hind wings much widened

beyond the nervature; fringe at widest part of wing about half the width of the wing there. Legs long and slender; hind tarsi slightly longer than their tibiæ, about 20 : 17.

Fig. 1.



Female antenna of (a) *Telenomus lelus*, sp. n.; (b) *T. cyrus*, sp. n.;  
(c) *T. lucullus*, sp. n.

*Abdomen* about  $1\frac{1}{2}$  times as long as wide in undistorted specimens; tergite 1 evenly striate, its grooves sharply delimited apically; 2 striated over about basal third; 3-6 entirely smooth and shining.

Length: ♀, 1.05 mm.

JAVA: Lembang (*P. v. d. Goot*); series of 22 ♀♀, bred 1931 from eggs of *Nezara viridula* Fab.

This species is evidently characterized by the dark slender antennæ. In general facies it closely resembles *triptus*, sp. n., but has the stigma of the fore wings much longer, besides differing in many other details.

Species such as this approach very closely to *Microphanurus*, and were it not for the very distinctly hairy eyes *cyrus* would certainly be well placed within this genus.

The two following species belong quite clearly to the same species-group, and have the following characters in common:—

*Head* conspicuously wider than the thorax. Frons between the lower part of the eye and the antennal insertions distinctly bulging. Eyes occupying the entire lateral surface of the head, the head behind them being cut away at right angles to the long axis of the body; in this respect the two species in question are like *triptus*, sp. n. Vertex with a sharp, completely differentiated ridge, which is a continuation of the postorbital carina. Occipital margin present only at sides of vertex, that is, having only vertical direction, being widely obliterated above.

*Thorax*: mesonotum with very feeble sculpture. Scutellum entirely smooth and shining. Wings: stigmalis long (fig. 12, *d, e*), hind wings very obviously widened beyond the nervature.

*Abdomen* not much longer than wide, about 4:3. Tergite 2 striate over about basal third, the striæ longest medially; furthermore, this tergite is not wider than long.

*Telenomus lelus*, sp. n.

♀.—Black. Legs, except the anterior coxæ, pale honey-yellow. Antennæ, except scape and radicle, which are yellow, brown.

*Head* much wider than the thorax, 5:4. Frons entirely smooth all over. Vertex predominately smooth and shining all over with a few scattered punctures; to sides of anterior ocelli there is a little, extremely feeble, scaly-reticulation. Antennæ: radicle somewhat long, fully one-third the length of the scape (fig. 1, *a*); funicle 1

fully as long as the pedicel, 4 bead-like, clearly nearer in size to 3 than to 5, so that the club is more or less 5-segmented. Eyes thickly hairy, the shortest distance between them not much greater than their length as seen from above, 13 : 10.

*Thorax*: mesonotum quite strongly shining, especially posteriorly, its ground-sculpture extremely weak; minute, not very close granulations occur almost all over its surface. Postscutellum with a medial, subsemicircular, strongly rugose swelling. Fore wings slightly brownish; venation brownish, sharply defined; stigmalis long (fig. 12, e); hind wings (fig. 2, b).

*Abdomen* of same shape as in *triptus* (cf. fig. 2, e). Tergite 2 very slightly longer than wide, about 20 : 17, its mid-basal striations extending over basal third, the lateral striations much shorter.

Length: ♀, 1.1 mm.

MALAYA: Kuala Lumpur (W. A. Lamborn); 3 ♀♀, bred 11. i. 1921 from undetermined eggs on grass.

*Telenomus lucullus*, sp. n.

This species differs from *lelus* as follows:—

♀.—Antennæ (except the four apical club segments, which are black) honey-yellow. Legs, as in *lelus*, yellow throughout.

*Head* slightly wider in proportion to width of thorax, about 21 : 16. Eyes much less hairy, shortest distance between them compared with their length as seen from above, as 23 : 17. Vertex between the ocelli and to sides of anterior ocellus, extremely finely and evenly scaly-reticulate; this sculpture is without punctures, except for one or two against the eye-margin and two or three on each side of the anterior ocellus, almost touching it. Radicle of the antennæ slightly longer in proportion to the length of the scape; apical funicular segments a little narrower (fig. 1, c).

*Thorax*: sculpture of mesonotum somewhat duller, slightly stronger; distinct granulations are much less obvious than in *lelus*. Fore wings paler (fig. 12, d); venation yellowish and not sharply outstanding; hind wings slightly narrower (fig. 2, a).

*Abdomen*: striations of tergite 2 much shorter, not occupying more than basal fourth.

Length: ♀, .9 mm.

JAVA (*T. H. C. Taylor*); 1926, 3 ♀♀ bred from eggs of a Noctuid moth.

Important for the recognition of this species seem to be the predominately yellow antennæ and the pale wings, with their not sharply defined yellow veins.

*Telenomus triptus*, sp. n. (Fig. 2, e.)

♀.—Black. Legs (except the front coxæ) and antennal scape yellow throughout. Funicle brown throughout.

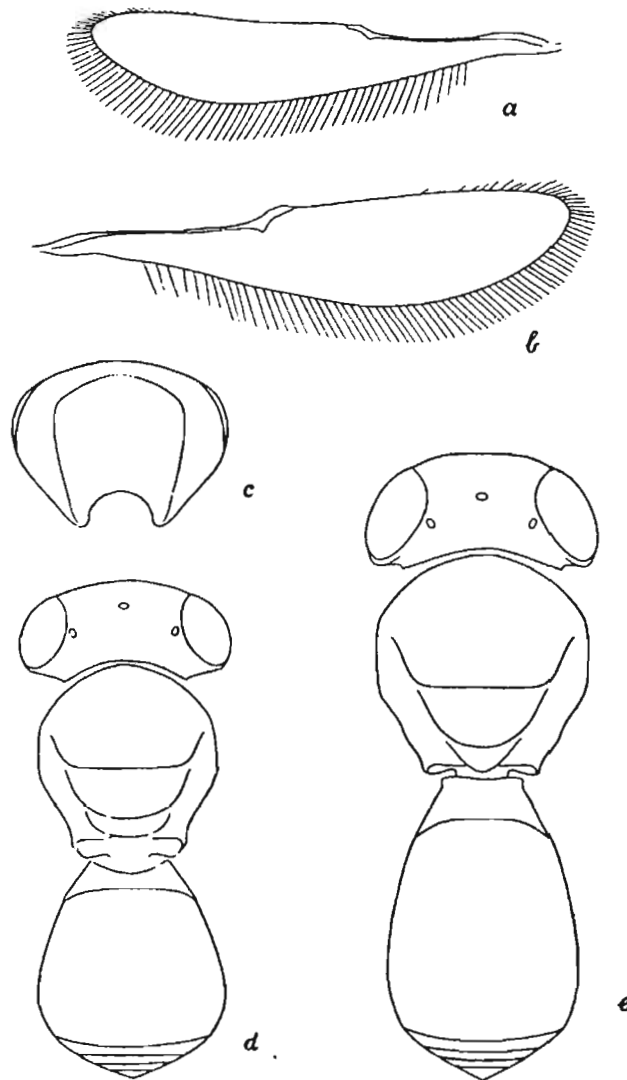
*Head* not much wider than the thorax, 19:17. Frons in greater part entirely smooth and shining, becoming scaly-reticulate only between the lower part of the eye and the antennal insertions. Shortest distance between the eyes not much greater than their width as seen from above, about 9:7. Occipital margin very ill-defined above, but its highest point situated well below the top of the vertex, its position corresponding more or less to that of the margin in *manolus*, sp. n. (cf. fig. 2, c). Vertex finely scaly-reticulate, not very sharply rounded behind; at least within the ocellar region there are no punctures in the scaly-reticulate sculpture. Antennæ: funicle 1 nearly as long as the pedicel, fully  $1\frac{1}{2}$  times as long as its apical width (fig. 3, h); funicle 5 clearly nearer in size to 6 than to 4, so that the club is more or less 5-segmented.

*Thorax*: mesonotum thickly pubescent, evenly convex, feebly shining, its sculpture consisting more or less of broken scaly-reticulation, but becoming granulate anteriorly. Scutellum entirely smooth and shining. Post-scutellum subtriangularly produced in the middle and strongly rugose. Fore wings: stigmatalis rather short (fig. 12, b); hind wings distinctly widened beyond the nervature; fringe at widest part of hind wing about two-thirds the width of the wing there.

*Abdomen* obviously longer than wide, about 11:7. Tergite 1 sculptured to its extreme apex; the sculpture of this tergite is distinctive in that the interstices of the striations towards the apex of the segment are finely sculptured, with the result that the longitudinal grooves themselves are not sharply delimited apically. Tergite 2 striate over at least basal third, very slightly longer than wide.

♂.—Funicle pale brown; funicle segments 4–9 more or

Fig. 2.



a, hind wing of *Telenomus lucullus*, sp. n., ♀; b, hind wing of *T. letus*, sp. n., ♀; c, head (from behind) of *T. manolus*, sp. n., ♀; d, body of *T. manolus*, sp. n., ♀; e, body of *T. triptus*, sp. n., ♀.

less evenly spherical. Genitalia (fig. 9, a): the entire structure (two preparations) appears to be very feebly sclerotized, the struts, to which the apical toothed appendages are articulated, appearing darkest.

Length: ♂♀, .85 mm., approx.

MALAYA: Kajang (*N. C. E. Miller*); 22. i. 1929, 4 ♀♀, 1 ♂; Stapak (*G. H. Corbett*), series containing both sexes, bred 15. i. 1924 from eggs of a Pentatomid bug, *Scotinophara coarctata* Fab.

*Telenomus manolus*, sp. n. (Fig. 2, d.)

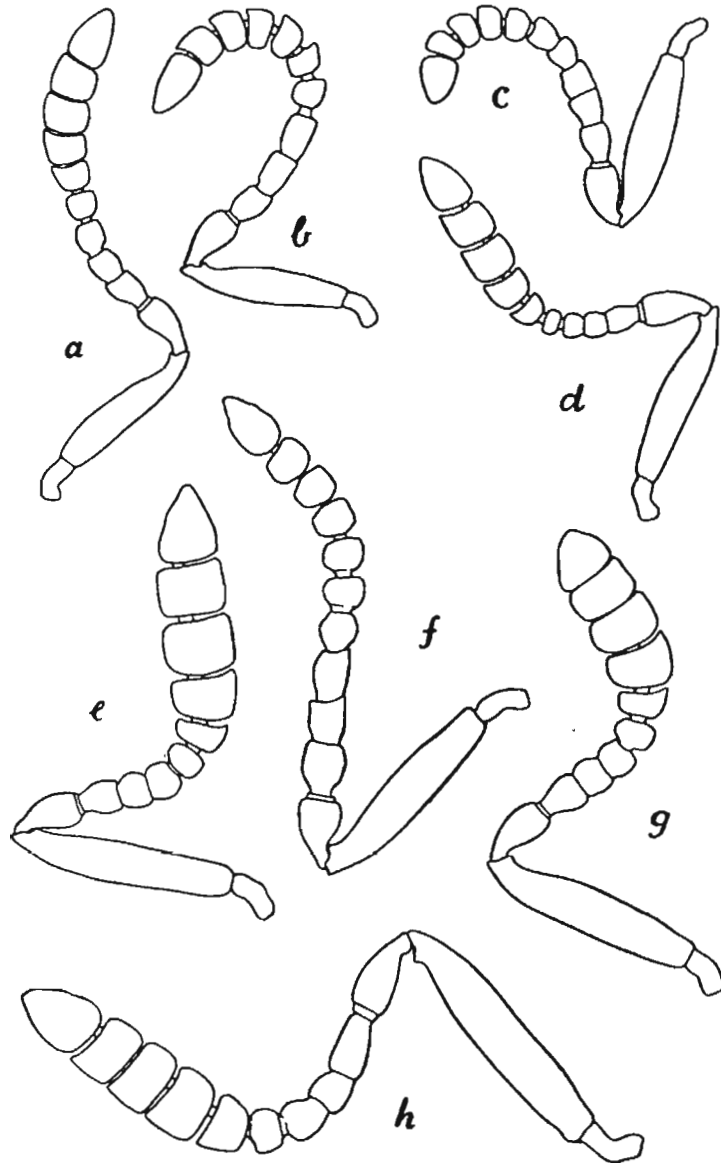
♀.—Deep black. Antennæ more or less black throughout. Legs dark, obscurely yellowish brown, with all the femora infuscated.

*Head* wider than the thorax, about 16:13, strongly transverse, and, seen along a line perpendicular to a line between the posterior ocelli, very slightly more than twice as wide as its greatest length, 32:15. Shortest distance between the eyes equal to about  $1\frac{1}{2}$  times their width as seen from above. Head very sharply cut away behind the eyes. Vertex fairly sharply rounded just behind the posterior ocelli, between the ocelli with some delicate reticulation which has a transverse tendency or merely with transverse aciculation. Antennæ: funicle 1 hardly longer than its greatest width; 2-4 small, bead-like; 5 very strongly transverse, so that the club is more or less 4-segmented if size alone of segments be considered (fig. 3, e). Highest point of the occipital margin situated far below the top of the vertex, so that the latter has a well-defined posterior (declivous) surface (fig. 2, c).

*Thorax* raised high above the level of the abdomen. Mesonotum fairly strongly shining, with a feeble indefinite sculpture. Wings: stigmalis short, as, for example, in *triptus* (cf. fig. 12, b); hind wings distinctly widened beyond the nervature, its fringe at widest part of wing clearly less than the width of the wing there.

*Abdomen* short and wide, only a little longer than wide, about 17:14; this relationship is difficult to estimate in dried specimens, as the apical tergites tend to be telescoped within the second. Tergite 1 with well-developed costæ, its basal margin rather deeply emarginate; 2 not longer than wide, with very short striations which extend beyond the basal foveæ.

Fig. 3.



Antenna of (a) *Telenomus perplexus*, sp. n., ♀; (b) ditto, ♂; (c) *T. remus*, sp. n., ♂; (d) ditto, ♀; (e) *T. manolus*, sp. n., ♀; (f) ditto, ♂; (g) *T. attaci*, sp. n., ♀; (h) *T. triptus*, sp. n., ♀.

♂.—Legs pale, predominately yellowish. Antennal scape more or less yellow testaceous; funicle brownish, of ordinary form, segments 5-9 being slightly transverse (fig. 3, f). Genitalia (fig. 4, a): apical articulated appendages each with five teeth, behind the most posterior of which is what appears to be a sharply pointed, highly sclerotized projection; although this projection appears to be free, that is, having no clearly visible membranous attachment along its posterior margin, I have not shown it as free in the figure, believing it to be homologous with a sclerotization usually seen in a corresponding place in other genitalia of *Telenomus*.

Length: ♂♀, .75-.8 mm.

MALAYA: Kuala Lumpur (G. H. Corbett); series bred, 13. viii. 1935, from lepidopterous eggs on *Coffea* sp.

*Telenomus proditor*, sp. n.

In general facies this species exactly resembles *manolus*, sp. n. Both are closely and naturally related forms, and are insects of stout, dumpy build. *T. proditor* is largely characterized as follows:—

♀.—Not so intensely black as *manolus*; legs paler, more yellowish. Ridge of vertex sharply defined towards sides, that is, behind each posterior ocellus, but feeble in the middle. Antennæ markedly hairy, much more so than in *manolus*, but otherwise not different from those of that species. Head more deeply emarginate behind than in *manolus*. Mesonotum and scutellum slightly more hairy. Discal hairs of fore wings less fine, and slightly longer than in *manolus*.

Length: ♀, .75 mm.

UNITED PROVINCES: Dehra Dun (S. N. Chatterjee); series of 12 ♀♀ bred, 20. ix. 1929, from eggs of a moth on ?*Gmelina arborea* Linn.

The most reliable criteria for separating this species from the preceding are the submargined vertex and the more hairy antennæ.

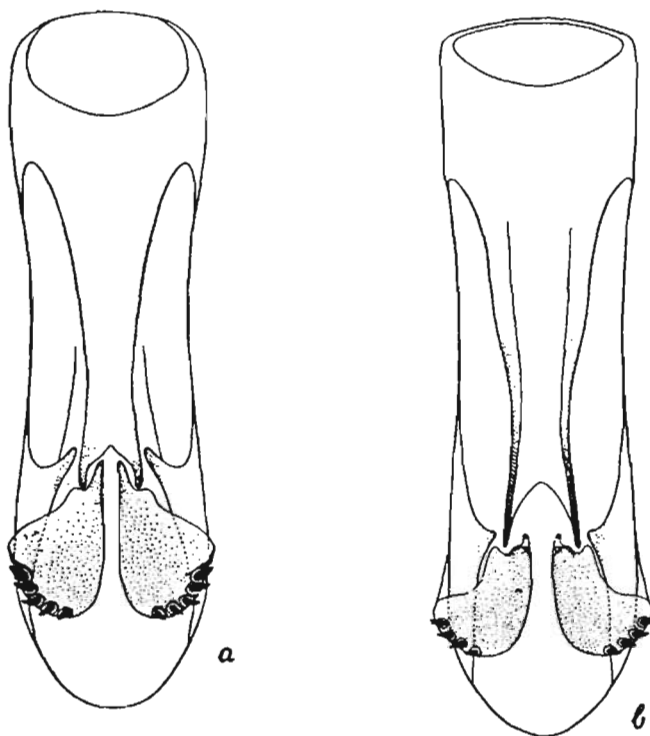
*Telenomus attaci*, sp. n.

♀.—Antennæ predominately brownish black, with the scape paler at base. Legs yellowish brown.

Head not strongly transverse, very slightly less than twice as wide as its greatest length, seen along a line

perpendicular to a line between the posterior ocelli, and only very slightly wider than the thorax (fig. 7, *h, i*). Eyes rather large, the shortest distance between them on the frons almost exactly equal to their width as seen from above. Frons along the inner orbits with a wide surface of delicate scaly-reticulate sculpture; often

Fig. 4.



Male genitalia of (a) *Telenomus manolus*, sp. n. ;  
(b) *T. attaci*, sp. n.

this sculpture is continuous right across the frons in front of the anterior ocellus, but usually it fades out entirely immediately in front of the anterior ocellus. Antennæ: last five segments of the funicle forming a rather short thick club, which is not sharply differentiated, segment 5 of the funicle being considerably shorter

than 6; 1 hardly longer than wide; 2 and 3 bead-like (fig. 3, *g*). Posterior (declivous) part of the vertex rather deeply scooped out; occiput itself deeply emarginate.

*Thorax*: mesonotum feebly shining, evenly but very indefinitely scaly-reticulate all over. Scutellum not strongly transverse. Wings: stigmalis short; hind wings clearly widened beyond the nervature, its fringe at greatest width of wing about two-thirds the width of the wing there.

*Abdomen* narrow, at least twice as long as its greatest width, sometimes a little longer (fig. 8, *i*). Tergite 1 very short, deeply longitudinally costate, so that it appears to have a transverse row of deep pits; 2 distinctly longer than wide, about 7:5, striate on basal fourth, not at all sharply margined laterally; following tergites each with an irregular row of longish hairs, which are semi-erect; apical sternites similarly clothed.

♂.—Antennæ pale brownish yellow, the more apical segments of the funicle slightly darkened. Legs honey-yellow.

Funicle somewhat short and thick, hardly widened towards the apex; segments 2 and 3 only very slightly dilated; 5-9 distinctly transverse. Abdomen not elongate as in the ♀. Genitalia (fig. 4, *b*): the drawing is from a preparation of the only male available.

Length: ♀, .9-1 mm., ♂, .7 mm.

MALAYA: Kuala Lumpur (*G. H. Corbett*); two long series of females bred, March 1925 and June 1928, from eggs of *Attacus atlas* L. SIAM: Bangkok (*W. R. S. Ladell*); 3 ♀♀, 1 ♂, bred, February 1930, from eggs of *Attacus atlas* L.

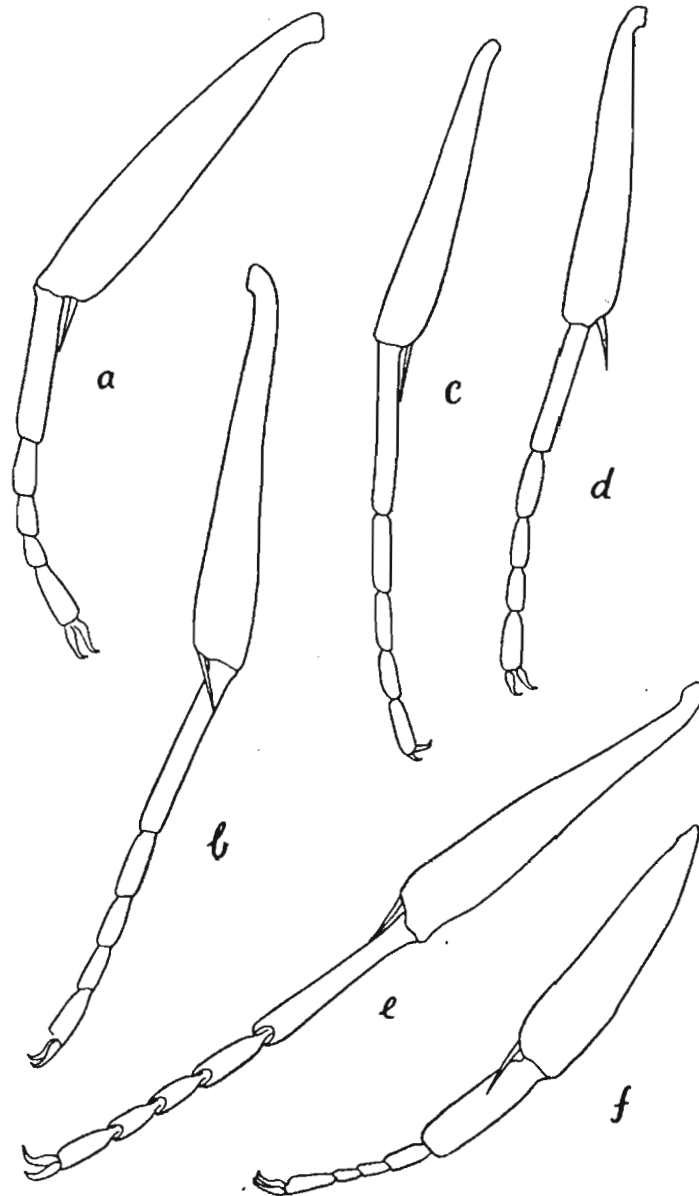
This species is evidently characterized in the female by the shape of the head and the hairiness of the apical abdominal tergites. The genitalia of the male appear to be distinctive, but it must be emphasized that only one specimen was available for examination.

*Telenomus sorus*, sp. n.

♀.—Black, but not deep black. Legs and scape more or less honey-yellow.

*Head* strongly transverse. Eyes somewhat small, the shortest distance between them (on frons) considerably greater than their width as seen from above. Vertex

Fig. 5.



Hind tibia and tarsus of (a) *Telenomus pontus*, sp. n., ♂; (b) ditto, ♀; (c) *T. dignoides*, sp. n., ♀; (d) *T. dignus* Gahan, ♀; (e) *T. rowani* Gahan, ♀; (f) ditto, ♂.

almost without a posterior (declivous) part, the occipital margin reaching almost to the top of the vertex (fig. 7, g); at the temples the occipital margin is very close to the eye. Antennal club fairly slender but not clearly differentiated. Frons smooth and shining more or less everywhere. Vertex between the ocelli very vaguely scaly-reticulate.

*Thorax*: mesonotum quite strongly shining, its sculpture very fine. Scutellum smooth and shining all over, very short, strongly transverse, fully two and a half times as wide as long. Wings: stigmalis short; hind wings virtually parallel-sided beyond the nervature, their fringe at widest part of wing only a very little shorter than the width of the wing there.

*Abdomen* about three times as long as its greatest width, abruptly narrowed just beyond middle, then tapering gradually to a point; this narrow part of the abdomen is almost cylindrical (fig. 8, d). Tergite 1 conspicuously smooth and unsculptured, its costæ reduced to an almost imperceptible row of tiny punctures at its base; 2 longitudinally costate at its extreme base, fairly deeply emarginate at apex; 3 and 4 much longer than their apical width.

Length: ♀, .9 mm.

MALAYA: Parit Buntar (H. T. Pagden); series of 10 ♀♀, bred 10. xi. 1931 from eggs of *Philo* sp.

*Telenomus rowani*. (Fig. 8, c.)

*Phanurus rowani* Gahan, 1925, Philipp. Journ. Science, p. 106.

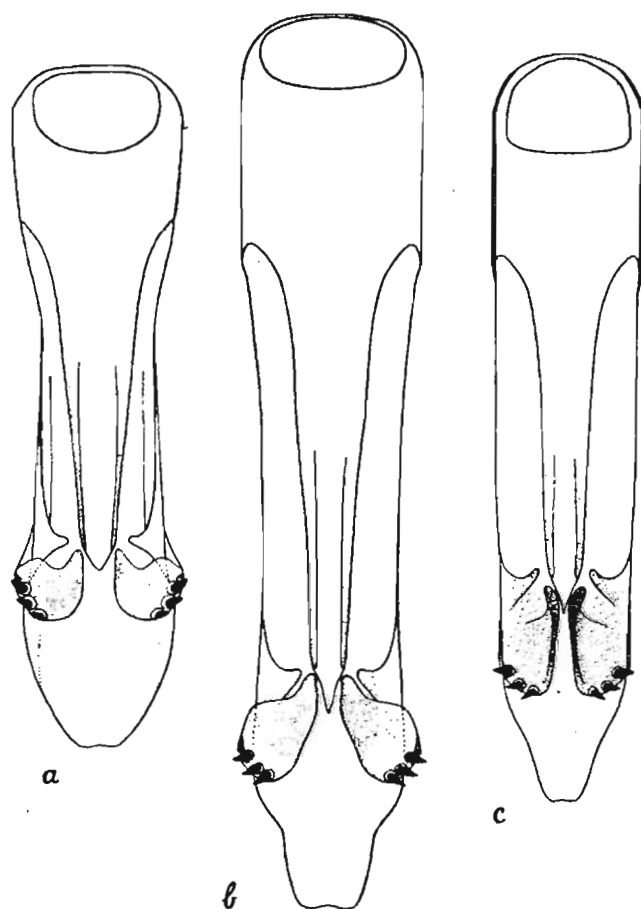
This species is very similar to the last, and appears to differ materially from it only in the structure of the abdomen. Both species have exactly the same type of head and thorax, and I can find no differences in a comparison of these parts.

*T. rowani* has been very carefully described by Gahan, so that it is necessary only to emphasize the differences between it and its allies. This applies to the female; the male is unusually distinct.

♀.—Both this and the preceding species differ from *dignus* Gahan and *dignoides*, sp. n., in having the head considerably more transverse, the scutellum shorter and more transverse, tergite 1 virtually unsculptured, and

tergite 2 emarginate at its apex. This last detail is not easy to appreciate in dried examples. I have drawn the figure of *rowani* from a specimen taken from spirit and

Fig. 6.



Male genitalia of (a) *Telenomus rowani* Gahan; (b) *T. dignoides*, sp. n.; (c) *T. dignus* Gahan. All drawn to same scale.

measured before any telescoping of the abdominal segments had taken place. In spirit-specimens the abdomen tends to be swollen dorsally between tergites

1 and 2; as a result tergite 1 is tilted forward out of the horizontal. Hind leg (fig. 5, e). Antennæ (fig. 7, a).

♂.—This sex is much exaggerated in form, and would not be readily associated with the ♀. Besides being lighter in colour it has the legs shorter and much thickened. The basal tarsal segment of all legs is much dilated (fig. 5, f); this feature alone will separate *rowani* from all the related species dealt with in this paper. Antennæ: scape very short; funicle 1-3 about twice as wide as the following segments, which are very small and bead-like (fig. 7, b). Genitalia (fig. 6, a). Fore wings very narrow, the fringe very long (fig. 12, c).

Length: ♂, .5-.6 mm., ♀, .8-.85 mm.

This species was originally described from the Philippines (Luzon) from a series containing both sexes bred from the eggs of the rice-borer, *Schænobius incertellus* Wlk. (now known as *bipunctifer* Wlk.). I have also a large series, bred together with *Telenomus dignus* Gahan, x.-xi. 1936, from N.W. Java (Tandjoeng) (*P. v. d. Goot*); the hosts of this mixed series were *Schænobius incertellus* Wlk. and *Scirpophaga innotata* Wlk.

*Telenomus dignus* Gahan. (Fig. 8, e.)

*Phanurus dignus* Gahan, 1925, Philipp. Journ. Science, p. 108.

Gahan's description is very full, and hardly in need of amplification. The following points, however, will help to characterize the species:—

♂♀.—Legs bright yellow throughout, except, as is usual, the front coxæ. Antennæ blackish, with only scape proximal to middle pale.

♀.—Vertex evenly rounded from anterior ocellus to occipital margin. Antennæ: club more or less 4-segmented (fig. 7, c). Thorax not longer than wide. Mesonotum, as in *rowani*, quite strongly shining, with its surface sculpture very weak. Hind wings very narrow, their fringe at widest part of wing being hardly, or not at all, shorter than the width of the wing there. Metatarsus of hind leg shorter in comparison with the tibia than in *rowani* and the following species (fig. 5, d). Abdomen about twice as long as wide, narrowed to a sharp point at apex. Tergite 1 with sharply defined longitudinal costæ right across; tergites 3 and 4 strongly transverse.

♂.—Black, with yellow legs. The antennæ are yellow except for the apical three or four segments; funicle of ordinary form, segments 4–9 being more or less spherical. Genitalia (fig. 6, c) distinct on account of a thickening which appears as a dark band along the inner side of the apical appendage.

Length: ♂♀, .7–.8 mm.

This is a parasite in the eggs of *Schænobius incertellus* Wlk., the rice-borer, and, so far, has the following distribution:—PHILIPPINES: Luzon (type-locality); CHINA: Canton; N.W. JAVA: Tandjoeng (P. v. d. Goot), bred with *rowani* from *S. incertellus* Wlk. and *Scirpophaga innotata* Wlk.

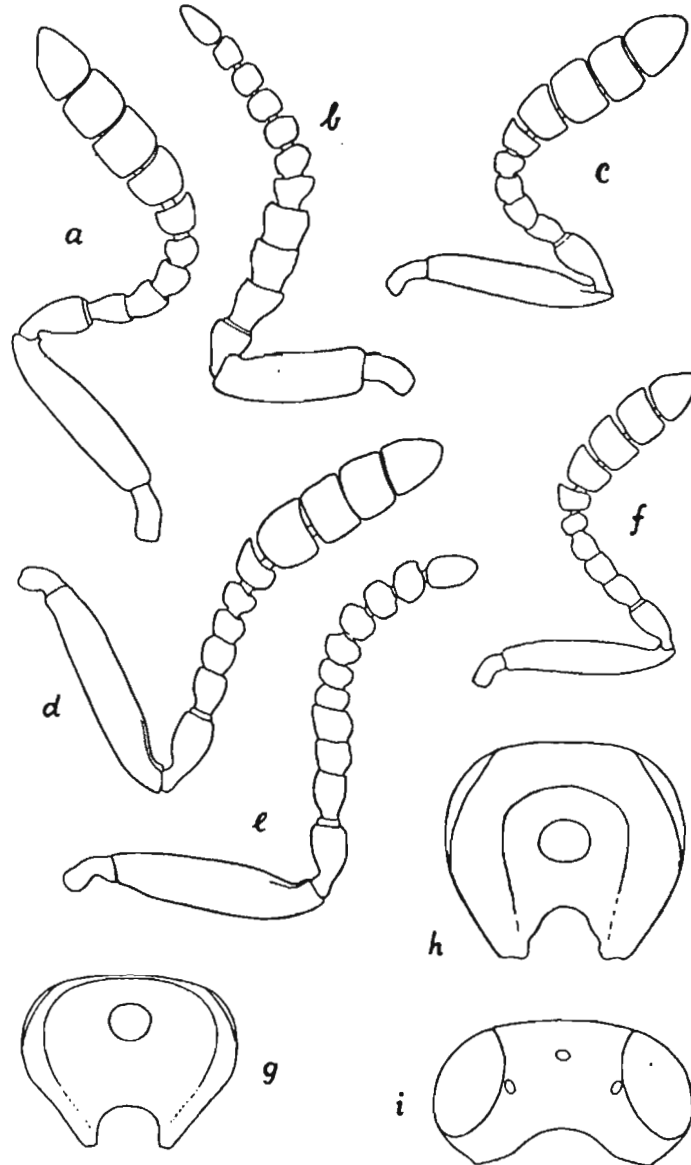
*Telenomus dignoides*, sp. n. (Fig. 8, f.)

♀.—Black. Legs except all the coxæ, which are decidedly darkened, entirely yellow. Scape blackish, paler proximal to middle; funicle more or less uniformly blackish throughout, the four basal segments hardly paler than the rest.

*Head* very slightly wider than the thorax. Eyes somewhat large, but the shortest distance between them on the frons clearly greater than their width, as seen from above. Vertex between the ocelli delicately and fairly sharply scaly-reticulate; with a few (about five) well-defined punctures here; in *dignus* the sculpture here tends to be more reduced, giving an impression of greater shininess, but the difference is not strong and only one of degree. Antennæ not essentially different from those of *dignus*. As in *dignus* the vertex is only very feebly rounded between the anterior ocellus and the occipital margin, there being no well-defined posterior (declivous) surface as, for example, in *manolus*, sp. n.

*Thorax*: mesonotum feebly shining, but with the usual vague sculpture, which, however, is a little stronger than in *dignus*. Scutellum, as in *dignus*, evenly rounded posteriorly, not markedly transverse as in *rowani*. Hind wings decidedly a little wider beyond the nervature than in *dignus*, the fringe at widest part of wing being equal to only about two-thirds the width of the wing there. Basal segment of hind tarsus longer in proportion to length of tibia than in *dignus* (fig. 5, c).

Fig. 7.



Antenna of (a) *Telenomus rowani* Gahan, ♀; (b) ditto, ♂; (c) *T. dignus* Gahan, ♀; (d) *T. pontus*, sp. n., ♀; (e) ditto, ♂; (f) *T. beneficiens* Zehntner, ♀; (g) head (from behind) of *T. sorus*, sp. n., ♀; (h) ditto of *T. attaci*, sp. n., ♀; (i) head (from above) of *T. attaci*, sp. n., ♀.

*Abdomen* about three times as long as wide, but variable within small limits, gradually narrowed from widest part to apex. Tergite 1 very distinctly costate over slightly more than posterior half; 2 with a very distinct costate furrow and with short striations radiating from the costæ.

♂.—Black. Not at all exaggerated in structure. Legs with only the front coxæ very distinctly darkened. Apical segments of funicle slightly darkened above, otherwise yellow, in structure resembling those of *dignus*. Fore wings very slightly less yellowish than in the ♀, the stigmalis also very slightly longer. Genitalia (fig. 6, b) resembling those of *dignus* in general outline, having the "penis-sheath" narrowed before the apex; there is a difference in the shape of the apical appendages, but it is difficult to say how much this is due to their accidental position or to their actual structure; in all the three preparations made the relative position of these appendages was the same; the conspicuous darkening along the inner border of the apical appendages, which is characteristic of *dignus*, is absent in the present species.

Length: ♂, .9 mm., ♀, 1-1.1 mm.

W. JAVA: Cheribon (Sugar Experimental Station), January 1937; large series bred from eggs of *Scirpophaga auriflua* Zell. var. *intacta* Sn., on sugar-cane.

This species is certainly very closely related to *dignus* G. For separating the females of the two species the only reliable difference, apart from size, appears to be the longer abdomen of *dignoides*. To separate the males the genitalia must be examined.

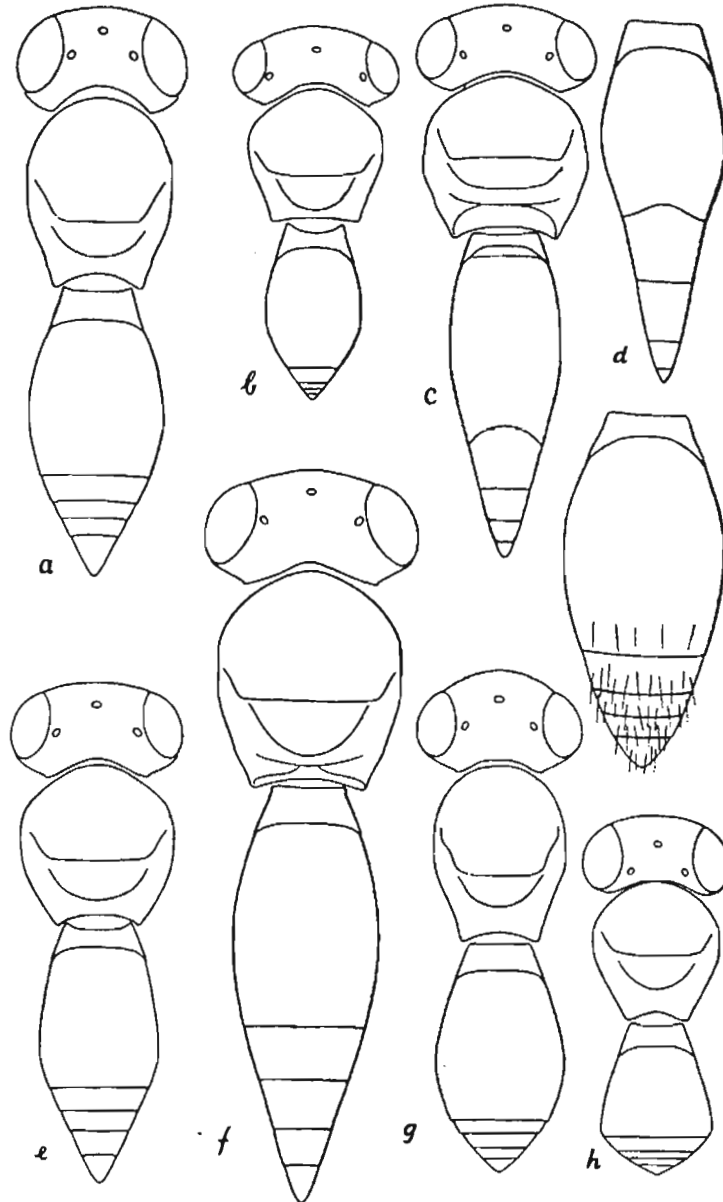
*Telenomus beneficiens* Zehntner. (Fig. 8, g).

*Phanurus beneficiens* Dodd in 'Canadian Entomologist,' 1914, p. 293.  
*Ceraphron beneficiens* Zehntner in 'Archief voor de Java-Suiker-industrie,' 1896, iv. p. 487.

This species was described by Zehntner in a paper entitled "Levenswijze en Bestrijding der Boorders." The particular moth dealt with is referred to as "De Stengelboorder (*Diatræa striatalis* Sn.)."

Since Dodd first recognized the species as a Telenomid from the figure reproduced by Krüger in 'Das Zuckerrohr und seine Kultur,' 1899, p. 350, the name by which he redesignated it, "*Phanurus beneficiens*," has figured extensively in the literature, though, as the species of

Fig. 8.



(a) body of *Telenomus pontus*, sp. n., ♀; (b) body of *T. remus*, sp. n., ♀; (c) body of *T. rowani* Gahan, ♀; (d) abdomen of *T. sorus*, sp. n., ♀; (e) body of *T. dignus* Gahan, ♀; (f) body of *T. dignoides*, sp. n., ♀; (g) body of *T. beneficiens* Zehntner, ♀; (h) body of *T. perplexus*, sp. n., ♀; (i) abdomen of *T. attaci*, sp. n., ♀. All drawn to same scale.

*Telenomus* tend to be highly specific in their choice of hosts, it is extremely doubtful whether the insect described by Zehntner has as many hosts as the subsequent use of his name for it would suggest.

In view of the fact that several species of *Telenomus* have now been bred from the eggs of the various lepidopterous pests of sugar-cane, it is reasonable to suggest that the name "*beneficiens*" be restricted to an insect known to be bred from *Diatræa striatalis* Sn., and agreeing tolerably well with Zehntner's figure and description. The species which I propose to call "*beneficiens*" satisfies both these requirements. Accordingly, all references to *Telenomus beneficiens* Z. as having been bred from hosts other than *Diatræa striatalis* Sn. (now *venosata* Walk.) must be regarded as of doubtful value unless they can be shown to refer to the species defined below:—

♀.—Legs, except front coxæ, and scape bright yellow throughout; basal segments of the funicle hardly paler than the rest.

*Head*, seen from the side and from above, rather large in proportion to the size of the insect; seen from above it does not give the impression of being at all strongly transverse. Frons unusually strongly convex. Vertex only feebly rounded between the ocelli and the occipital margin; the latter obliterated at what would be its highest point. Eyes small (*cf.* key). Antennæ: funicle 1 and 2 not at all longer than wide; 5 clearly nearer in size to 4 than to 6, so that, if size alone of segments be considered, the club is 4-segmented (fig. 7, f).

*Thorax* a little narrower than the head and distinctly longer than wide, about 14:11. Mesonotum somewhat flattened and with the usual vague scaly-reticulate sculpture, which, however, is stronger and more even than in *dignus* and *rowani*, giving the mesonotum a duller surface than in these two species. Fore wings less yellowish than in *dignus*, *rowani*, and *sorus*, the venation greyish, more sharply defined. Basal segment of the hind tarsus half the length of the tibia, almost exactly 1:2.

*Abdomen* less than twice as long as its greatest width, about 17:10. Tergite 1 with deep costæ nearly to apex; 2 with extremely short, radiating striations at base.

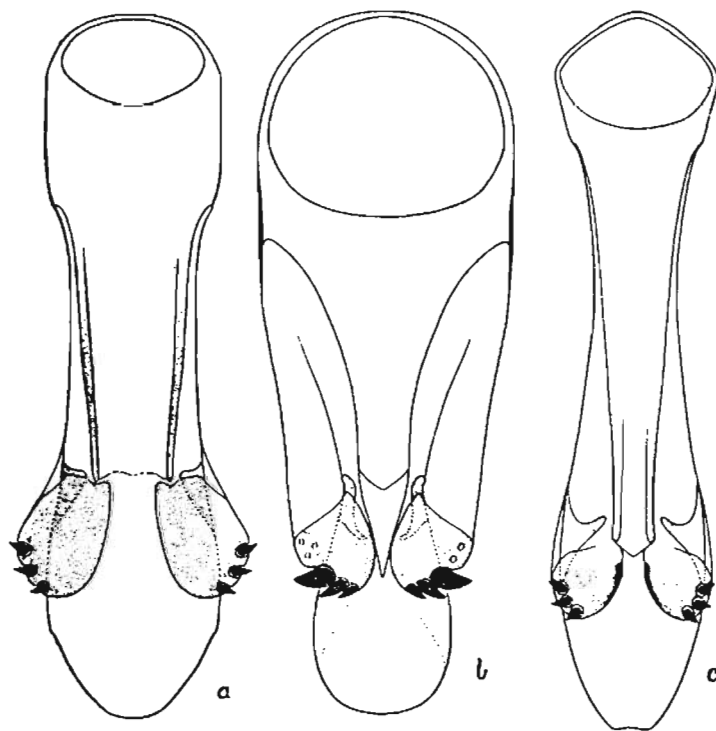
♂.—Antennæ of usual form; funicle 1–3 longer than the following segments, but hardly wider. Genitalia

very distinctive (fig. 9, *b*); the outer tooth of the articulated appendages is much larger than the two inner ones; this disparity in size is unique in my experience; the shape of the entire structure is characteristic and unusual.

Length: ♂♀, .7 mm.

W. JAVA (Cheribon), Jan. 1937; series containing both sexes bred from eggs of *Diatraea venosata* Wlk. (*striatalis* Sn.).

Fig. 9.



Male genitalia of (a) *Telenomus triptus*, sp. n.;  
(b) *T. beneficiens* Zehntner; (c) *T. pontus*, sp. n.

*Telenomus beneficiens* Z., as I have interpreted it, is characterized in both sexes by a combination of yellow legs, swollen frons, and rather strong mesonotal sculpture. The facies, too, is distinctive, and the genitalia of the male, as already pointed out, is remarkable.

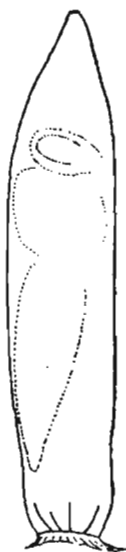
According to Zehntner the parasites develop singly in the eggs of the host.

*Telenomus pontus*, sp. n. (Fig. 8, a.)

♀.—Black. Legs not bright yellow, though predominately yellowish; all the femora very slightly darkened.

Head not strongly transverse, approaching a subcubical condition. Eyes large, the shortest distance between them equal to their width, as seen from above. Postorbital margin rather strongly raised. Antennæ (fig. 7, d).

Fig. 10.



Egg of host of *Telenomus pontus*, sp. n., showing parasite within.

The vertex is rather deeply hollowed out; the occipital margin does not approach so closely to the top of the vertex as in *dignus* and its close allies, so that the vertex has a short but well-defined posterior (declivous) surface.

Thorax somewhat elongate. Mesonotum weakly shining, rather strongly convex, its sculpture very feeble and indeterminate. Hind leg (fig. 5, b).

*Abdomen* only very slightly narrower than the thorax, not noticeably so, a little more than twice as long as wide. Tergite 1 with well-marked longitudinal costæ right across; 2 very distinctly striate at extreme base.

♂. Form somewhat exaggerated. Body blackish brown, the head still paler, inclining to yellowish brown. Antennæ: scape of usual form, but funicle very short, segments 4-9 being very close together and more transverse than usual (fig. 7, e). Fore wings (fig. 12, a). Basal tarsal segment not at all dilated (fig. 5, a). Genitalia (fig. 9, c); proximal to middle, this structure is rather heavily sclerotized.

Length: ♂, .8 mm., ♀, .85 mm.

SOLOMON IS.: Guadalcanal, Rere (*R. A. Lever*); series bred, 14. viii. 1934, from undetermined eggs on leaf of a Monocotyledonous plant. Fig. 10 shows one of these eggs, which are possibly those of a Dipteron, with the parasite inside.

This species appears to be characterized in the female sex chiefly by its elongate form and shape of head. The male antennæ are distinctive.

*Telenomus perplexus*, sp. n. (Fig. 8, h.)

♀.—This little species has the head considerably wider than the thorax and rather large in proportion to this, 23:19. Vertex in the neighbourhood of the ocelli with some rather large well-defined punctures. Eyes large, occupying more or less the entire lateral surface of the head—that is, the temples behind them cut away very sharply. Occipital margin distinct only at sides of occiput, fading out more or less completely before reaching the temples; the sharp angulation between the vertex and the occiput is defined by a more or less distinct ridge. Antennæ (fig. 3, a): pedicel and first four segments of funicle pale yellow like the scape.

*Thorax* only slightly longer than wide, 23:19. Mesonotum shining, vaguely scaly-reticulate. Wings: stigmalis pale and indistinct; fringe of hind wing at widest part of wing fully as long as the width of the wing there.

*Abdomen*: striations of tergite 1 difficult to make out owing to the pale colour of the segment, but apparently not well developed; 2 with some extremely short striations extending slightly beyond the basal foveæ.

♂.—Antennæ very distinctly clavate (fig. 3, b); funi-

cular segments 5-9 very distinctly transverse. Genitalia (fig. 11, a).

Length: ♂♀, .5-.55 mm.

MALAYA: Ulu Sali Road (G. H. Corbett); series containing both sexes bred, 16. v. 1935, from lepidopterous eggs.

This species is characterized chiefly by general facies, colour, and absence, in part, of occipital margin. It is curious that in general appearance it exactly resembles *Telenomus (Aholcus) ulusalus* Nixon\*, which was also bred from lepidopterous eggs by Mr. Corbett at the same time and place. The males of the two species have a strongly clavate funicle; this in itself is an unusual feature in *Telenomus*. The genitalia of the males, however, though similar in general outline, show obvious differences in details of structure, as a comparison of the figures will show.

*Telenomus remus*, sp. n. (Fig. 8, b.)

This is a small obscure looking insect, with dark legs, and is not at all sharply characterized.

♀.—Antennæ predominately blackish throughout. Legs brown, with the tarsi paler,

*Head* markedly transverse, wider than the thorax. Vertex without a posterior (declivous) surface, and, when the head is seen directly from above (along a line perpendicular to a line between the posterior ocelli), the occipital margin almost touches an imaginary line drawn between the posterior ocelli. Eyes not very large, the shortest distance between them fully  $1\frac{1}{2}$  times their width as seen from above. Vertex between the ocelli almost smooth. Antennæ: funicle 1-4 very small, bead-like, much narrower than the pedicel; 6-8 subequal in size, so that the club is more or less 4-segmented (fig. 3, d).

*Thorax* raised high above the level of the abdomen. Mesonotum evenly convex, feebly shining and with only the usual very weak sculpture. Fore wings somewhat greyish; stigmalis short; fringe of hind wing at greatest width of wing considerably greater than the width of the wing there; furthermore, the hind wing is very narrow beyond the nervature.

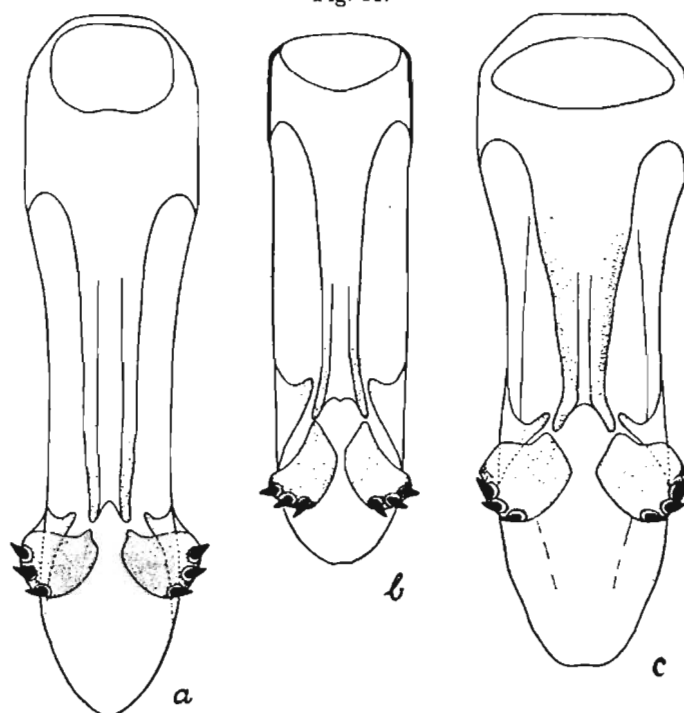
*Abdomen* small in comparison with the size of the thorax, narrower and only a little longer than the latter. Tergite

\* 1937. Ann. & Mag. Nat. Hist. (10) vol. xx. p. 119.

1 with well-marked costæ; 2 striate only at extreme base.

♂.—Legs paler than in the ♀, inclining to yellowish. Antennæ pale brownish; funicle slightly thickened towards apex; segments 4–9 of funicle slightly transverse (fig. 3, c). Genitalia (fig. 11, c) rather short and broad,

Fig. 11.



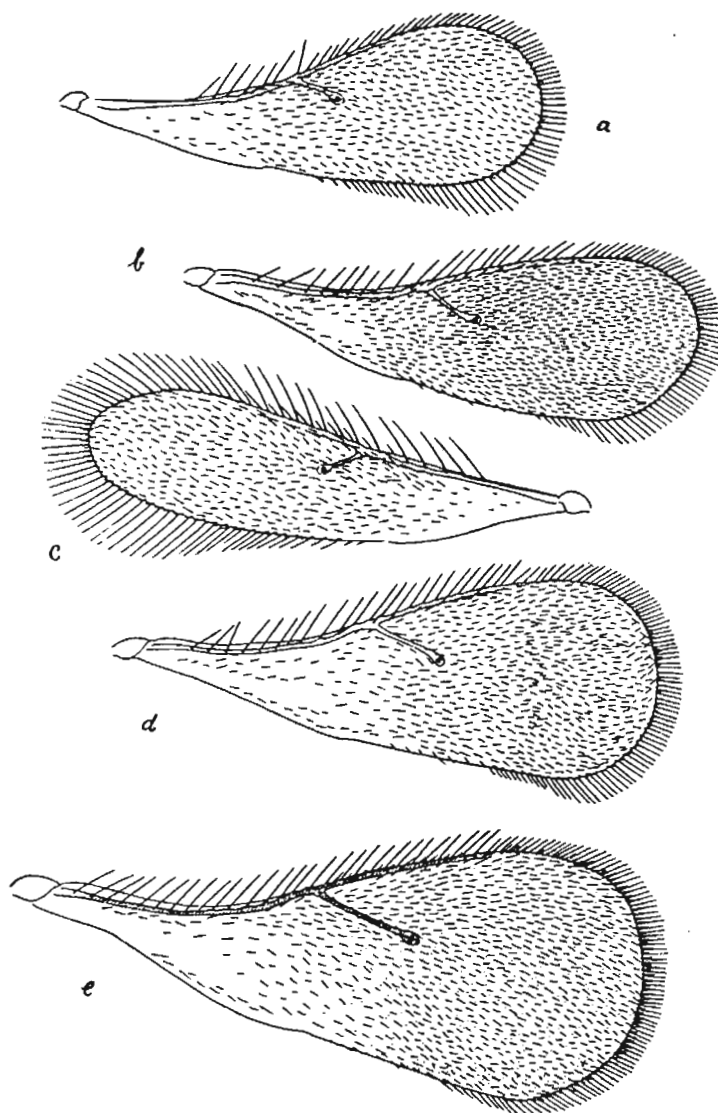
Male genitalia of (a) *Telenomus perplexus*, sp. n.; (b) *T. tirathabæ* Ferrière; c, *T. remus*, sp. n.

distinctive in comparison with those of the other species dealt with in this paper.

Length: ♂♀, .55 mm.

MALAYA: Ulu Gombak, type-loc. (G. H. Corbett); large series bred, 12. xi. 1929, from egg-mass of ? *Spodoptera* sp. Kuala Lumpur: series bred, 15. ix. 1927, from eggs of *Spodoptera mauritia* Boisd., and 12. ix. 1928, series from eggs of Noctuid moth, probably *Prodenia* sp., on the rain-tree, *Samanea saman* (Jacq.) Merrill.

Fig. 12.



Fore wing of (a) *Telenomus pontus*, sp. n., ♂; (b) *T. triptus*, sp. n., ♀; (c) *T. rowani*, Gahan ♂; (d) *T. lucullus*, sp. n., ♀; (e) *T. letus*, sp. n., ♀.

This species is probably *Telenomus spodopteræ* Dodd \*, which was described from four females labelled "from eggs of a moth *Spodoptera* sp. on sugar beet, Kreet, Java, 23. 7. 1913." Except for the fore wings, which, as described, are too narrow for *remus*, Dodd's description of *spodopteræ* fits the present species very well. It is, however, so short that I am reluctant to use his name.

The figure of the male genitalia was drawn from three preparations made from specimens belonging to the first series (Ulu Gombak) and one taken from the last-mentioned series (ex *Prodenia* sp.). Although the hosts belong to different though closely related moths, I have been unable to find any differences in the two series of parasites.

*Telenomus tirathabæ* Ferrière.

1933. *Stylops*, vol. ii. part 5, p. 106.

This little species is very similar in several details to *remus*, but is easily separable from the latter insect as follows :—

*Head* not obviously wider than the thorax and much less transverse (cf. fig. of *remus*). Eyes larger, the shortest distance between them compared with their width, as seen from above, as 4 : 3. Antennæ hardly different, but pedicel slightly less thick in proportion to funicle 1 than in *remus*. Vertex, as in *remus*, without a posterior (declivous) surface, the occipital margin, itself very feeble, reaching to the top of the vertex.

♂.—Genitalia (fig. 11, b) easily distinguishable from those of the preceding species.

Length: ♂♀, .5 mm.

The original description of *tirathabæ* has the following data :—"Java, Buitenzorg, 18 ♀♀, 22 ♂♂, from eggs of *Tirathaba* sp."

*List of Hosts of Telenomus mentioned.*

HEMIPTERA.

1. *Nezara viridula* Fab. . . . . *T. cyrus*, sp. n.
2. *Scotinophara coarctata* Fab. . . . . *T. triptus*, sp. n.

LEPIDOPTERA.

1. *Attacus atlas* L. . . . . *T. attaci*, sp. n.
2. *Diatræa striatalis* Sn. . . . . *T. beneficiens* Zehntner.

\* 1914. *Arch. Naturg.* vol. lxxx. p. 164.

- |   |  |
|---|--|
| 3. <i>Philo</i> sp. ....  | <i>T. sorus</i> , sp. n.                             |
| 4. <i>Prodenia</i> sp. ....   | <i>T. remus</i> , sp. n.                             |
| 5. <i>Schænobius bipunctifer</i> Wlk.<br>(= <i>incertellus</i> Wlk.). | { <i>T. rowani</i> Gahan.<br><i>T. dignus</i> Gahan. |
| 6. <i>Scirpophaga auriflua</i> Zell. var.<br><i>intacta</i> Sn.       | { <i>T. dignoides</i> , sp. n.                       |
| 7. <i>Spodoptera</i> sp. ....   | <i>T. remus</i> , sp. n.                             |
| 8. <i>Tirathaba</i> sp. ....  | <i>T. tirathabæ</i> Ferrière.                        |