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With Two Plates.

Hymenoptera — Chalcidoidea
" Proctotrupoidea

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The interesting material which led to the preparation of the present paper was obtained by Professor W. M. Wheeler during the summer of 1920, when he visited the Tropical Research Station maintained by the New York Zoölogical Society under the direction of Mr. William Beebe at Kartabo, British Guiana. While exploring the forest in the vicinity of the laboratory he found upon the surface of some freshly cut stumps of trees, numbers of a minute species of gall-midge, the females of which were ovipositing in the lumen of exposed vessels of the wood. The larvæ of these midges undoubtedly feed within the vessels and their presence attracts swarms of very small Hymenopterous parasites of the family Platygastridæ, which are seen scattered over the moist, freshly cut surface depositing their eggs within the bodies of the midge larvæ upon which they are parasitic. Professor Wheeler secured specimens of the midges and a large series of the parasites which he very kindly turned over to me, thinking that they would prove of interest on account of the extremely long abdomen possessed by some of the parasites, whereby they are enabled to deposit their eggs in the host larvæ within the vessels, well below the surface of the wood. The midges are similarly modified for this purpose as the apical abdominal segments are very slender and form an extrusible tubular ovipositor which can also be inserted into the interstices of the woody tissue. Dr. E. P. Felt has been so good as to examine the midges and informs me that they are probably referable to the genus Janetiella Kieffer, although a knowledge of the male might show them to represent a new genus. Felt ('18) lists a number of North American species of Janetiella that produce galls on very diverse plants (Pinaceæ, Vitaceæ and Myricaceæ) and one that occurs under decaying bark of chestnut, but cites no zoöphagous forms. Janetiella occurs in Europe and both North and South America.

The parasites proved to be of much greater interest than had been

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[1] Contribution from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 196.

anticipated, due not only to their strangely modified egg-laying apparatus but on account of a type of variation which they exhibit that appears to be quite different from any hitherto reported among the females of insects.

Previous to a careful examination it appeared probable that two species were represented in the series, one with the abdomen lengthened to a varying degree in different individuals and a second with the abdomen short like that of most genera of Platygastridæ. Closer study has shown, however, that no less than six species, distributed in as many genera, are included, in addition to some males which I cannot associate with the females of any of the species in the lot.

These forms from Kartabo, described on a later page, are as follows:

Polymecus (Dolichotrypes) minor sp. nov.
Synopeas meridionalis sp. nov.
Gastrotrypes spatulatus gen. et sp. nov.
Polygnotus simplex sp. nov.
Platygaster tubulosa sp. nov.
Isostasius crassus sp. nov.

Three of them, Dolichotrypes, Gastrotrypes and Platygaster have the apical portion of the abdomen, the ovipositor, or both, lengthened and modified to reach their hosts within the wood, while the others are apparently in no way specially adapted to the habits of the host. The latter must, therefore, be able to parasitize only host larvæ which are feeding very close to the surface of the wood unless they may have active first-stage larvæ, but this does not seem probable, since no planidium forms or other free-living larvæ are known to occur within the family.[1]

In 1911 Crawford and Bradley ('11) described the genus Dolichotrypes in which they placed a single North American species, *D. hopkinsi*. This remarkable insect had been first collected in West Virginia by Dr. Hopkins who found the females supposedly ovipositing in the bodies of dipterous larvæ living in a stump. Later, in 1897, Professor J. H. Comstock found the same species near Ithaca, New York. He noted them in large numbers, the "females busily inserting the long part of the abdomen into the intercellular spaces of the wood near the bark. They were confined to the outer two inches of the

[1] The larvæ of some other species of Polygnotus, Platygaster and Synopeas which have been observed are cyclopoid when first hatched, *cf.* Marchal, '04, Marchal '06, Richardson '14.

wood." That the insect occurs generally about Ithaca is evident as it was again taken by Prof. C. R. Crosby in 1910. My own first acquaintance with Dolichotrypes was during the summer of 1911 when Mr. W. F. Fiske, then director of the Gipsy-moth Laboratory at Melrose, Mass., gave me several vials containing numerous specimens of minute Platygastridæ that he had collected upon freshly cut stumps not far from his laboratory. He was quite certain that the females were ovipositing in objects concealed within the wood, and from the known habits of numerous related genera, surmised that Dolichotrypes attacks the larvæ of some Itonidid midge. [1]

At the time I noticed that there was a great variation in the size and appearance of Mr. Fiske's specimens and on having them mounted, found that more than one species was represented. This material received no further study, however, till Professor Wheeler showed me the series of similar insects obtained at Kartabo. A re-examination of my New England material then showed the presence of not only Dolichotrypes, but also of two of the other genera found at Kartabo. Mr. Fiske's material then, includes the following:

Polymecus (**Dolichotrypes**) **hopkinsi** Bradley & Crawford.
Synopeas sp. (perhaps **S. cornicola** Ashm.).
Gastrotrypes caudatus sp. nov.

I found no males, and there appears to be considerable doubt also, whether the males of Dolichotrypes described and figured by Bradley and Crawford ('11) are really such. This is a minor matter, however, in the present connection, as the interesting points here dealt with relate to the females.

If one examines a large series of *Dolichotrypes minor* under the microscope it is at once evident that the individuals vary greatly in length, and that this variation is confined almost entirely to the apical segments of the abdomen. The head, thorax and the first three abdominal segments which form the gaster are uniform in conformation and equal in size, apart from the small differences which are always exhibited even by the least variable insects. Among the Platygastridæ in particular, variations in body size are usually well marked as the species are parasites of the larvæ of Diptera, and they reflect not only the intraspecific variability of the host, but also to some extent, its change

1 Since then the genus Dolichotrypes has been found in Australia by Dodd who described ('16) a species from Queensland. The single female known was taken on foliage of sugar-cane.

in size due to age at the time of parasitization. Such variation is always more pronounced among the parasites of insect larvæ than is the case with egg-parasites where the food supply of each individual parasite is more evenly apportioned (*e.g.*, in the related family Scelionidæ).

As can be seen from the diagrammatic sketches shown in Figure 1, the variability in size of the gaster is quite noticeable, but not excessive. The following segments (four to six) show enormous differences not

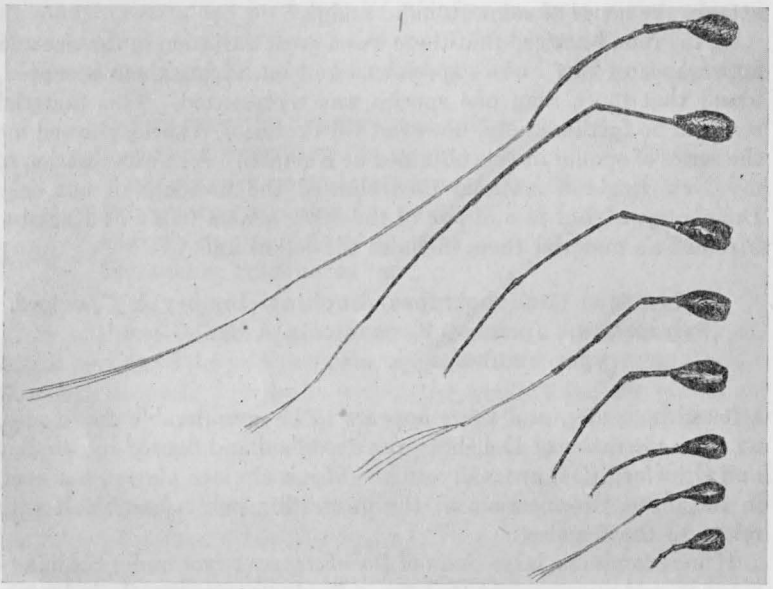

FIGURE 1. *Polymecus* (*Dolichotrypes*) *minor* sp. nov. Diagrammatic views in profile of the abdomen of a selected series of females.

only in actual length but also in proportionate length in any selected series. Of these, segments four, five and six are black and heavily chitinized, while the seventh or apical one is membranous and almost hyaline. Beyond it, extends the ovipositor and its two sheaths which may be exserted to great length or very nearly concealed within the body. Taken together, these elongated segments resemble the telescopic arrangement of parts seen in many insects and other animals. In fact the abdomen of all insects is built upon this principle as its

extension and retraction depends upon slight telescopic movements of the sclerites permitted by the infolded membranes which connect their adjacent edges. In a greatly exaggerated form this type of construction is by no means rare; it occurs in the apical part of the abdomen of the higher Diptera, in the midge upon which Dolichotrypes is parasitic, in the Serphoid Scorpioteleia, referred to on a later page, and quite frequently in association with the ovipositor of various insects.

Careful dissections of the abdomen of Dolichotrypes show, however, that only the membranous apical segment is extrusible and retractile in response to muscular impulsion. The basal tubular segments (4, 5 and 6) are of a fixed length in each individual insect although one segment may be eight or ten times as long in one specimen as the corresponding one in another example. Furthermore, it is impossible to segregate a large series of individuals into classes, based on length of segments as the proportionate lengths are not constant, although there is a well-marked tendency for all to be either long, short, of medium length, etc.

The reasons for believing that the lengths of the chitinized segments cannot be changed by muscular action are very clear. The individuals do not show any segments in which the chitinized basal end is telescoped within the apex of the preceding segment, nor do any of them show an elongation of the intersegmental membranes. In all cases the exposed portions are black and thickly chitinized, but no hardened portions remain concealed. It is evident, therefore, that the segmental lengths of adults are fixed and that they have been determined previous to the hardening of the exoskeleton which occurs soon after the insects have undergone their last ecdysis from pupa to imago. Whether it occurs at the time of pupation cannot be stated definitely as no pupæ have been observed, but as the form of such parts is usually determined at that time there is no reason to believe otherwise in this case. It seems probable, therefore, that the ultimate form of the abdomen is determined when the pupa is first formed, after which pigmentation and chitinization develop slowly.

It is noticeable in specimens with extremely long fourth segment that this segment is just long enough, if it could be retracted within the body, to reach to the anterior region of the thorax as is the case with the ovipositor in Inostemma.[1] Such is also true in most of the long-tailed individuals with regard to the length of the membranous seventh segment which when exserted equals approximately the sum

[1] The condition of the ovipositor in this genus is discussed on a later page (p. 280).

of the lengths of the more anterior parts of the abdomen and the thorax. In other genera (*e.g.*, Scorpioteleia, p. 279) with similar parasitic habits, the apical portion of the abdomen consists of long tubular slender segments which telescope one within another, but remain movable during life. In Dolichotrypes a precocious extrusion of the segments at the time of pupation would lead to their chitinization and fixation at whatever length they happened to have been protruded. I am therefore inclined to believe that the polymorphic conformation of the abdomen of the imago is actually determined by the individual insect at the time it pupates and that the process is by no means an entirely passive one.

Nevertheless, the condition of the abdomen in Dolichotrypes recalls the high and low males of other insects (*e.g.*, certain Dermaptera and lamellicorn beetles) well known to entomologists and subjected to statistical study by Bateson, '92). That this dimorphism may be due to Sporozoan parasites was suggested by Giard ('94), but however plausible and attractive this hypothesis may appear, it seems, at least in the case of the earwigs, to be disproved by the findings of Brindley and Potts ('10) and of Brindley ('18) as these authors found no such correlation between gregarine parasites and the high and low males of *Forficula auricularia*. So far as Dolichotrypes is concerned such an explanation undoubtedly cannot apply. I have been unable to find any Protozoan or bacterial parasites in them and, moreover, as such endoparasitic species do not have extensive opportunity to acquire microörganisms they are never generally supplied with them, and stand in marked contrast to the free living earwigs, termites, lamellicorn beetles, *et al.*

As already indicated, one of the species of Dolichotrypes and most of those belonging to the other genera are new to science so that it has been necessary to include a taxonomic account of these. This is given below.

Polymecus (Dolichotrypes) minor sp. nov.

♀. Length 0.8 mm., exclusive of the 4th, 5th and 6th abdominal segments; these together fully exserted 3 mm., and fully retracted 0.4 mm.; the hyaline 7th segment extrusible to 1.5 mm., rarely to 2.5 mm., filaments of ovipositor extrusible to 2 mm., rarely a little more. Black, with the basal half of the scape, the coxæ, and the legs, except the thickened parts of the tibiæ and femora, brownish yellow. Wings entirely hyaline. Head, oval, fully twice as wide as thick, the occiput more convex than the front; ocelli in a curved line, the lateral ones one-half as far from the eye-margin as from the median one. Head

shagreened, more densely so above. Eyes bare; malar space half as long as the eye, without furrow. Antennæ 10-jointed; scape half as long as the pedicel and flagellum together, much thickened apically; pedicel narrow at base, twice as long as thick; four funicle joints much more slender than the pedicel, the first and fourth short, quadrate, and the second and third considerably longer than thick; club 4-jointed, joints of about equal length, as broad as long. Mesonotum shining, very delicately shagreened, distinctly longer than wide; parapsidal furrows obsolete, indicated only by a depressed spot on the hind margin of the mesonotum; basal scutellar groove narrow, but deep. Scutellum highly convex, with a short, slightly curved and upturned thorn at apex. Pro- and mesopleuræ smooth and shining; metapleura punctate and densely hairy, as is also the first abdominal segment; lateral angle of propodeum with a long, straight, backwardly and outwardly directed slender spine. Second segment of abdomen almost as broad and as long as the thorax, polished, with scattered, short, white bristles; broadest just before the middle; third minutely punctured, narrowed apically, the tip only one-fourth as wide as the base of the second. In fully extruded specimens the following segments are very slender, and proportioned as follows, fourth as long as the remainder of the body, the fifth and sixth each as long as the body, including the third segment. In retracted specimens the fourth segment may be only half as long as the second and the fifth and sixth each not over one-half to two-thirds as long as the second. The ovipositor is rarely extruded to any extent, except in otherwise greatly extended examples. Fourth to sixth segments shining, but under high magnification, distinctly scabrous; on these segments the sharp lateral edge is visible, but becomes obsolete on the second, except at the extreme base. Fore wing with only very minute marginal cilia; disc hairy, the hairs large and sparse, forming indistinct lines; basal third with minute hairs. Hind wing with two frenulum hooks.

Type and numerous paratypes from Kartabo, British Guiana, August 20 and 21, 1920, ovipositing as previously described in a cut stump, containing larvæ of the Itonidid, Janetiella sp.

This species differs from *D. hopkinsi* Crawford and Bradley ('11) by its much smaller size, almost entirely obsolete parapsidal furrows and somewhat different color. The club of the antenna and the fifth and sixth segments [1] of the abdomen are entirely black, not brown as in the North American species.

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[1] Not the fourth and fifth as stated by Crawford and Bradley; the third is short and narrow and so closely attached to the second that they have considered it as a part of the latter.

Polymecus (Dolichotrypes) hopkinsi Crawford & Bradley ('11, p. 124).

Mr. W. F. Fiske obtained numerous females of this species on May 19 near Boston, on cut stumps, behaving as described by Crawford and Bradley. From some of his specimens which he kindly gave me at the time, I have been able to compare the South and the North American species.

The genus Dolichotrypes is probably not distinct from Polymecus according to Mr. Fouts who has given much time to taxonomic studies in this family. I have retained it above in subgeneric form to include the two species here dealt with. Other species of Polymecus have the apical prolongation of the abdomen to a lesser degree as do also some species in other genera such as Sactogaster. In addition to the "tail," the females of the latter genus possesses a sac-like enlargement of the venter probably associated with the egg-laying apparatus. A European species was bred more than half a century ago by Winnertz ('53) from *Contarinia* (*Cecidomyia*) *pisi*, but further observations on this interesting genus do not appear to have been made.

In two other Serphoid families there is a somewhat similar ventral swelling of the second segment which extends forwards; the Diapriid Cardiopria Dodd and the Belytids Acanosema Kieffer and Cardiospilus Kieffer are thus modified.

Gastrotrypes, gen. nov.

Antennæ 9-jointed, with a minute hyaline joint-like connection in addition, between the pedicel and first flagellar joint. Maxillary palpi consisting of two equal, elongate joints; labial palpi one-jointed, elongate. Head about twice as broad as thick, a little wider than the thorax. Ocelli in a broad triangle, the lateral ones much closer to the eye than to the median ocellus. Parapsidal furrows wanting. Scutellum highly convex, without spine, not deeply separated from the mesonotum which bears a large shallow impression at each side behind; pubescent, especially at the sides apically. Abdomen with the first four segments forming an oval mass; second segment quadrate; third and fourth short, much narrowed; fifth very narrow, sometimes very much elongated; sixth segment membranous, very slender, capable of being greatly extruded. Wings veinless, with very weak discal hairs; with prominent marginal cilia apically behind.

Type species: *G. spatulatus* sp. nov.; other included species: *G. caudatus* sp. nov.

Gastrotrypes spatulatus sp. nov.

♀. Length 0.8–1.20 mm., exclusive of the very slender hyaline apical portion of the abdomen which may be entirely withdrawn or extruded to a length of slightly more than that of the body; true ovipositor very short, never extruded for more than a very short distance beyond the hyaline tube which comprises the sixth and seventh segments, although in many specimens it appears to consist of only a single segment, the sixth. Black; antennal scape honey-yellow, except more or less at apex; legs honey-yellow, hind coxæ sometimes darker; hind femora and tibiæ infuscated apically, also sometimes the femora and tibiæ of the other legs. Head, seen from above oval, slightly, but distinctly more than twice as broad as thick. Ocelli large, the lateral ones removed by somewhat less than their own diameter from the eye-margin, surface of head shining, the vertex and sides of the front shagreened, but the front almost entirely smooth medially; head behind and cheeks, smooth; malar space rather long, more than half the width of the eye, smooth and polished, without furrow. Antennæ nine-jointed, not taking into account a minute hyaline connection between the pedicel and first flagellar joint; scape about half as long as the remaining joints together; pedicel short, one-half longer than wide; first flagellar joint slightly longer than the second, nearly twice as long as thick; third very small, half as long and half as thick as the second; club 4-jointed, rather stout, the joints as long as broad, except the last which is more elongate. Mesonotum shining, sparsely clothed with pale appressed hairs laterally; without parapsidal furrows; much narrowed anteriorly, with the pleuræ largely visible from above. Scutellum not separated by a basal groove, but with a large pubescent fovea at each side; strongly convex, the posterior portion obliquely sloping, almost truncate; entire surface densely hairy and apparently closely punctate beneath the hairs. First four abdominal segments smooth, forming an oval mass as long as the thorax; first segment short, campanulate, with a deep fovea at each side, densely pubescent, except above; medially with a median groove which receives a corresponding ridge on the propodeum when the abdomen is bent upwards; second segment as long as wide, broadest behind, one half longer than the third and fourth together; third and fourth sharply narrowed, of equal length; fifth segment longitudinally aciculate, slightly longer than the fourth, only one-fifth as wide as the second segment, its sides parallel, except on the narrowed apical half; from its apex projects the hyaline sixth segment which is scarcely

thicker than the posterior tarsi. Pleuræ smooth, the metapleuræ behind densely clothed with backwardly directed pale hairs. Wings hyaline, with a well-developed marginal fringe apically below; disc with very minute hairs; hind wing with two frenulum hooks.

Type and numerous paratypes from Kartabo, British Guiana (W. M. Wheeler).

The color of the legs in this species varies as in *Synopeas meridionalis*, but the variation is continuous and no color forms are distinguishable.

Gastrotrypes caudatus sp. nov.

♀. Length 2.5 mm., including the long stylate apical segment of the abdomen which is nearly as long as the remainder of the body. Black, the wings hyaline, the antennæ and legs, including coxæ, brownish yellow; upperside of antennæ, especially the apex of scape and the club and the thickened parts of the femora infuscated. Head seen from above twice as wide as thick, shining and almost smooth, the occiput faintly transversely striate and separated from the vertex by a distinct, very fine, raised line; lateral ocelli twice as far from the median one as from the eye margin. Antennæ 9-jointed, the scape rather slender, more than half the length of the flagellum; pedicel small, narrower and one-third shorter than the first flagellar joint; first flagellar twice as long as thick, considerably longer than the third; fourth minute, narrowed at base, about as long as wide; club 4-jointed, first joint longest, twice as long as thick, following subequal, each shorter and somewhat thicker than the first; malar space nearly as long as the width of the eye. Mesonotum smooth and shining, with a band of sparse appressed pale hairs on each side of the middle; parapsidal furrows entirely absent; behind with a transverse impression on each side at the base of the scutellum, densely clothed with pale hairs. Scutellum highly convex at the middle, obliquely sloped behind and finely, densely punctate beneath a mat of woolly hair. Pro- and mesopleuræ smooth and highly polished, metapleura with backwardly directed pale hairs. Propodeum angularly produced laterally and medially with a tubercle which corresponds to a central impression on the dorsal surface of the first abdominal segment. Body of abdomen ovate, nearly as long as the head and thorax together, consisting of four segments; first segment about as wide as long, much narrowed basally, its posterior edge set into the base of the second; medially with a quadrate impression and woolly laterally; second segment as long as wide, broadest behind the middle; its basal margin produced

forward at the sides and also medially, so that it is bisinuate, on each side of the middle basally with about five fine longitudinal striæ that extend nearly half way to apex; third and fourth segments evenly narrowed to the base of the stylate fifth; third twice as wide as long; fourth triangular, as long as broad; fifth of even width throughout, ten or twelve times as long as broad; apical segments membranous, very slender, usually retracted but in one specimen exserted to a length equally the entire length of the body; filaments of ovipositor not much extruded. Fore wings without marginal cilia; hind wing with two frenulum hooks.

Type and numerous paratypes obtained by Mr. W. F. Fiske on stumps of freshly cut trees in the environs of Boston, Mass., on May 19, 1911.

This species is very much larger than the preceding South American *G. spatulatus* described on a previous page, the fifth abdominal segment is much longer and more slender and the sculpture of the second segment is quite different. The length of the fifth segment gives it quite a different appearance, but as most of the important structural characters are similar in the two forms, I believe that they should be considered to be congeneric.

This species was found associated with Dolichotrypes by Mr. Fiske, but does not seem to have been represented in the material examined by Crawford and Bradley when they described the latter ('11).

Synopeas meridionalis sp. nov.

♀. Length 0.7–0.8 mm.; occasional specimens from 0.6–0.9 mm. Black; with the basal half of scape, trochanters base of femora and tibiæ deep yellow; front and middle tarsi whitish, posterior ones infuscated; thickened apical parts of femora and tibiæ piceous; coxæ piceous, the hind ones somewhat lighter; wings hyaline. Head, seen from above, broadly oval, twice as broad as thick; shagreened above, less distinctly so and more shining on the front; lateral ocelli twice as far from the median one as from the eye margin; malar space as long as half the width of the eye; cheeks and back of head distinctly shagreened. Antennæ 10-jointed; scape nearly half as long as the remaining joints together, strongly thickened apically; pedicel as long as the width of the scape, nearly twice as long as thick; basal four joints of flagellum slender, the first and fourth but little longer than thick, second and third longer, but less than twice as long as thick; four club-joints broad, each about as long as thick, oblique.

Mesothorax as broad as long; the mesonotum strongly convex, shining, faintly shagreened, with only very slight traces of parapsidal furrows anteriorly; scutellum triangular in outline, highly convex and separated from the mesonotum by a deep, narrow groove, terminated by a short spine or thorn at the apex. This thorn is straight or slightly curved downward at tip and projects horizontally in the plane of the upper surface of the thorax; below it near the upper edge of the propodeum on each side is another backwardly projecting spine of very slender form which is more or less concealed in dried specimens by the dense white backwardly directed hairs that cover the propodeum; upper surface of thorax sparsely covered by short sparse white appressed hairs. Pro- and mesopleuræ smooth and highly polished, bare. Abdomen short, ovate, no longer than the thorax, highly polished, with a few minute appressed white hairs; lateral carina distinct; first segment densely white woolly pubescent on the sides, but bare medially above; second segment one-third longer than the remaining ones together, widest just before apex, almost as wide as long; remaining segments very rapidly narrower; third and fourth extremely short, fifth noticeably longer; sixth triangular, as long as the three preceding. Ovipositor very short, never exserted for more than one-third the length of the abdomen; third, fourth and fifth segments occasionally exserted to twice the extent described above. Wings with only extremely minute marginal cilia; disc with rather sparse strong hairs which form very irregular lines; base with very minute hairs; anterior and posterior margins bare near the middle of the wing. Frenulum consisting of two hooks.

Type and numerous paratypes from Kartabo, British Guiana (W. M. Wheeler).

Synopeas meridionalis var. **clara** var. nov.

♀. Length the same as the typical form. Differs by the entirely yellow antennal scape and yellow coxæ and legs, with only the thickened part of the hind femora and the hind tarsi, infuscated. Rarely the hind femora are slightly darkened at tips, but there are no intergrades in the many specimens of both forms before me.

The typical form and the pale variety are about equally numerous in the series and the variety averages a trifle larger in size.

This species differs from the North American form with similar habits, perhaps *S. cornicola* Ashm., mentioned on a later page in the following characters: it is considerably smaller, the lateral ocelli are closer to the eye-margin, and the parapsidal furrows are not complete.

Synopeas (?) cornicola Ashm. ('93, p. 288).

With Dolichotrypes and Gastrotrypes, Mr. Fiske took several specimens which apparently belong to this species, so far as Ashmead's original description is concerned. His types of *S. cornicola* were reared from an Itonidid gall on *Cornus paniculata*, however, which suggests that the present form is probably distinct. These specimens are very much like the species from British Guiana (*S. meridionalis*) but considerably larger and otherwise specifically distinct.

Polygnotus simplex sp. nov.

♀. Length 0.8–0.9 mm. Black; antennal scape honey-yellow, darkened toward apex; legs honey-yellow, the coxæ piceous and the femora, especially the hind ones infuscated; hind tibiæ and sometimes the other tibiæ also, darkened at tips. Head very much flattened, seen from above nearly three times as broad as long; lateral ocelli nearly as close to the median one as to the eye-margin; head behind the ocelli transversely aciculate; front smooth and polished; malar space long, fully half the width of the eye, faintly shagreened as is also the head behind the eyes. Antennæ 10-jointed; scape stout, not much thickened apically, half the length of the remaining joints together; pedicel elongate, nearly twice as long as thick; first flagellar joint small, pale colored; half as long and half as thick as the pedicel; second and third larger, nearly equal, each a little longer than thick; remaining five forming a rather slender club of which the basal joint is smaller and the last longer than the intermediate more or less quadrate ones. Mesonotum convex, smooth, without furrows, thinly clothed with appressed pale hairs. Scutellum very highly convex, separated at base by a narrow groove, with a large oval impression at each side; its surface finely and shallowly punctate-reticulate. Abdomen elongate ovate, widest near the apex of the second segment. First segment quadrate, as long as the scutellum, coarsely longitudinally fluted; second considerably longer than wide, twice as long as the following segments together, with several short grooves medially at base and a large cuneate basal impression near each side at base; third and fourth equal, each very short; fifth small, triangular, but longer than the fourth; terminal segments not exserted, ovipositor very short. Pro- and mesopleuræ smooth and shining; metapleuræ clothed with rather sparse backwardly directed pale hairs. Lateral

carina of abdomen sharply defined. Femora, especially the hind ones, very strongly clavate. Wings with a well developed marginal fringe apically, especially near the lower outer angle; disc with very minute hairs, almost bare, except on apical third of wing where the hairs are large and strong; basal third also somewhat more noticeably furnished with minute hairs. Hind wing with two frenulum hooks.

Type and a number of paratypes from Kartabo, British Guiana (W. M. Wheeler).

This species is not very abundantly represented in the collection; a careful sorting has disclosed only about thirty specimens.

Platygaster tubulosa sp. nov.

♀. Length to tip of third abdominal segment 1.0–1.2 mm. Black; scape of antennæ yellowish brown basally; coxæ, thickened portions of femora and of middle and hind tibiæ piceous; trochanters and anterior tibiæ pale yellow; tarsi pale, with the last joint infuscated; wings hyaline; third segment of abdomen brown, the apical ones not always extruded, hyaline, with the tips brownish. Head rather flat, more than twice as broad as long when seen from above; ocelli rather large, the lateral ones almost as far from the eye-margin as from the median one; vertex and occiput finely shagreened; front shining, practically smooth; malar space nearly half as long as the eye-width, smooth, as is also the head behind the eyes. Antennæ apparently 9-jointed, but really with ten joints, counting the small joint just beyond the pedicel; scape considerably more than half as long as the remaining joints together, slender, much narrowed basally; pedicel one half longer than thick; first flagellar joint almost as long as the pedicel, with a short, indistinctly separated ring-joint attached to its base; second and third joints slightly shorter, about quadrate; remaining four joints forming a slightly thickened, but not very distinct club, the joints of which are slightly longer than wide. Mesonotum with finely impressed, but complete and distinct parapsidal furrows, shining, clothed with sparse appressed hairs. Scutellum large, convex, longer than wide and gently sloping downwards behind, its base without foveæ and separated only by a thin, shallow impressed line. Propodeum with a strongly raised longitudinal ridge toward each side, enclosing a deep quadrate median impression. Pro- and mesopleuræ shining, faintly punctate; metapleura thinly pale pubescent. Abdomen elongate, lanceolate; first segment broader than long, coarsely longitudinally striated; second segment three times as long as broad

tapered from middle toward base and apex, more strongly so behind; base medially with some short fine longitudinal striæ and toward each side with a larger and deeply impressed groove that extends to the basal fourth; third segment one-third as long as the second, very narrow and evenly contracted to the more or less blunt apex; fourth, fifth and sixth segments tubular capable of being entirely retracted; the fourth nearly as wide as the tip of the third, but the other two very slender; ovipositor never extending much beyond the sixth segment. In the most fully extruded example the fourth to sixth segments together measure 1.5 mm., or distinctly more than the length of the remainder of the abdomen. Wings absolutely hyaline, without distinct marginal fringe, except for some almost transparent hairs apically; disc bare. Hind wing with two delicate frenulum hooks.

Type and eight paratype specimens from Kartabo, British Guiana (W. M. Wheeler).

This species is represented by fewer specimens in the collection than any of the others.

Isostasius crassus sp. nov.

♀. Length 1.0 mm. Black; coxæ piceous, the trochanters, base of femora and tibiæ and tarsi, except last joint pale yellowish; remainder of legs dark brown or piceous. Wings hyaline, the vein fuscous. Head considerably broader than the thorax, flattened, more than twice as wide as long when seen from above. Ocelli large, close together, the lateral ones as far from the eye-margin as from the median one; vertex and occiput shagreened, subshining; face shagreened, but more shining; lower margin of face elevated at the insertion of the antennæ; malar space indistinctly transversely striated, more than half as long as the width of the nearly round eyes; head behind eyes shagreened, with a faint trace of striæ curving upwards across the cheeks. Antennæ 10-jointed, less than half as long as the remaining joints together, rather stout, more slender basally; pedicel large, almost as broad as the scape, one-half longer than wide; funicle, consisting of the first four flagellar joints, short, the joints very small, of about equal length and quadrate, except for the broader and distinctly transverse fourth joint, club large, first joint narrower than the others; second and third very broad, nearly twice as wide as long, last elongate, triangular, narrower than the preceding one. Thorax broad, the mesonotum as broad as long and the pleuræ only slightly visible from above; mesonotum shagreened; rather dull, sparsely clothed

with fine appressed hairs like the remainder of the thorax and the head; parapsidal furrows delicate, quite distinct behind, but obsolete in front. Scutellum strongly convex medially, noticeably elevated above the level of the mesonotum, separated at the base by a narrow impression, wider at the sides; posterior margin defined by a semicircular raised margin inside of which is a deep submarginal groove. Propodeum trilobed behind, woolly on the sides and with a pair of longitudinal ridges on its central portion. Abdomen short, ovate, barely longer than the thorax; first segment short, more than twice as broad as long, slightly woolly and longitudinally fluted; second segment shining, very convex, twice as long as wide, broadest at the middle, and forming the entire gaster except for the small, elongate-triangular third segment; second finely longitudinally striate at its extreme base, with a larger and deeper groove at each side of the base; third segment punctulate, with sparse pale hairs. Venter highly convex, the lateral carina not very distinct. Propleuræ shagreened; mesopleura broadly impressed medially and behind, obliquely striate near its posterior border; metapleura thinly clothed with short pale hairs. Ovipositor only slightly projecting, curved downwards. Legs rather slender, the femora strongly clavate, the tibiæ more weakly so. Wing with a short, but distinct marginal fringe, the disc bearing strong and rather large hairs except at the base; vein capitate, one-third as long as the wing.

Type and 12 paratype specimens from Kartabo, British Guiana (W. M. Wheeler).

As may be gleaned from the taxonomic description (p. 270) of Gastrotrypes, both species have the abdomen lengthened as in Dolichotrypes, but the stylate fifth segment is not of variable length so that, exclusive of the greatly elongated apical membranous segments, all individuals are of approximately equal length. The membranous parts may be entirely retracted or extruded to a length equalling that of the entire remainder of the abdomen.

Similarly in *Platygaster tubulosa* the apical abdominal segments (in this case the fourth and following) are tubular and capable of complete retraction or of extrusion to a length somewhat greater than the remainder of the abdomen.

The foregoing observations on Dolichotrypes and the Gastrotrypes and Platygaster associated with it in British Guiana, suggested an examination of several other Serphoid Hymenoptera. A brief account of these is given below.

A similar elongation of the terminal portion of the abdomen occurs in females of members of the genus Serphus (*Proctotrypes*), but here the

anatomical structure is quite different. The fifth apparent (possibly really the sixth) segment is contracted to the tip from which issues a stylet-shaped piece, often curved or hooked at the apex and varying in length from a slight projection to a piece nearly as long as the remainder of the abdomen. The stylus is heavily chitinized and appears to be the terminal abdominal segment. Dissection shows, however, that it is composed of the paired sheaths of the ovipositor. These are crescentic in cross-section and fit closely together along the median line above and to form a hollow tube through which the ovipositor extends. The latter can be only slightly extruded as it is enlarged into a bulb at the base which lies within the last segment and is supported by a chitinous strut ventrally. This apparatus is evidently suited for puncturing quite resistant tissues.

In Scorpioteleia of the related family Belytidæ an elongation of the terminal abdominal segments occurs, very similar to that shown by the species of Gastrotrypes and by *Platygaster tubulosa*. This remarkable genus was first described by Ashmead ('97) from Eastern Canada and later recorded by the present writer ('09) from Wisconsin and the state of Washington. Several other species are known from Europe, which Kieffer ('10) regards as congeneric with Cinetus believing that the modified abdomen of the female is not a good generic character. In the type species, *S. mirabilis* Ashm., I find upon re-

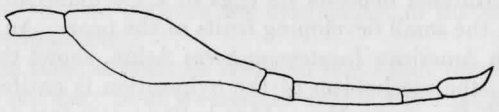

FIGURE 2. *Scorpiotelia mirabilis* Ashm. Abdomen of female in profile.

examination that the apical prolongation of the abdomen is undoubtedly retractile as it is not chitinized except toward the apices of the segments and the proportionate lengths of the extruded parts of the latter vary considerably in different individuals. The third, fourth, and fifth segments are tubular, successively smaller, but the sixth and last is of much greater diameter, enlarged at the base, then constricted and then turned upward at the pointed tip. Although the curve is reversed in position, the resemblance to the sting of a scorpion is very striking and suggested the appropriate name of Scorpioteleia. Dissection shows the last segment to consist of a ventral valve and two dorsal ones, one overlapping the other. The basal piece extends

halfway to the tip and the apical one to the tip where it meets the tip of the ventral one. Between these the ovipositor issues. It is very short and its basal attachment lies well within the last segment. Its valves are heavy and lie one on each side, meeting on the median line above and below. Many Belytids are parasitic on dipterous larvæ in fungi and quite probably the Scorpiotelei is modified to reach its host in some tube-bearing fungus such as Boletus or Polyporus.[1] In certain other Belytids, *e.g.*, Miota, the tip of the abdomen is upturned and more or less plowshare-shaped, but does not exhibit such excessive elongation.

The Platygastrid genus Inostemma is characterized by a most remarkable projection which arises from the dorsum of the first abdominal segment and extends forward over the thorax with its tip over the anterior ocellus. The curvature of this horn corresponds closely to that of the mesonotum, above the surface of which it is raised, and the vertex of the head bears a median depression to allow free motion of the head without interference by the tip of the horn. This rigid process is present only in the female and although several entomologists had suggested that it received the ovipositor, its function remained in doubt till Marchal ('06) showed that in the European *Inostemma piricola*, it really serves to receive the basal portion of the ovipositor which is much longer than the abdomen, so that when not extruded the base lies in the anterior part of the horn. The Inostemma studied by Marchal deposits its eggs in a Cecidomyiid larva which feeds within the small developing fruits of the pear. An examination of the North American *Inostemma horni* Ashm. shows that, as might be expected, the mechanism of the oviposition is entirely similar to that of the European species. Marchal was at a loss to account for the apparent origin of the ovipositor within the basal tergite of the abdomen. Unfortunately the only specimens available have been mounted dry for a number of years, but dissections of these which I have made show that the ovipositor appears actually to arise within a membranous apical segment which has been invaginated so as to occupy the cavity of the process on the first segment. As there are six visible chitinized segments, this membranous tube is no doubt the seventh, or seventh and eighth abdominal segments and it must furnish the muscular apparatus for the manipulation of the ovipositor. The horn is therefore only secondarily a housing for the ovipositor.

1 The Australian genus Stylaclista Dodd ('15) is evidently very similar to Scorpioteleia, having the third to sixth abdominal segments produced into a long fleshy stylus.

The genus Brachinostemma and several genera (*e.g.* Baryconus, Probaryconus, Ceratoteleia, Caloteleia, Ceratobæus, etc.) of the closely allied family Scelionidæ show a tubercle or very short horn arising from the dorsum of the first abdominal segment, but in no case does this ever attain a development approaching that seen in Inostemma. From the apparently rudimentary development of what is seemingly homologous to the horn in Inostemma, one might readily conclude that these genera show it in an incipient stage. From the standpoint of function this does not seem possible, however, as the projection is often so short that it does not serve to lengthen the space within the abdomen. Possibly the tubercle or horn may have been developed for some other reason and later served for the accommodation of the ovipositor. The long horn appears to be unique, however, and no one has so far been able to attribute to it any other function. We may readily suppose that its ontogenesis is in direct response to pressure produced by the base of the developing ovipositor. It seems impossible that its length, at least in the incipient stage could be of any selective value, since most Hymenoptera provided with lengthened ovipositor have developed no structures or devices of any kind to permit of extensive retraction of this organ. After what has been said of the conditions prevailing in Dolichotrypes which have been considered at some length, it is evident that a more extensive knowledge of these minute Hymenoptera may lead to interesting conclusions concerning the relation between the morphology of the body and the function of oviposition.

At the same time, it must be borne in mind that the horn of Inostemma does not vary to any excessive degree and that its form and size are at present as definite and clearly fixed in each species as are the other parts of the body, and that they are not variable like the abdominal segments of Dolichotrypes which have not yet attained fixed dimensions.

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EXPLANATION OF THE PLATES.

PLATE I.

1. Antennæ of *Polymecus* (*Dolichotrypes*) *minor* sp. nov. ♀.
2. Antennæ of *Synopeas meridionalis* sp. nov. ♀.
3. Antennæ of *Gastrotrypes spatulatus* Gen. et sp. nov. ♀.
4. Antennæ of *Polygnotus simplex* sp. nov. ♀.
5. Antennæ of *Platygaster tubulosa* sp. nov. ♀.
6. Antennæ of *Isostasius crassus* sp. nov. ♀.

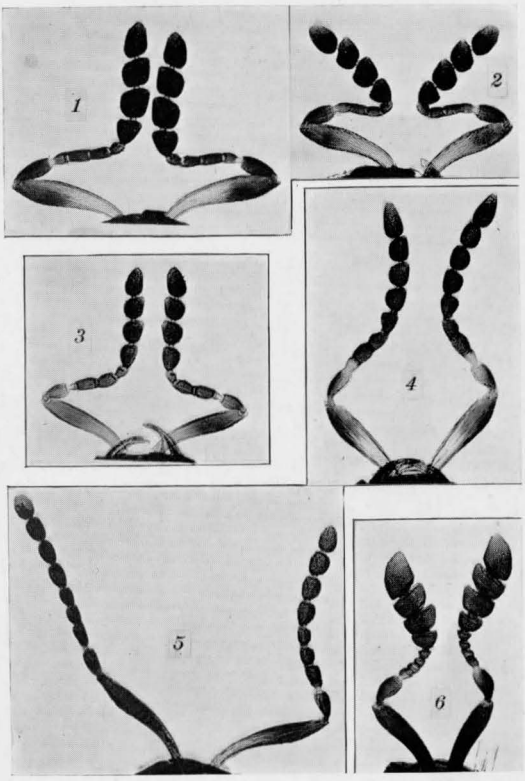
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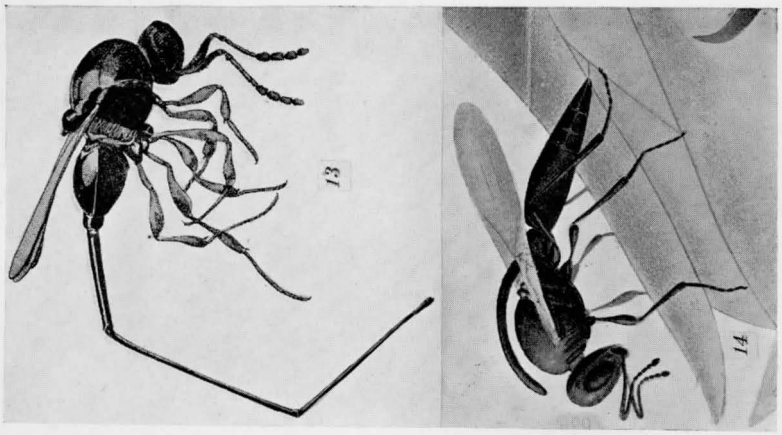
PLATE II.

7. Wing of *Polymecus* (*Dolichotrypes*) *minor* sp. nov. ♀.
8. Wing of *Synopeas meridionalis* sp. nov. ♀.
9. Wing of *Gastrotrypes spatulatus* gen. et sp. nov. ♀.
10. Wing of *Polygnotus simplex* sp. nov. ♀.
11. Wing of *Isostasius crassus* sp. nov. ♀.
12. Wing of ♂ not associated definitely with any of the foregoing species.
13. *Polymecus* (*Dolichotrypes*) *hopkinsi*, ♀. (After Crawford and Bradley.)
14. *Inostemma piricola* Kieffer, ♀. (After Marchal).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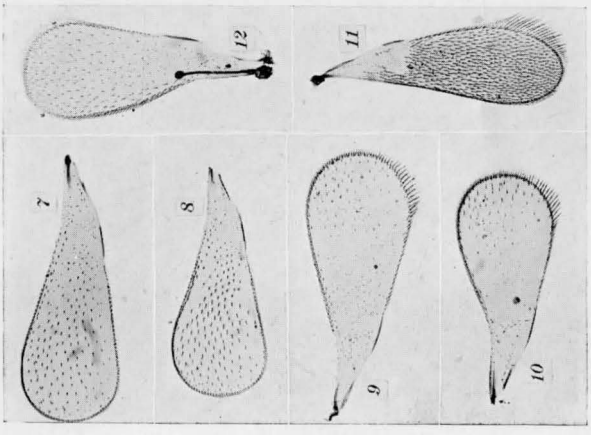
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