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THE PARASITES OF LEAF-HOPPERS.
With Special Reference to Anteoninæ.

F. A. Fenton.

PART II.

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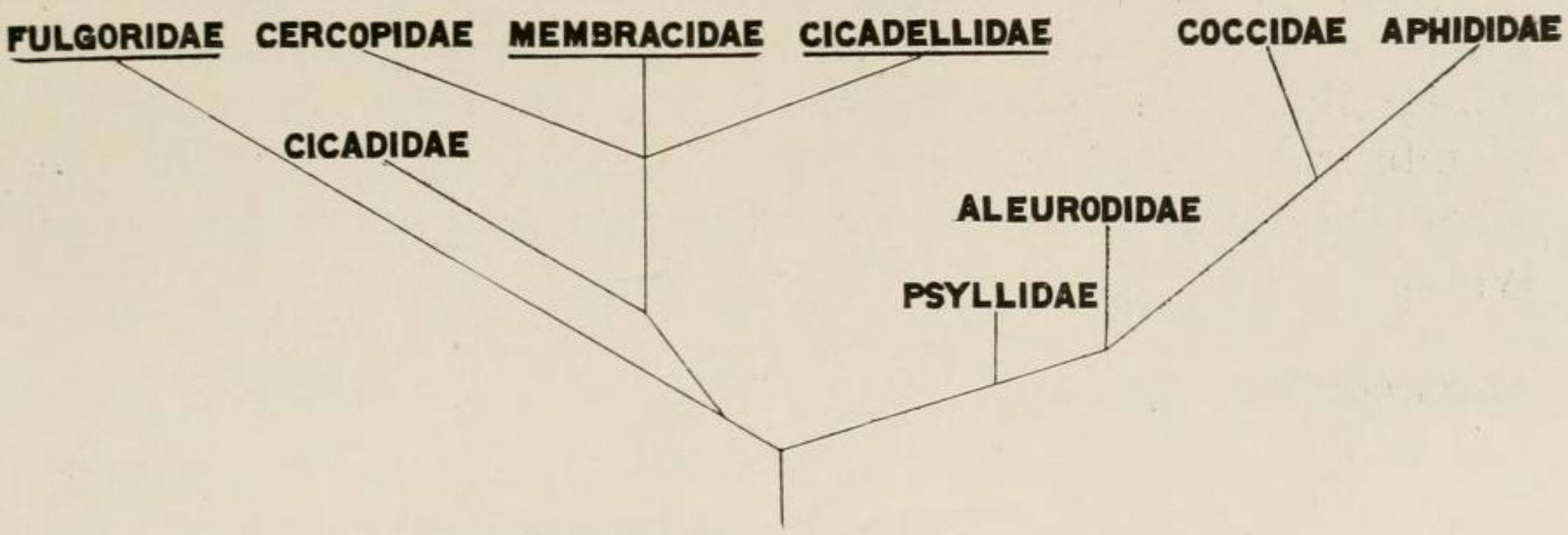
PHYLOGENY.

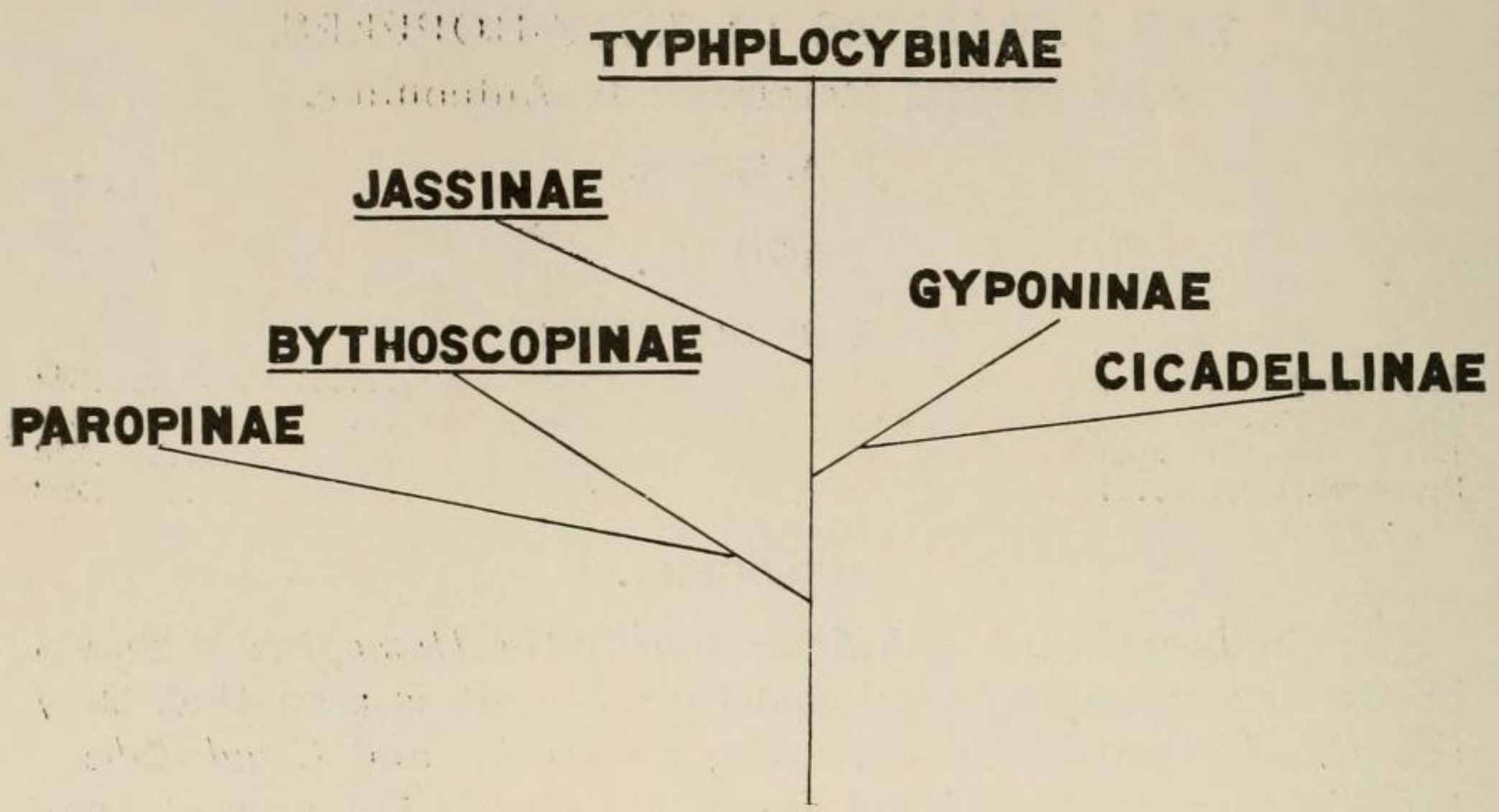
The relationship of the *Anteoninæ* to the *Homoptera* is shown in the accompanying phylogenetic tree. It is seen that they are parasitic on the *Membracidæ*, *Fulgoridæ*, and *Cicadellidæ*—three rather closely-related families. Up to the present time there are no records of any dryinid being parasitic on a Cercopid. If this holds true, it may be said that the spittle-forming habit



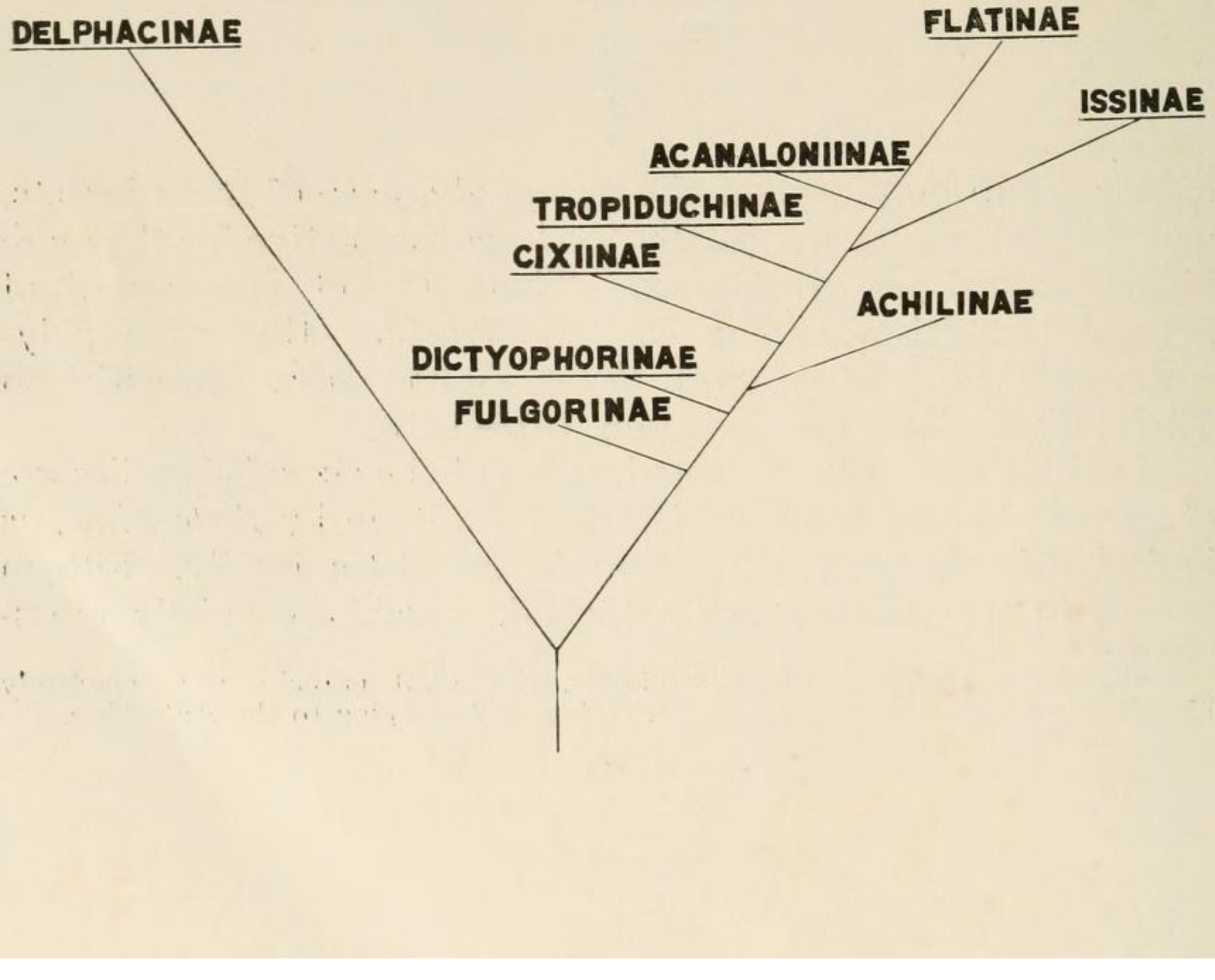
of this group may protect the nymphal stages of these insects, and that the adults are usually too large and active for the more highly specialized *Anteoninæ*. There is but one record of dryinid parasitism among the *Membracidæ*—that of a poly-embryonic form *Aphelopus theliæ* Gahan mss. parasitic on *Thelia bimaculata** (Kornhauser, 1915–1916).

In the *Cicadellidæ*, as noted, three of the six sub-families are at present known to be subject to parasitism by *Anteoninæ*, as indicated in the above phylogenetic tree of the family. Fifteen genera in the *Jassinæ* are attacked, which are chiefly grass-

* According to Professor Kornhauser, the adult parasite was separately identified by both Mr. Brues and Mr. Gahan as belonging to the *Anteoninæ*.



inhabiting forms, and but eight genera in the *Bythoscopinæ*, *Cicadellinæ* and *Typhlocybinæ*. It is interesting to note that the only genus parasitizing the *Typhlocybinæ* is *Aphelopus*, which is the most primitive and generalized genus in this sub-family. This same genus is the one found parasitizing Membracid nymphs. *Anteoninæ* parasitizing genera in the other sub-families noted are all higher and more specializd types.



By far the greatest number of host records today in the family *Fulgoridæ* are in the sub-families *Delphacinæ* and *Flatinæ*, the highest specialized groups of this family. Ten genera in each of these are paratitized, while but one or two genera are parasitized in the *Issinæ*, *Acanaloniinæ*, *Tropiduchinæ*, *Cixiinæ*, and *Dictyophorinæ*. No species in the others are at present known to be dryinized. Only the highest specialized genera in the *Anteoninæ* parasitize this group, thus suggesting that as a group they were first parasitic on the *Cicadellidæ*, later becoming adapted for parasitizing the *Fulgoridæ*. Most of the species are subject to parasitism in their immature stages, the adults apparently being free, except in the less active, smaller, and short-winged forms as *Liburnia*.

Apterous species with both arms of chela lamellate, hosts Fulgoridæ, sexual dimorphism marked. *Pseudogonatopus* type.

Apterous species with one arm of chela lamellate, hosts Cicadellidæ, sexual dimorphism marked. *Gonatopus* type.

Winged species with both arms of chela lamellate, hosts Fulgoridæ, sexual dimorphism marked. *Echthrodelphax* type.

Winged or partly apterous species, lateral arm of chela serrate, median arm bare, hosts Fulgoridæ, sexual dimorphism. *Phorbas* type.

Winged species with one arm of chela lamellate, hosts Cicadellidæ, sexual dimorphism, *Chelothelius* type.

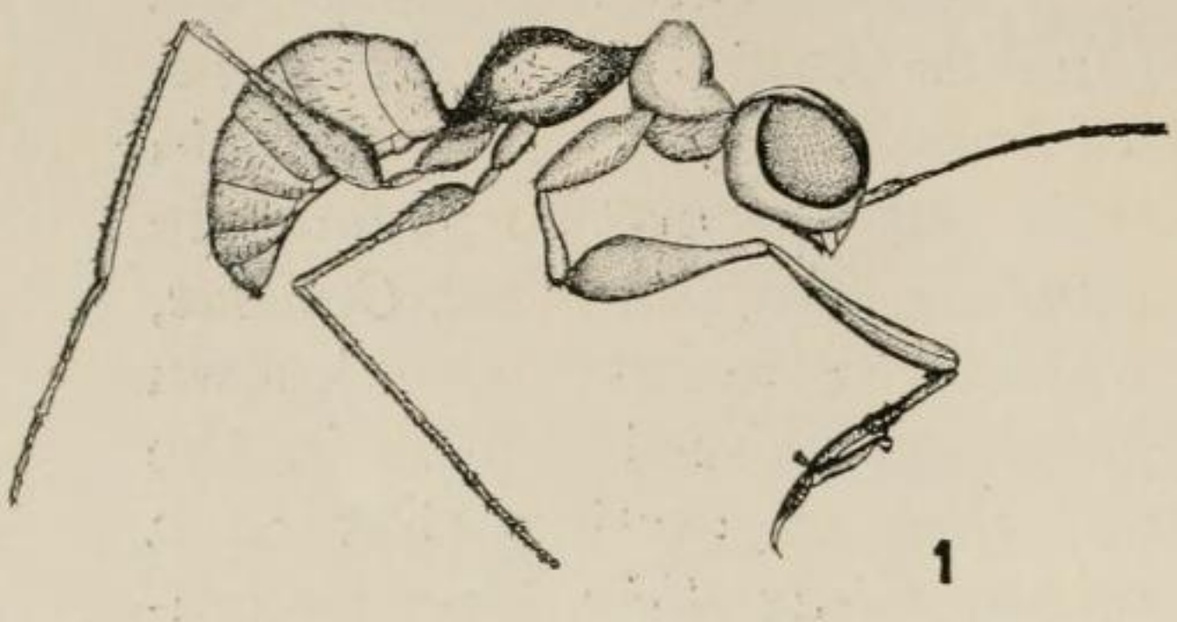
Winged species, chela fairly specialized and freely extensile, hosts Cicadellidæ, sexual dimorphism. *Deinodryinus* type.

Winged species, chela in some species only partly extensile, hosts Cicadellidæ, sexual dimorphism but not extreme. *Chelogynus* type.

Winged species, chela in some species not extensile, hosts Cicadellidæ. *Anteon* type.

Winged species, no chela, hosts Cicadellidæ and Membracidæ, no sexual dimorphism. *Aphelopus* type.

Primitive Dryinid



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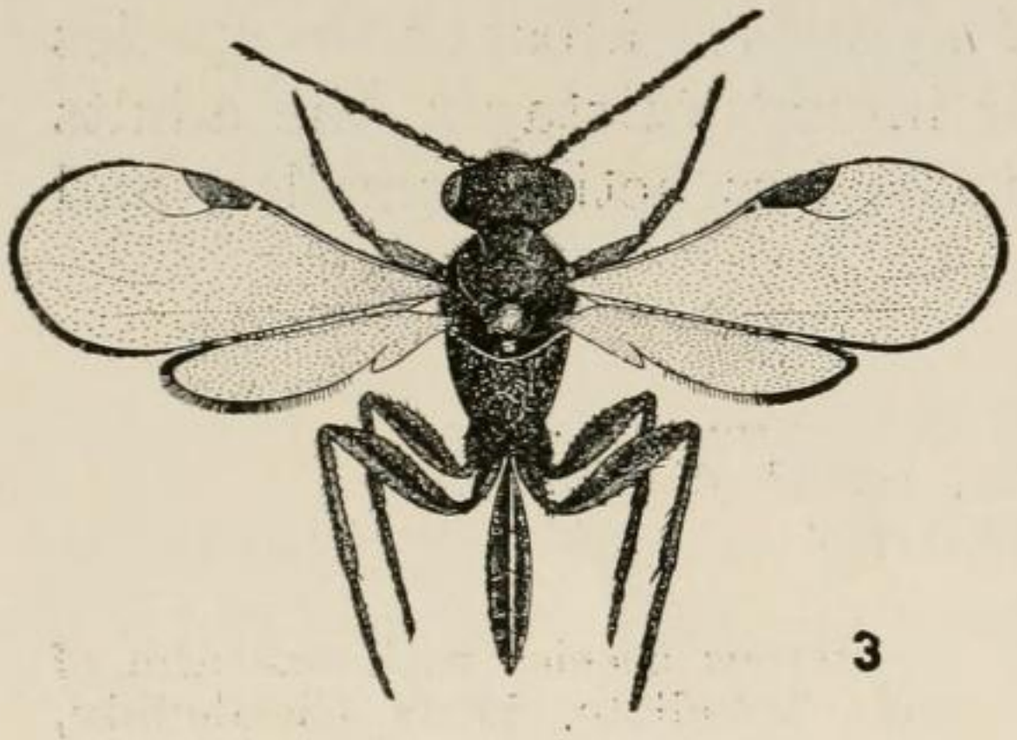

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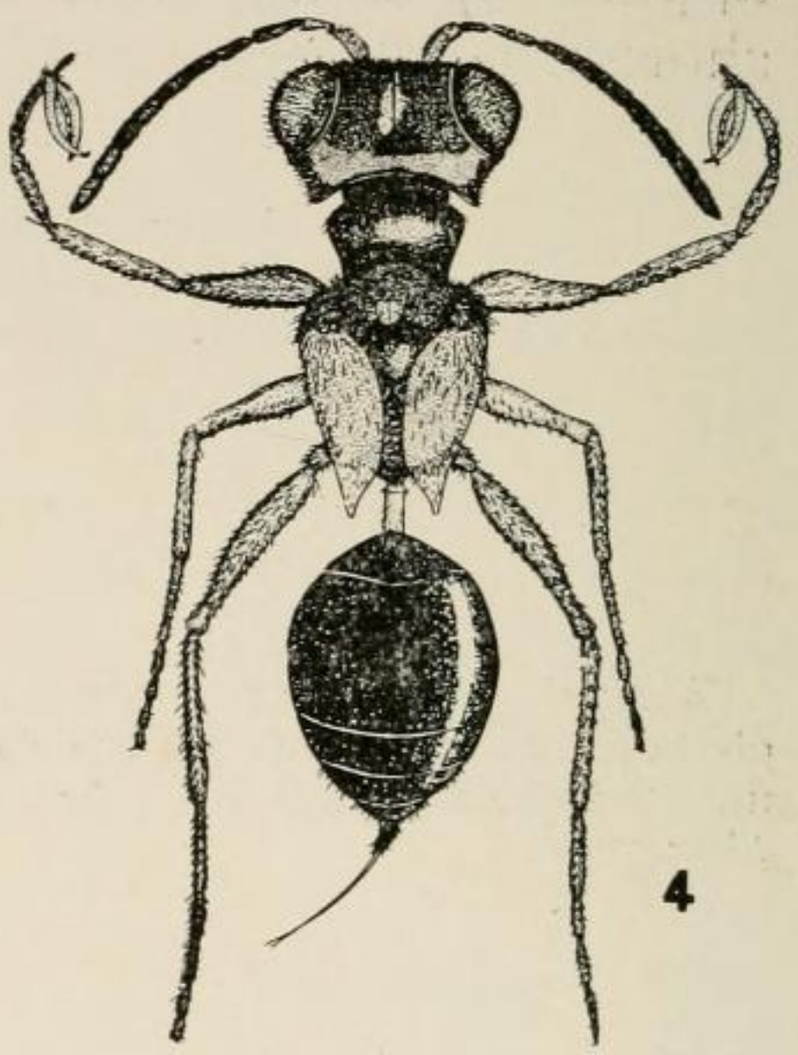

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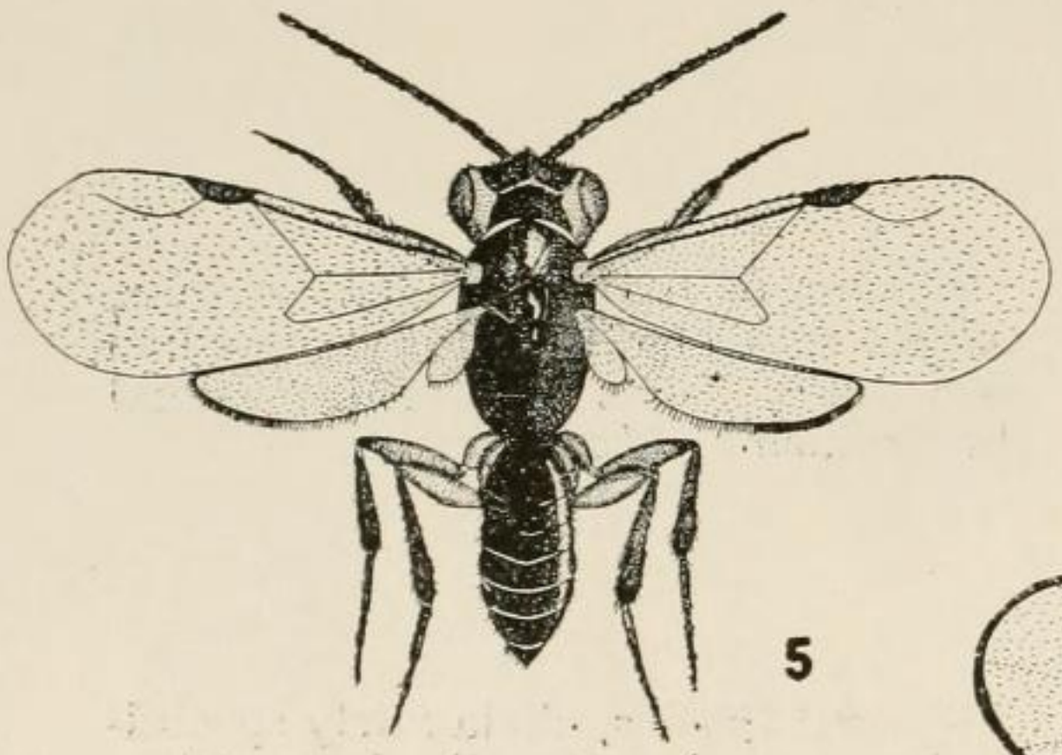

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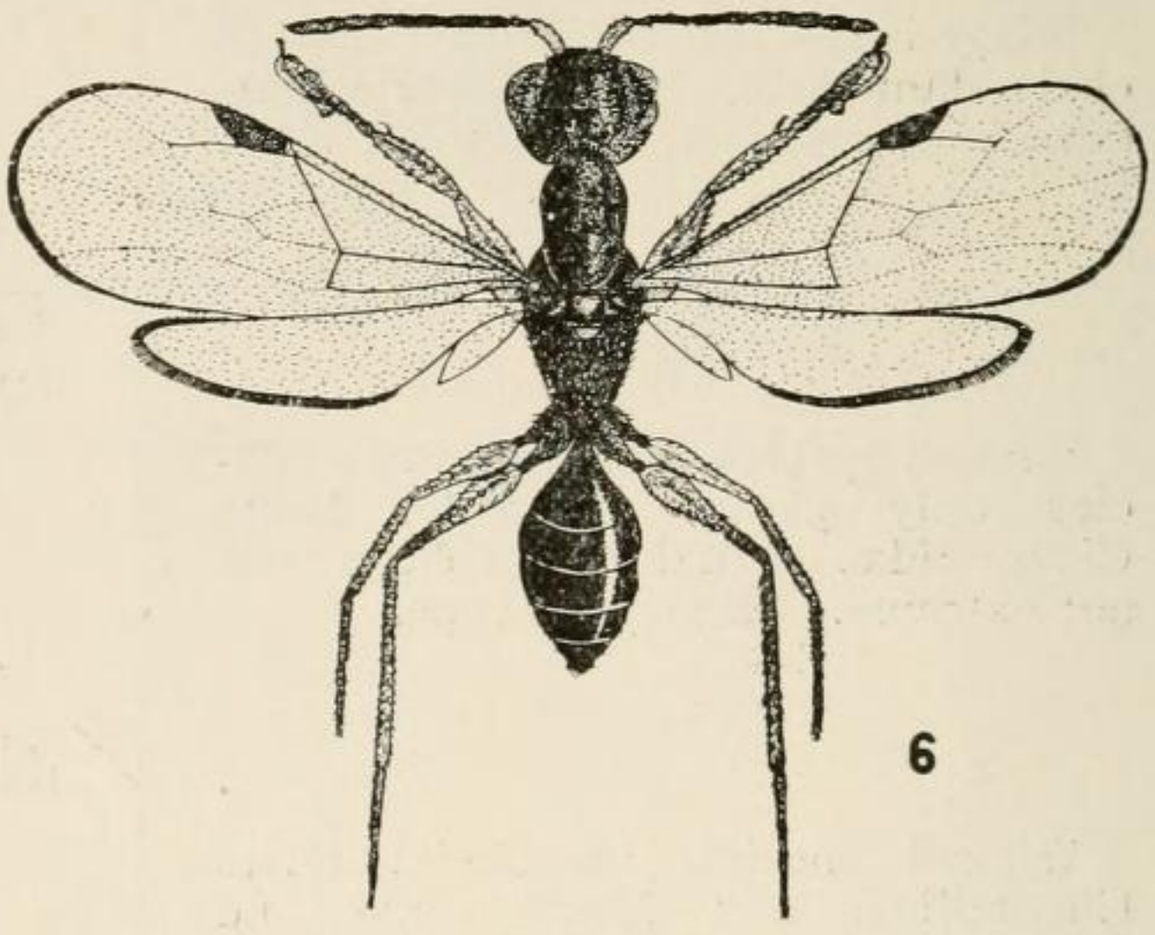

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TAXONOMY.

The relationships of the *Anteoninæ* in the *Hymenoptera* is a much-debated question, but it is now generally concluded that they are a sub-family of the *Bethylidæ* in the super-family *Proctotrupoidea.* The larval sac is a structure which at once distinguishes all *Anteoninæ*, and at the same time shows their possible affinity with such other forms that present this peculiar characteristic. Of the three other sub-families that Kieffer (1914) places with them under the *Bethylidæ*, little is known of the life history of the *Embolemininæ* and the *Sclerogibbinæ.* However, with the sub-family *Bethylinæ*, the genus *Harpagocryptus* Perkins shows its relationship in the similar larval sac found on the Orthopteron *Trigonidium*, which resembles that of the genus *Aphelopus.* Perkins (1912) says: "It is interesting to note that the elongate larval sac of *Harpagocryptus* and *Aphelopus*, so different from those of the other *Dryinidæ* (*Bethylidæ*), is correlated with the possession of simple front tarsi in the females." In working out the life cycle of *Rhopalosoma poeyi* Cresson, parasitic on the jumping tree-cricket, *Orocharis saltator* Uhl., Hood (1913) brought out the interesting fact that here there is also a larval sac very similar to that of the *Anteoninæ.* In commenting on Mr. Hood's paper in the same meeting, Mr. Rohwer said: "One is confronted with the remarkable resemblance between the larva of *Rhopalosoma* and some of the dryinids. Perhaps the *Rhopalosomidæ* and the (*Dryinidæ*) *Anteoninæ* had a common origin, as the larvæ would indicate, and the adults have specialized along different lines,though retaining certain characters in common." Ashmead placed this genus in a new family, which he included in the super-family *Vespoidea;* and Rohwer believes that this is the more nearly correct view. However distinct the adults of *Rhopalosoma* may be from the *Anteoninæ*, the fact that larval sac is a feature in common with both, and the development of this structure on two widely separated insect groups—the *Homoptera* and *Orthoptera*—indicates at once an adaptation to the jumping habit of these insects.

The development and specialization of the chelate front tarsus in the female may be taken as a criterion showing the evolution of the group. The chelate tarsus is an adaptation of the parasite to the structure and habit of the host. Along with

the specialization of this structure, such other modifications as the loss of wings and shortening of the antennæ in the female—all leading to sexual dimorphism—can be correlated. Thus, as is shown in the above phylogenetic tree, we start with *Aphelopus* as the most primitive and generalized group in which there is no sexual dimorphism. We note specialization proceeding along two different lines: one a loss of wings, probably due to the general activity and abundance of the host; the other a development of the chelate tarsus as an aid to catching and holding the active prey. With the latter again specialization has taken place with regard to the kind of host attacked. Perkins (1905) has observed that *Anteoninæ* parasitizing jassids have the lateral claw of the chela without lamellæ, and generally curved, (Plate I, Fig. 7). Those confining their attacks to the *Fulgoridæ* having the lateral claw of the chela with lamellæ, generally nearly straight and with a slight notch near the tip, (Plate I, Fig. 8). So characteristic is this structure of the chela that the host family can be ascertained at once by examining the female.

Specialization has taken place primarily and more markedly in the female, the males of even those species having the most highly specialized females being very similar to the males of the most generalized genus. This is due to the greater need for activity on the part of the female in the hunting and capturing of the active hosts. In fact, males of some of the more highly specialized genera are still unknown and these species are possibly entirely parthenogenetic.

LIFE HISTORIES OF SPECIES.

Gonatopus erythrodes (Perkins).

July 3, 1917, a large number of *Deltocephalus inimicus* nymphs bearing dryinid larval sacs were collected in a run-down meadow near Castalia, Ohio. About thirty per cent of the nymphs of this species were parasitized. They were placed individually in shell vials for separate study. This field was revisited several times on successive days, but after July 15 the parasites had disappeared, the remaining nymphs having matured. July 9 the first parasite killed its host, and July 17 the last one of the series of sixteen individuals collected had entered the ground to pupate.

Adults issued between Agust 3 and 11, the time spent in the cocoon averaging about twenty-five days. One female issued August 6 and was allowed to oviposit August 17, without having been fertilized by a male. This female pounced upon the first nymph and oviposited in it, and within five minutes repeated the operation upon another. She oviposited in thirteen nymphs from August 17 to 21 inclusive. Each nymph after being parasitized, was placed in a separate vial. After two or three ovipositions, the parasite rested, paying no attention to other nymphs. The greatest number of eggs laid in a single day was six, although this number is probably too low for natural conditions. Nymphs in the third and fourth instars are parasitized, the fourth instar being the most susceptible.

The egg measures .2 mm. by .12 mm. and is oval, pale yellow in color, without any sculpturing on the chorion.

Two of the nymphs did not develop parasites, although they were paralyzed and the ovipositor inserted. Instead, they matured and were perfectly normal in every way, so far as could be observed. This indicates that the sting itself will not produce castration nor stop development, but that the larva itself must produce some condition that brings about these changes. Six nearly-developed eggs were found in the ovaries of this female, thus proving that the eggs are not developed all at one time but instead are gradually matured, and that the life of the adult and extent the oviposition period are relatively long. This female lived seventeen days and died only because of abnormal conditions. The total life of this individual is summed up below.

Date Issued	Date First Egg Laid	Date Last Egg Laid	Total Oviposition Period	Total Number of Eggs	Average per Day	Died	Total Life
Aug. 6	Aug. 17	Aug. 21	5 days	12	2+	Aug. 27	17 days

This female issued from a sac located on the abdomen of the host, and invariably oviposited in this same position on the nymphs. In this species the greatest number of sacs are found between the fourth and fifth abdominal segments. They are found as frequently attached to the right side of the body as to the left. The place of attachment is shown below.

ABDOMEN.

Segments.....	1–2	2–3	3–4	4–5	5–6	6–7
Right.....	0	0	3	3	1	0
Left.....	0	0	2	3	2	0

Five days after oviposition, a dark discoloration is noticed on the parasitized nymph near the region where the ovipositor is inserted. This is due to the presence of the developing parasite within the tissues, surrounded by its first exuvium, the dull gray color of which shows through the opaque yellow body-wall of the host. Thus it seems likely that the egg hatches very shortly after being laid, and that the first instar is relatively of short duration. Two days later, a week after oviposition, a tiny gray vesicle protrudes between the segments of the nymph. This is the second larval instar enclosed within the first exuvium. At this phase, the entire outlines of the parasite can be seen within the body of the jassid, the anterior end reaching as far anteriorly as the posterior margin of the preceding segment.

The second molt occurs in from seven to ten days after the appearance of the sac, and the third three to four days later. The larva enters the fifth instar and kills the host eighteen or nineteen days after the sac becomes external. Within a few hours the host is devoured, and the parasite leaves it. The nymphs are killed in from twenty-four to twenty-five days after oviposition.

The larval sac is about 1 mm. in width, oval, compressed and dull black in color, being composed of the typical three exuviæ, the first being smooth and shining, the second dull and roughened on the outer half, and the third being distinctly rugosely sculptured.

Immediately after emerging the white, grub-like larva seeks the soil, beneath which it spins a compact oval, white cocoon covered with soil particles. Some of the larvæ in the second generation spin their cocoons above the soil, attached to some convenient object, a fact not observed in those of the first or summer generation. The outer cocoon is completed in a day, but longer time is required for the completion of the inner. The larvæ of the last generation can be seen spinning within the cocoon for days after it is apparently completed. The length of

time spent in the cocoon in the summer is from twenty to thirty-one days, averaging twenty-five and a half days. In one case an adult was noticed within the cocoon ready to issue seventeen days after it was spun. This issued two days later. Of ten cocoons spun during the summer, seven contained larvæ that pupated soon, the rest remaining as larvæ over winter.

The life cycle is summarized in the following table:

	Maximum	Minimum	Number of Specimens
Time between oviposition and appearance of sac	7 days	5 days	5
Time between appearance of sac and death of host	19 days	18 days	4
Time spent in cocoon	31 days	20 days	6
Total	57 days	43 days	

There are two generations a year, the adults for the first issuing during June, and those for the second in early August. Winter is passed in the larval stage in the cocoon. This species is parthenogenetic.

Gonatopus contortulus Patton.

This species parasitizes *Deltocephalus sayi* adults and has been reared from no other host. The oval, dark grey egg is always laid between the anterior abdominal segments, generally being thrust entirely beneath the cuticle but occasionally being attached externally in the suture between the segments. In the majority of cases it is laid between the second and third abdominal segments, either on the right or left side, but it may also be laid between the first and second or third and fourth. The female used in the experiments was unfertilized, having been bred from a parasitized hopper taken in the field. She issued August 17 and died August 30, thus living thirteen days. A total of 17 eggs was laid in a period of nine days as the table below indicates:

	Date—August									Total 9 days
	18	19	20	21	22	23	24	25	26	
No. of Eggs..	2	0*	2	3	0*	4	2	1	3	17 eggs

* No hoppers were given to the female August 19 and 22.

The normal longevity and number of eggs a female of this species can lay under natural conditions is probably greater than the above records indicate. However it can be seen that the adult life of the female extends throughout several weeks and that the oviposition period is prolonged. Females dissected show but few eggs matured in the ovaries and this fact, together with the presence of all stages of the parasite in the field at a given time, seem to prove this. The female generally made no attempts at oviposition after two or three hoppers had been parasitized. At least twenty minutes and generally over an hour elapsed before the second attempt.

An adult *Deltocephalus oculatus* was placed in the cage to determine whether the parasite was confined to *sayi* as its host. The hopper was seized and partly eaten without any attempt at oviposition.

The first larval stage is passed within the tissues of the host and when the egg is laid externally the young larva must penetrate into the host of its own accord. Shortly after the first molt the larva begins to push its way out between the segments through which the egg is laid. It molts for the first time and enters the second instar four days after oviposition. Nine days later larvæ are found to be in the third instar which is characterized by the two large head lobes. Within twenty-five days after the egg is laid the larva enters into the fifth stage. It issues from the sac and kills the host in from 26 to 31 days after the latter has been parasitized. The mature larva is 4 mm. in length, white, with no visible hairs.

The larval sac is oval, and shining black in color, the third exuvium being distinctly rugosely sculptured. The oval, white cocoon is spun above the ground on the grass blades and is 4½ mm. long and ½ mm. wide. The pupal period extends from 22 to 24 days, the adult remaining in the cocoon for two or three days before issuing, through an irregular hole near one end.

The species parthenogenetic, unfertilized females producing females. There are two generations a year, the winter being passed in the larval stage within the cocoon. The following table summarizes the life history experiments. The pupal stage was passed through in the green house and is included in the table because the length of time under artificial conditions is dentical with that of normal summer conditions.

TABLE I.—Life Cycle of *Gonatopus contortulus*.

Experiment Number	Date Egg Laid	Time of Oviposition	Location of of Egg	Date Host Killed	No. Days Host Lives	Date Pupated	Date Issued	Length Pupal Stage	Emerged From Cocoon	Total Life Cucle	Sex
49a	Aug. 18	2:00 P. M.									
49b	Aug. 18	4:50 P. M.	Left side abd., segs. 3–4								
49c	Aug. 20	3:35 P. M.									
49d	Aug. 20	4:50 P. M.									
49e	Aug. 21	10:55 A. M.	Left side abd., segs. 2–3.								
49f	Aug. 21	11:30 A. M.	Left side abd., segs. 1–2.								
49g	Aug. 21	4:15 P. M.									
49h	Aug. 23	4:45 P. M.	Right side abd. segs. 3–4.	Sept. 24	31 days	Feb.9–11	Mar. 4	22 days	Mar. 6	53 days	Female
49i	Aug. 24	3:35 P. M.									
49j	Aug. 25	11:30 A. M.	Left side abd., segs. 2–3	Sept. 20	26 days	Feb. 6–8	Mar. 2	22 days	Mar. 4	48 days	Female
49k	Aug. 26	12:00 NOON	Left side abd., segs. 2–3.								
49l	Aug. 26	12:20 P. M.									
49m	Aug. 26	12:24 P. M.		Sept. 22	27 days	Feb. 4–6	Mar. 2	24 days	Mar. 4	50 days	Female

Haplogonatopus americanus Perkins.

Nearly mature nymphs and adults of *Liburnia campestris* and *L. Lutulenta* are found bearing the larval sacs of *Haplogonatopus americanus* throughout the latter part of July and early August in the vicinity of Sandusky, Ohio, and in June and August about Columbus, Ohio. *L. campestris* is by far the more heavily parasitized species of the two, possibly due to its greater abundance. The larval sac of this parasite is always dorsal in position and attached to the posterior region of the host's abdomen. The greater number of sacs are found protruding between the 5th and 6th segments, but there is some variation as the following table shows:

Segments	1–2	2–3	3–4	4–5	5–6	6–7	7–8
Dorsal median.....	0	0	0	2	6	0	0
Dorsal right.....	0	0	1	2	7	0	0
Dorsal left.....	0	0	0	3	7	1	0

Unlike the other two species studied the females do not oviposite readily in captivity and so but few data were obtained in the oviposition experiments. At the time the adults issued nearly all the Liburnias had matured and there is a possibility of this species living until a second generation of nymphs is produced. This is not likely since this species parasitizes adults.

The process of oviposition was observed in a few instances and is similar to that already described for *Gonatopus erythrodes* (Perkins), except that the tip of the ovipositor is curled upward and thrust in the dorsal side of the abdomen. Parasitized hoppers taken in the field bearing sacs containing larvæ in the second instar are killed by the mature larva within eight to eleven days.

When the larval sac becomes visible on the outside of the body of the host, it is dull grey or brown in color but when fully developed it is brown or dark yellow. It is then 1 mm. in length and oval in shape. The first exuvium is smooth and shining and is always darker in color than the other two. These comprise the greater part of the sac and are dull and roughened. The spiracles are dark brown and distinctly visible along the median line of the different exuviæ.

After leaving the host the white elongate larva almost immediately starts spinning the cocoon on some convenient object above the ground. The cocoon is completed in two days and is

elongate oval and white in color being 3 mm. long and 1 1-3 mm. wide. Soon after the cocoon is completed, generally within three days, the larva pupates. The pupa is typical, being 2½ mm. in length and .9 mm. wide. In from nine to eleven days during the summer and in twenty-six days during the fall, the adult issues through a hole at or near one end of the cocoon. The entire time spent in the cocoon varies from fourteen to seventeen days during the summer and from twenty-four to thirty-five days during the fall. Males are as numerous as females.

There are two generations a year in the latitude of northern Ohio and three in the vicinity of Columbus, larvæ of the third hibernating within the cocoons.

TABLE II.

Life Cycle of *Haplogonatopus americanus*.

Exp. No.	Date Cocoon Spun	Date Pupa-ted	Date Issued	Length Pupal Stage	Time Spent in Cocoon	Sex of Par-asite	Stage of Host	Sex of host	Host Species
22a	July 20		Aug. 6		17 days	♂	nymph	?	Liburnia nymph
23a	July 18		Aug. 2		15 days	♂	nymph	?	Liburnia nymph
23b	July 18	July 25	Aug. 3	10 days	16 days	♀	adult	♂	Liburnia camp-estris winged
23d	July 20	July 26	Aug. 3	9 days	14 days	♂	nymph	?	Liburnia nymph
24a	July 20		Aug. 5		16 days	♂	nymph	?	Liburnia nymph
24b	July 21		Aug. 6	16 days	16 days	♀	nymph	?	Liburnia nymph
24c	July 21		Aug. 6		16 days	♂	nymph	?	Liburnia nymph
24e	July 20		Aug. 5		16 days	♀	nymph	?	Liburnia nymph
25d	July 22	July 27	Aug. 6	11 days	15 days	♂	nymph	?	Liburnia nymph
25e	July 20		Aug. 5		16 days	♀	nymph	?	Liburnia nypmh
25f	July 22	July 27	Aug. 6	11 days	15 days	♀	nymph	?	Libutnia nymph
25g	July 20	July 26	Aug. 5	11 days	16 days	♀	nymph	?	Liburnia nymph
25h	July 22	July 27	Aug. 6	11 days	15 days	♂	nymph	?	Liburnia nymph
35b	July 27		Aug. 7		11 days	♀	adult	♂	Liburnia lutu-lenta winged
39a	Aug. 2		Aug. 26		24 days	♀	nymph	♀	Liburnia nymph
42	Aug. 5	Aug. 11	pupa p	reserved		♂	adult	?	Liburnia lutu-lenta
51a	Aug. 26	Sep. 4	Sep. 20	26 days	35 days		nymph	?	Liburnia numph

Chelogynus osborni n. sp.

This species parasitizes both nymphs and adults of *Chlorotettix unicolor* Fitch, infested individuals of which are found from late June to middle July in the vicinity of Sandusky, Ohio. The sac is always located on the thorax either to the right or left side between the meso- and metathorax in the suture just below the middle coxa. When it first appears it is very small and blue green in color, being almost invisible against the green of the host. After five days it assumes the normal black color and when fully developed it is nearly circular, laterally strongly compressed, and dull black in color. The third exuvium is strongly rugosely sculptured. Nine days after the appearance of the sac the parasite maggot issues and kills the hopper. It is relatively large, green, and bears few scattered hairs. The male parasite is usually much smaller and does not completely devour the host. The cocoon is spun in the soil and is 3.5–4.5 mm. in length, broadly oval, white, with sand or soil particles plastered over the outside. There is but one generation a year in this region, the larvæ hibernating and pupating the following spring.

Phorbas mirabilis (Perkins).

This species attacks both nymphs and adults of *Brucomorpha oculatus* Newm., the latter being more often parasitized. From one to three sacs may be attached to one individual and all may mature even though they are of different sizes. The sacs are always found protruding between various segments on the hopper's abdomen. In one specimen three sacs were found attached between the second and third, third and fourth, and fourth and fifth abdominal segments respectively. The fully developed sacs vary from one to two mm. in diameter. They are shining black in color, the outer exuvium being distinctly rugosely sculptured. The larva is of a pale purple color when it first matures. The cocoon is spun in the soil and is large varying from 2 to 4 mm. in length and 1 mm. in width. It is very tough and composed of white silk, intermixed with soil, so that it is of a dull brown color. The adult escapes through a large, ragged hole cut through at one end. There are two generations a year, the first occurring in July and the second in September.

Aphelopus dikraneuri n. sp.

Aphelopus dikraneuri n. sp. parastizes adults of *Dikraneura fieberi* (Low), which is found to be quite extensively infested with this parasite in the vicinity of Columbus in July and September. The sac is found attached to the anterior region of the abdomen either to the right of left side, the position of attachment varying somewhat as the following table shows:

ABDOMEN.

Segments	1–2	2–3	3–4	4–5	5–6	6–7
Right.....	1	7	1	0	0	0
Left.....	1	8	3	0	0	0

The sac is opaque yellow in color, elongate oval, and 1 mm. in length. Because of its small size, the first exuvium is usually overlooked, but it is smooth and shining, while the other two are dull and finely punctate. The second exuvium is often brown in contrast to the other two. Under reflected light the empty sac is irridescent.

The mature larva is white, elongate, with numerous hairs. The cocoon is spun just below the surface of the soil. It is small, white and oval, generally being coated over with soil. There are two generations a year.

The above description and life history is true of all species of *Aphelopus* parasitizing *Dikraneura, Empoasca, or Erythroneura.* It is particularly similar to that of *Aphelopus comesi* n. sp. parasitizing *Erythroneura comes* Say. This species was found to be very abundant in one grape vineyard in Columbus during the latter part of October, 1917. As high as 80% of the grape leaf hoppers were parasitized. Adults of *A. comesi* issued in May the following year.

SYSTEMMATIC.

The following classification is based upon Kieffer's Monograph of the Bethylidæ (1914).

Subfamily ANTEONINÆ.

Dryinidæ (part.), Haliday, Ent. Mag., v. 4, p. 411, 1837.
Dryininæ, Haliday, Hym. Syn., p. 3, 1839.
Dryinoidæ, Förster, Hym. Stud., v. 2, p. 94, 1856.
Dryinini, C. G. Thomson, Ofv. Ak. Forh., v. 17, p. 175, 1860.
Anteonidæ, Kieffer, Bull. Soc. Metz, v. 27, p. 108, 1911.
Anteoninæ, Kieffer, Das Tierreich, 41 L, 1914.

Female: Body sometimes lengthened or very elongate, sometimes somewhat compact. The length varies between 1.5–10 mm. Head viewed dorsally transverse, almost square or rounded. Mouth on the anterior end of the head. Mandible three or four-dentate, in one species stated to be two-dentate. Antennæ ten-jointed originating close behind the clypeus, slender, filiform, or distally slightly and clavate. Eyes very large and prominent (*Lestodryinini* and *Gonatopodini*) or moderately large in the others. Ocelli three, mostly forming a triangle, in apterous forms often lacking. Wings and tegulæ often entirely lacking, seldom reduced. Fore wings with pterostigma, two or three closed basal cells (subcostal, median, and submedian), one distal and generally anteriorly open radial cell. Anal vein often distinct. Traces of a cubital as well as two discoidal cells, namely, one distal median cell and one distal submedian cell; in the *Aphelopini* and in two other species only costa and radius are developed. Hind wings lobed. Legs slender, femur in form of a reversed club, tibia only slightly thickened, spur of fore tibia with a transparent lamella, extending for its length, abruptly ending before the tip, the spur thus appearing bi-lobed, claws of the four hind legs and in the male in the fore legs generally with one broad proximal or divided tooth.

In all females, except in the tribe *Aphelopini* the fore legs are modified. The coxa is excessively elongated, often more than half as long as the femur, the trochanter is a long, often stalked proximally and somewhat curved joint, which is often five times as long as the corresponding joint on the other legs, femur proximally strongly club-shaped, tibia thicker and shorter than the others, the tarsus ending in an almost bare chela, which is generally thrown backward, lying close to the tarsus, ventrally or dorsally, and generally reaching to the proximal end of the third, seldom the fifth, the fourth or the second joints; the fore legs are therefore called "Raubfusze," "Pedes raptorii," the third tarsal joint, often also the second, present a proximally, oblique or perpendicular projecting process, from which long, stout, bristles project, and lie against the distal end of the chela, while the fourth joint, for the same purpose, on the whole ventral side appears more or less convex or flattened; also the third and fourth joints on both sides bear single, very long, stout bristles, which generally provide the chela with a support. The medial chela arm, which generally lies against the under-

side of the former, is composed of the fifth tarsal joint, which proximally is more or less elongated, only in some *Anteonini* is the fifth joint about normal, without elongation; on the ventral side, that is, on the side lying against the lateral chela arm, the median chela arm bears numerous rows of hyaline diversely shaped lamellæ and bristles. The lateral chela arm is slender, pointed, mostly saber-shaped, ventrally with or without rows of lamellæ and bristles, the medial chela arm usually so rests that both ends cross; there is presented a strong, lengthened claw; the other claw in contrast is reduced and wrapped around by the lobes of the more or less strongly lengthened empodium. If the fifth tarsal joint is much shorter than the proximal process, then both chela arms are movable, whereby the morphological proximal end of the fifth tarsal joint becomes apparently the distal end; in the contrary case only the lateral chela joint is movable. Abdomen slightly depressed from above, seldom laterally depressed together, second segment somewhat bell-shaped, the following gradually shorter and smaller.

Male: Generally the male is much smaller than the female, mostly only half as long, the eyes are pubescent and almost half spherical, while in the female they are bare and oval. The pronotum of the male is not visible from above, the hind angles of the prothorax reach the tegulæ always in the male, while in the female they often do not, the parapsidal furrows can be seen very plainly often extending across the mesonotum in the male, while in the female they may be lacking. In *Deinodryinus* the pterostigma is broad in the male and only moderately broad in the female, in two other genera the veins of the basal cells are obliterated in the male, while they appear well developed in the female, the legs of the male are not long and slender as in the female, but short and quite thick, the fore tarsus lacks the chela.

Key to Tribes of the *Anteoninæ*.

FEMALES.

1. Thorax divided by a deep constriction into two nodes, apterous, fore-tarsi with chela ..... Tribe *Gonatopodini*
   Thorax not so divided, winged 2
2. Pterostigma small, lanceolate, female with chela ..... Tribe *Lestodryini*
   Pterostigma broad 3
3. Wings with two basal cells, female with chela ..... Tribe *Anteonini*
   Wings without basal cells, female without chela ..... Tribe *Aphelopini*

MALES.

1. Pterostigma broad 2
   Pterostigma lanceolate 3
2. Wings with two basal cells ..... *Anteonini*
   Wings without basal cells ..... *Aphelopini*
3. Vertex angulate, head triangular in profile, ocelli generally widely separated ..... *Gonatopodini*
   Vertex rounded, head not triangulate in profile, ocelli not widely separated, *Lestodryinini*

Tribe *Lestodryinini*.

Dryininæ, Kieffer, Gen. Ins. fasc. 54 p. 3, 1907.
Lestodryinini, Kieffer, Das Tierreich, 416, 1914.

Female: Head mostly transverse; eyes long, strongly projecting; mandibles three or four dentate; antennæ slender. Pronotum mostly

not attaining the tegulæ. Wings present, with two or three closed basal cells, and a generally distally open radial cell; pterostigma small, lanceolate or linear-lanceolate; in two or three species the wings are rudimentary or shortened; fore legs strongly lengthened, coxa and the generally stalked and curved trochanter long, femur proximally strongly thickened, tibia distally thickened, first and fourth tarsal joints long, second, third and fifth short, the fifth always much shorter than its proximal elongation, forming with it the median chela arm, this always with rows of lamellæ, lateral chela arm often with rows of lamella or spines. The four hind legs more slender than the fore legs, coxa and trochanter much shorter, femur and tibia longer, first basally strongly thickened, the last distally slightly thickened; abdomen weakly depressed from above.

Male: Head transverse, vertex convex, ocelli situated close together in a triangle, seldom in an arc, eyes oblong oval, pubescent. Antennæ filiform, pubescent. Prothorax not visible from above, the hind angles attaining the tegulæ on the sides, mesonotum with or without parapsidal furrows. Wings with two basal cells; radius curved or angulate, the distal part generally as long or longer than the proximal, somewhat shorter in *Phorbas*. Pterostigma linear-lanceolate or small-lanceolate.

Genus *Phorbas* Ashmead.

Phorbas Ashmead, Bull. U. S. Mus., v, 45, p. 90 (♂), 1893.
Bocchus Ashmead, Bull. U. S. Mus., v. 45, p. 91 (♀), 1893.
Eukœbeleia Perkins, Rep. Exp. Sta. Hawaii, Ent. v. 1, p. 59, 1905.

Female: Head large, broad, vertex slightly convex, the sides converging behind the eyes; occiput very slightly concave, eyes large, oval; ocelli close together in a triangle, antennæ subfiliform, slightly thickened toward the tip, scape longer than first flagellæ joint. Maxillary palpi six-jointed, labial palpi three-jointed; mandibles three-dentate. Thorax normal, pronotum large, narrower than mesothorax. The hind angles attaining the tegulæ, parapsidal furrows distinct, somewhat converging, propodeum distinctly truncate. Wings present or rudimentary; if developed with lanceolate stigma, two basal cells, and an open marginal cell, the radius long and curved. Fore legs of medium length, fourth tarsal joint very long, but shorter than first; median chela arm not widened and provided with lamellæ but ventrally with continuous raised process; lateral arm ventrally dentate. Abdomen globose, distinctly petiolate, the petiole slender, cylindrical.

Male: Head broadly transverse, wider than thorax, vertex convex, eyes oblong oval, pubescent; longer than thorax. Maxillary palpi five-jointed, labial palpi three-jointed, mandibles three-dentate. Thorax with sparse short white hairs; mesonotum with two distinct parapdisal furrows. Wings hyaline, covered with fine white hairs and very shortly ciliated. Venation pale, pterostigma lanceolate, two basal cells and an open marginal cell, radial vein pale and curved, distally distinctly longer than proximally. Legs short. Abdomen subpetiolate, oval.

NOTE.—It has been suspected that *Phorbas* Ashmead was the male of *Bocchus* Ashmead and that *Eukoebeleia* Perkins was synonomous with the latter. The difference mentioned is that *Bocchus* has a four-jointed maxillary palpus while that of *Eukoebeleia* is five-jointed. Examination of Ashmead's type specimen of *Bocchus* showed that it had a five-jointed maxillary palp, and that the male of *Eukoebeleia* was synonymous with *Phorbas*. In Kieffer's key to *Bocchus* (1914) it is mentioned as having bare eyes. There is no note of this is Ashmead's description and those of his type were slightly hairy. Since the females of *Phorbas* have not been described it is impossible to include such species in the following key:

KEY TO SPECIES.

1. Wings rudimentary .....3. *mirabilis*
   Wings developed.....2
2. Scape as long as the third antennal joint, pronotum as long as the mesonotum..3
   Scape shorter than the third antennal joint, pronotum longer than the mesonotum.....4
3. Prothorax yellow, head and mesonotum tinged with brown...1. *flavicollis*
   Prothorax black and most of body black.....5. *arizonica*
4. Third antennal joint almost twice as long as the first, abdomen reddish brown .....2. *atriceps*
   Third antennal joint but slightly longer than the first, abdomen black, 4. *schæfferi*

1. P. flavicollis (Ashmead).

Bull. U. S. Mus., v. 45, p. 91 (♀), 1893.

Female: Black, except as noted, wings hyaline, with fuscous band across marginal cell, two-thirds width of wing. Length, 3 mm.

Marquette, Mich. Collected.

2. P. atriceps (Brues).

Bocchus atriceps Brues, Canad. Ent., v. 36, p. 118 (♀), 1904, Kieffer, Das Tierreich 41 L p. 45, 1914.

Chelogynus atriceps Brues, Bull. Wis. Soc. ser. 2 v. 3, p. 184, 1905.

Female: Reddish brown, head black above antennæ. Wings hyaline with fuscous band as in *flavicollis*. Length, 5 mm.

Moshola, New York. Collected.

3. P. mirabilis (Perkins). Plate I, Figs. 2 and 4.

Eukœbeleia mirabilis Perkins, Rep. Exp. Sta. Hawaii, Ent. v. 1, p. 59, (♀) 1905.

Female: Dull red to black, in black specimens only posterior region of vertex dorsal part of prothorax and mesonotum dull red. Antennæ except two or three basal joints black; mandibles and legs yellowish-brown or testaceous, abdominal pedicel pale. Head and thorax densely minutely punctate, thorax and sides of head distinctly pilose. Propodeum rugose-areolate dorsally, posteriorly rugose with median area defined by raised lines and this bordered by a similar narrower area on each side. Wings rudimentary, pointed, the fore pair reaching beyond

posterior margin of thorax. Abdomen smooth, polished, posterior segments with scattered stout hairs. Length, 2.5–3 mm.

Male: Black, pubescent, tibiæ and tarsi of fore legs fuscous, tarsi of middle and hind legs, except fifth joint which is fuscous, testaceous or pale yellow. Head distinctly more than twice as wide as long, posterior margin arcuate, occiput concave. Ocelli in a triangle, the anterior one its diameter distant from the lateral ones which are much nearer to each other than to the eyes. Eyes oblong, oval, pubescent. Antennæ of medium length, pubescent, scape twice the length of three, this twice longer than two, very slightly longer than four, four to nine subequal, nine somewhat smaller than four, ten slightly longer than nine and pointed; clypeus arcuate, mandibles black except the brown teeth, maxillary palpi dark brown, long, extending beyond the posterior margin of the head, with three joints visible beyond the geniculation. Head and thorax densely punctate. Mesonotum broad, wider than long, with distinct parapsidal furrows which slightly converge and extend to the posterior margin of the mesonotum being widely separated there; scutellum much smaller than mesonotum being nearly square and only slightly wider than long; metanotum somewhat shorter than scutellum, posteriorly rounded; propodeum rugose-areolated, with median area defined by raised lines, wings hyaline, posterior wings ciliate, clothed with very fine white hairs. Venation pale, subcostal vein brown, radius curved, not reaching the wing margin, the distal part shorter than the proximal, pterostigma, lanceolate; brown, often white medianly. Legs of medium length. Abdomen polished black, with scattered stout hairs laterally and posteriorly. Length, 1.5–2 mm.

Described from two specimens. Columbus, Sandusky, Ohio. Bred from *Brucomorpha oculatus* adults.

4. P. schæfferi (Brues).

Chelogynus schæfferi Brues, Bull. Wis. Soc., ser. 2 v. 5, p. 101 (♀), 1907.
Bocchus schæfferi, Kieffer, Das Tierreich, 41 L. p. 45, 1914.

Female: Black; base of antennæ, mandibles and clypeus yellowish; prothorax, four anterior legs; coxæ and basal parts of femora of hind pair bright ferruginous. Frons and vertex rugulose, prothorax, mesonotum and scutellum, smooth and polished, with scattered punctures; scutellum with transverse crenulate impressed line at its base. Propodeum rugulose, the posterior face nearly smooth above. Abdomen shining black. Body conspicuously whitish pubescent except flagellum of antennæ. Length, 5 mm.

Huachuca Mountains, Arizona. Collected.

P. schæfferi Var. a. (Brues).

Chelogynus schæfferi Brues, Bull. Wis. Soc., ser. 2 v. 5, p. 102 (♀), 1907.

Female: Colored like *P. atriceps* with entire thorax reddish, but structurally similar to above.

Brownsville, Texas. Collected.

5. P. arizonica (Perkins).

Eukœbelia arizonica Perkins, Rep. Exp. Sta. Hawaii, Ent. v. 2, Bull. 4, p. 44 (♀), 1907.

Female: Resembles *mirabilis*, but wings well developed, and raised lines on propodeum are more distinct. Length, 3 mm.

Nogales, Arizona. Bred from *Brucomorpha*.

Tribe *Gonatopodini*.

Gonatopodinæ, Kieffer, Andre, Spec. Hym. Eur., v. 9, p. 499, 1906.
Gonatopodini, Kieffer, Das Tierreich, 41 L, 1914.

Female: Head transverse or almost transverse, much broader than the thorax, dorsally mostly concave, seldom flat or slightly convex, posteriorly seldom rounded; the sloping surface of the posterior head concave. Eyes very large, almost occupying the entire side of the head, projecting outward, bare, posteriorly strongly diverging. Ocelli small and approximate, often indistinct or lacking. Maxillary palpus two to six jointed, labial palpus two or three jointed. Mandible slightly convex, three or four toothed. Antennæ originating close behind the clypeus, slender yet less so than in *Lestodryinini*, seldom reaching the hind end of the thorax, third joint the longest, the following gradually becoming shorter until the penultimate, the tenth somewhat longer than the preceding. Thorax strongly lengthened and of striking form, namely, divided by a generally pedunculate construction in a fore and a hind node, in one species asserted to be divided by two constrictions into three nodes. The fore node is composed of the prothorax and carries ventrally the fore coxæ; it is generally divided through a transverse furrow into two parts, of which the anterior is generally the shorter. The hind node bears ventrally the middle and the hind coxæ, and shows generally anteriorly a transverse suture, which continues itself laterally obliquely towards the posterior part and ends between the middle and the hind coxæ, this node is composed of the metathorax, the hind part of the mesothorax and the propodeum. The fore part of the mesothorax becomes formed through the nearly pedunculate constriction, which is joined to the fore node, without forming a part of the same. Mesothorax and scutellum not visible, the latter often recognizable as a trace on the anterior part of the hind node. In *Gynochelys* the mesonotum and scutellum are distinct though quite small. Tegula and wings quite lacking, except in *Gynochelys* where the tegula is present and the wings replaced by a barely visible, scale-like process. Fore legs because of the divergent form of the thorax very widely separated from the middle legs, coxa and trochanter greatly lengthened, the latter generally proximally more slender than distally, also club-shaped femur and tibia shorter and thicker than those of the other legs, the femur proximally greatly thickened, the tibia distally and less strongly thickened, meta-tarsus and fourth joint of the tarsus long, the three other joints short, in *Cryprtogonatopus* the fourth joint is also short, median chela arm ventrally with rows of lamellæ; lateral chela

arm often with lamellæ, sometimes with rows of teeth, sometimes unarmed; middle and hind legs long and slender, femur in form of a reversed club, tibia straight and very thin, distally hardly thicker, claws simple. Abdomen slightly flatly compressed, in circumference mostly shortly oval, petiole short, second segment longer than third, this longer than any of the following.

Male: Head transverse, triangular viewed from the side, vertex angulate, ocelli not situated close together but generally widely separated. Eyes rounded, pubescent. Occiput deeply concave. Prothorax either not visible from above or barely so, the hind angles attaining the tegulæ on the sides; mesonotum with parapsidal furrows. Wings with two basal cells, radius curved or somewhat angulate, pterostigma lanceolate. The males differ from those of the *Lestodryinini* in the triangular head, angulate vertex, rounded eyes, and the arrangement of the ocelli.

Genus *Haplogonatopus* Perkins.

Haplogonatopus Perkins, Rep. Exp. Sta. Hawaii, Ent. v. 1, p. 39, 1905.

Female: Vertex distinctly and fairly deeply concave, mandible four-dentate; maxillary palpus two-jointed, third antennal joint the longest twice as long as the following one. Pronotum not divided by a transverse impression into two parts. Fore trochanter same length as coxa, fore femur twice as long as trochanter basally much swollen; chela reaching to the base of the third tarsal joint; median arm with two rows of lamellæ which are large, pointed and set far apart, and with a row of long spines, distally distinctly curved with a cluster of lamellæ at distal end; lateral arm nearly straight but distinctly curved and notched at its distal end, medianly with a row of lamellæ. First and fourth fore tarsal joints the longest, the first being somewhat the longer, the second and third much shorter, the second being the shortest.

Male: Head transverse, not wider than thorax, vertex angulate, occiput deeply concave; eyes large, rounded, finely pubescent; ocelli in triangle, the fore ocellus situated below vertex in a concavity twice its diameter in front of the lateral ocelli. These situated nearer to the eyes than to each other and directly on the hind margin of the head. Antennæ filiform, pubescent, scape one-third longer than two, three to six joints the longest, two less than half as long as three and somewhat swollen, seven to ten subequal, seven slightly shorter than three. Maxillary palpi not visible ventrally. Mandibles three dentate. Thorax pubescent, prothorax barely visible from above the hind angles attaining the tegulæ, mesonotum with two distinct posteriorly converging parapsidal furrows which are approximate on the posterior margin. Wings hyaline, finely haired and ciliated; venation distinct though pale, two basal cells and a nearly closed marginal cell, pterostigma narrow, radius distinct, long and curved almost extending to the wing margin. Legs long, especially the hind legs. Abdomen subpetiolate, oval. Five species of which one is North American.

H. americanus Perkins.

Gonatopus bicolor Ashmead, Swezey, The Ohio Naturalist, v. III, p. 447–8 (♀), 1903.

Labeo longitarsus Ashmead, Swezey, The Ohio Naturalist, v. III, p. 447–8 (♂), 1903.

Haplogonatopus americanus Perkins, Rep. Exp. Sta. Hawaii, Ent. v. I, p. 40 (♀), 1905.

Female: Ferruginous to testaceous in color, abdomen black to brownish. Antennæ black, apical joint and two or three basal ones pale. Head nearly smooth, pronotum minutely punctured, propodeum dull with fine rugulosity. Length, 2.5 mm.

Male: Black, mandibles white, teeth brown, maxillary palpi white. Scutellum smooth and shining, metathorax posteriorly rounded, smooth and shining at top, but with lateral diagonal impressions separating punctate areas. Length, 2 mm.

Columbus, Sandusky, Ohio. Bred from *Liburnia campestris* and *L. lutulenta* nymphs and adults.

Genus *Gonatopus* Ljungh.

Gonatopus, Ljungh, Beitr. Naturk, v. 2, p. 161, 1810, Kieffer, Andre Spec. Hym. Eur., v. 9, p. 487 nota., 1906, Perkins, Rep. Exp. Sta. Hawaii, Ent. Bull. 11, p. 13, (non Perkins, 1905), 1912.

Dryninus, Dalman, Analecter ent., p. 14, 1823.

Neogonatopus Perkins, Rep. Exp. Sta. Hawaii, Ent. v. 1, p. 42, 1905.

Female: Head dorsally more or less slightly concave, maxillary palpus four-jointed, labial palpus two-jointed. Mesonotum and scutellum not visible. Fore tarsal joint, one and four long, the three others short; median chela arm distally bent inwards, ventrally with rows of lamellæ; lateral chela arm without lamellæ or teeth, at the most with a tooth before the distal end, often ventrally with rows of spines.

Male: Differs from *Haplogonatopus* chiefly in configuration of the head as follows: Concavity on the frons much smaller and vertex less angulate. There may be exceptions to this, however, as for instance, the male of *Gonatopus erythrodes* (Perk.). The maxillary palpus is four-jointed in comparison to that of *Haplogonatopus* which is two-jointed.

Key to Species.

1. The entire thorax smooth and shining.....2
   Thorax at least in part dull and transversely rugulose or punctate.....3
2. Hind thoracic node distinctly hairy, head brown.....16. *brunnescens*
   Hind thoracic node microscopically finely hairy, head yellow..17. *pallidiceps*
   Thorax not hairy.....7. *decepiens*....
3. The whole thorax finely and thickly transversely rugulose.....4
   Thorax at the most only in the smallest part transversely rugulose.....5
4. Thoracic spiracles situated on distinct elevations.....8. *contortulus*
   Thoracic spiracles not situated on elevations.....9. *punctatus*
5. Hind thoracic node with distinct erect hairs.....6
   Hind thoracic node without hairs.....12
6. Thorax entirely ferruginous.....7
   At least the hind node of the thorax dark.....8
7. Lateral chela arm with a tooth before the distal end.....11. *mimus*
   Lateral chela arm without tooth before distal end.....15. *mimoides*

8. Thorax black or dark brown.....9
   Thorax red, metathorax black.....14. *erythrodes*
9. Head ferruginous.....10
   Head black.....11
10. Pronotum with transverse impression.....2. *affinis*
    Pronotum without transverse impression.....1. *peculiaris*
11. Head deeply concave.....12. *obscurissimus*
    Head slightly concave.....13. *inimicis*
12. Head and thorax yellow, mandible 4-dentate.....4. *bicolor*
    Head in greatest part and thorax black or dark brown.....13
13. Head finely hairy, mandible 3-dentate.....5. *californicus*
    Head not hairy.....14
14. Abdomen flecked with reddish brown.....6. *flavifrons*
    Abdomen black.....15
15. Head finely rugulose, behind black.....3. *cyphonotus*
    Head very finely punctate, behind yellow or red.....10. *ombrodes*

1. G. peculiaris Brues.
Trans. Amer. Ent. Soc. v. 29, p. 125 (♀), 1903.

Female: Polished black, except greater part of head, sutures of legs and base of antennæ, which are reddish or yellow. Pronotum smooth, shining, lacking the transverse impression. Length, 2.75–3 mm.

Austin, Texas. Collected.

2. G. affinis n. sp.

Female: Differs from above chiefly in possessing the emargination on the pronotum. Dark brown to black, scape of antennæ white, mandibles and frons below antennæ testaceous, thoracic constriction, central area of hind node just before spiracles, and extreme posterior portion of propodeum yellow to testaceous. Legs ferruginous. Pronotum shining with minute punctures, thoracic constriction reticulately sculptured, hind thoracic node minutely reticulately rugose anteriorly and posteriorly, but smooth in middle. Abdomen polished, both abdomen and thorax with short scattered hairs. Length, 3.5 mm.

Male: Black, pubescent, vertex angulate, antennæ?* head triangular when viewed from side: vertex minutely and densely punctate; occiput deeply emarginate and excavated. Three ocelli visible from above, the anterior being below the vertex and twice its diameter distant from the lateral ones which are nearer to the eyes than to each other. Eyes nearly spherical, pubescent. Antennæ of medium length, pubescent. Mandibles white, teeth brown; maxillary palpi white, two joints visible. Prothorax scarcely visible from above attaining the tegulæ on the sides; mesonotum broad, with white pubescence very finely reticulately punctate; parapsidal furrows distinct, converging and meeting posterior margin of mesothorax but a small distance apart; scutellum much smaller than mesonotum, smooth and shining; propodeum minutely reticulately punctate. Wings hyaline, ciliated and clothed with fine hairs. Venation pale, pterostigma short and lanceolate. Two basal cells present. Radius pale, curved, the distal part much longer than the proximal, running almost to the margin of the wing, forming a nearly closed cell. Legs long, alternately marked with yellow and

* Specimen imperfectly emerged.

brown. Coxæ and most of middle and hind femora brown, front femora light at ends and ventrally but brown otherwise, middle and hind tibiæ brown but yellow at distal and proximal ends, fore tibiæ yellow with brown band across middle, tarsi yellow, fifth tarsal joint brown. Abdomen fuscous, depressed dorso-ventrally, with fine whitish pubescence. Length, 2 mm.

Described from one specimen, Bay View, Ohio, bred from *Deltocephalus affinis*. Type deposited in Entomological Museum at Ohio State University.

3. G. cyphonotus Bradley.
Canad. Ent. v. 38, p. 380 (♀), 1906.

Female: Black, except scape, pedicel, face, mandibles, trochanters, all coxæ beneath, posterior and middle coxæ in middle, and anterior tibiæ and tarsi above, lemon yellow, rest of legs reddish yellow. Thorax above and abdomen smooth and polished, side of thorax thoracic constriction above, head and coxæ finely roughened; hump of thorax without transverse impression. Differs from *G. contortulus* in that entire thorax lacks fine transverse striation and that thoracic construction less marked. Length, 2.5 mm.

British Columbia. Collected.

4. G. bicolor Ashmead.
G. ashmeadi Kieffer, Andre. Spec. Hym. Eur. v. 9, p. 108, 1904.
G. bicolor Ashmead, Bull. U. S. Mus. v. 45, p. 85 (♀), 1893, Kieffer, Das Tierreich, 41 L. p. 73, 1914.

Female: Yellow or reddish yellow; 4–5 basal antennal joints yellow, rest brown. Middle and posterior knees and tips of posterior tibiæ black; abdomen piceous black. Mandibles four-dentate. Propodeum smooth, polished, posterior face slightly transversely aciculated. Length, 3 mm.

Silma, Alabama; Texas. Collected.

5. G. californicus Ashmead.
Bull. U. S. Mus. v. 45, p. 85, (♀), 1893.

Female: Piceous brown, except apex of metathorax and the abdomen, which are more or less black. Antennæ, tarsi slender part of posterior femora, and middle posterior tibiæ honey-yellow. Head finely and closely punctate, pubescent, metathorax transversely rugulose. Length, 3 mm.

California. Collected.

6. G. flavifrons Ashmead.
Bull. U. S. Mus. v. 45, p. 84, (♀), 1893.

Female: Black, shining, with fine shagreened punctation. Occiput, face, mandibles, palpi, antennæ except three terminal joints which are fuscous, and legs, yellow. Anterior femora above almost entirely black,

tibia with black streak above, middle and posterior coxæ and femora basally more or less black above. Comes nearest to *G. contortulus* but is larger, head broader, and differs in color. Length, 4.4 mm.

New York and Hull, Canada. Collected.

7. G. decipiens Provancher.
Addit. Hym. Quebec, p. 179 (♀), 1897.

Female: Black, antennæ testaceous; tibia testaceous, fore tarsus brown, hind tarsi testaceous. Head large, flat, finely punctate, thorax smooth and shining. Length, 2.4 mm.

Kap Rouge, Canada. Collected.

8. G. contortulus Patton.
Canad. Ent., v. 11, p. 65, (♀), 1897.

Female: Black; frons black to testaceous; scape and first flagella joint fuscous to pale testaceous; pronotum with central black area bordered by testaceous color laterally and on posterior margin. Anterior coxæ testaceous, brown at sides, anterior trochanter pale testaceous, anterior femora, tibiæ and basal two tarsal joints dark fuscous or dark testaceous, rest of tarsus and chela testaceous. Middle and hind legs fuscous to dark testaceous. Abdomen black or fuscous polished and sparsley haired. Prothorax faintly reticulately sculptured, mesonotum longitudinally rugose, propodeum finely reticulately sculptured anteriorly, posteriorly distinctly transversely rugose. Length, 3 mm.

Redescribed from four specimens. Sandusky, Ohio. Bred from *Deltocephalus sayi* adults.

9. G. punctatus n. sp.

Female: Similar to *G. contortulus* except as follows: pronotum distinctly and finely punctate; propodeum entirely and distinctly punctate and propodeum spiracles sessile. Thorax and propodeum without hairs. A distinct lateral, oblique suture separates the meso-and meta-thorax. Length, 3.5 mm.

Male: Black, pubescent; vertex angulate, head being triangular when viewed from side; occiput deeply hollowed out. Ocelli in triangle, all visible from above, the anterior not situated in a concavity. A very slight concavity on frons below anterior ocellus. Lateral ocelli nearer to the eyes than to each other. Eyes spherical, pubescent; antennæ nearly as long as the body and pubescent; two slightly shorter and thinner than scape and swollen at middle, three to six and ten, five times as long as wide, seven to nine successively becoming shorter, nine four times as long as wide. Mandibles, except the brown teeth, and maxillary palpi sordid yellow; latter short with two visible joints. Prothorax not visible from above, attaining the tegulæ on the sides, mesonotum finely sculptured. Parapsidal furrows converging for three-fourths their distance towards the base then becoming parallel and ending distinctly separated at the base; scutellum smooth and shining, being slightly wider than long. Metanotum somewhat wrinkled and somewhat shining, shorter than scutellum, posteriorly rounded;

propodeum roughened and densely and coarsely punctate, no area separated by raised lines. Wings hyaline, ciliated, clothed with short hairs. Venation distinct, pterostigma lanceolate. Radius curved proximally distinctly longer than distally but not reaching tip, sub-discoidal vein finely distinct and extending clear to margin of wing, cubital vein visible short distance from wing margin. Legs long, fore pair testaceous, last two pairs fuscous. Abdomen same length as thorax, black, pilose, depressed dorso-ventrally. Length, 2.4 mm.

Described from one male and three females. Columbus, Ohio. Bred from *Deltocephalus sayi* adults. Types deposited in Entomological Museum, Ohio State University. Paratypes in writer's collection.

10. G. ombrodes (Perkins).

Neogonatopus ombrodes Perkins, Rep. Exp. Sta. Hawaii, Ent. v. 1, p. 42 (♀), 1905.

Gonatopus ombrodes Perkins, Rep. Exp. Sta. Hawaii, Ent. Bull. 11, p. 13, 1912.

Female: Black; vertex of head, and pronotum often piceous or brown, face and occiput yellow or ferruginous; basal two or three antennal joints pale; legs pale yellow brown or testaceous. Head and pronotum minutely punctate, propodeum dull and very densely sculptured. Abdomen smooth and glabrous. Length 3–3.4 mm.

Columbus, Ohio. Bred from *Deltocephalus* sp.?

11. G. mimus (Perkins).

Neogonatopus mimus Perkins, Rep. Exp. Sta. Hawaii, Ent. v. 2, Bull. 4, p. 33 (♀), 1907.

Gonatopus mimus Perkins, Rep. Exp. Sta. Hawaii, Ent. Bull. 11, p. 13, 1912.

Female: Ferruginous or testaceous, abdominal petiole black, abdomen often darker than the thorax or brown; first two or three antennal joints testaceous, rest black. Head in front of ocelli smooth, behind dull with minute sculpture, antennæ short and stout. Chela with fifth joint having lamellæ not reaching to articular cavity but replaced towards tip by bristles. Length, 2.5–3 mm.

Nogales, Arizona. Bred from jassid sp.

12. G. obscurissimus (Perkins).

Neogonatopus obscurissimus Perkins, Rep. Exp. Sta. Hawaii, Ent. v. 1, p. 43 (♀), 1905.

Gonatopus obscurissimus Perkins, Rep. Exp. Sta. Hawaii, Ent. Bull. 11, p. 13, 1912.

Female: Black, pronotum, mesonotum, and some of leg joints dark brown or piceous. Basal 2–3 antennal joints, tarsi and part of hind tibiæ and femora pale, yellow, or testaceous. Head and pronotum shining, latter faintly sculptured; propodeum with minute dense surface sculpture, posteriorly finely transversely rugose. Length, 3 mm.

Columbus, Ohio. Bred from *Deltocephalus* spp.

13. G. inimicis n. sp.

Female: Nearest to *G. obscurissimus* but differing as follows: Head slightly concave, general body color fuscous, head smooth, without hairs mesothorax ferruginous, fuscous anteriorly, finely reticulately rugose, propodeum fuscous, polished, smooth posteriorly with fine indistinct punctation. Thoracic spiracles on elevations. Length, 2.75 mm.

Described from two specimens. Bay View and Columbus, Ohio. Bred from *Deltocephalus inimicus* adults. Type deposited in Entomological Museum, Ohio State University.

14. G. erythrodes (Perkins). Plate I, Figs. 1 and 5.

Neogonatopus erythrodes Perkins, Rep. Exp. Sta. Hawaii, Ent. v. 1, p. 43 (♀), 1905.

Gonatopus erythrodes Perkins, Rep. Exp. Sta. Hawaii, Ent. Bull. 11, p. 13, 1912.

Female: Ferruginous; propodeum black, abdomen testaceous to brown; antennæ black, three basal joints pale; legs yellow-brown to testaceous. Head and pronotum shining, latter with fine indefinable punctation; propodeum dull, similar to *G. ombrodes* but posterior face distinctly transversely rugose. Length, 3 mm.

Male: Black, pubescent, vertex angulate, head being triangular when viewed from side; occiput deeply emarginate and excavated. Anterior ocellus situated in a concavity on the frons and not visible from above. Lateral occlli nearer eyes than to each other. Eyes oval pubescent; mandibles testaceous, teeth brown. Maxillary palpi sordid white with two joints visible. Antennæ pubescent, of medium length being about same length as thorax, two shorter than one, three distinctly longer than one being three times as long as wide, four-nine subequal shorter than three, ten pointed and narrow, slightly longer than nine. Head and prothorax densely punctate, latter not visible from above, attaining the tegulæ on the sides; mesonotum broad, shining, minutely sculptured, parapsidal furrows converging being but narrowly separated at the base; scutellum nearly square, polished, with transverse furrow near the base; metanotum polished and half-length of scutellum; propodeum rugose. Wings hyaline, ciliated, and clothed with fine hairs. Venation pale, pterostigma elongate lanceolate. Two basal cells present. Radius curved, the distal part longer than the proximal, nearly reaching margin of wing. Legs long, fore legs testaceous, tip of femora and bases of tibiæ lighter color, last two pairs of legs fuscous; abdomen as long as thorax, black, pilose dorso-ventrally depressed. Length, 1.5 mm.

Described from one specimen. Sandusky, Ohio. Bred from *Deltocephalus inimicus* nymphs. Type of male deposited in Entomological Museum, Ohio State University.

15. G. mimoides (Perkins).

Neogonatopus mimoides Perkins, Rep. Exp. Sta. Hawaii, Ent. v. 2, Bull. 4, p. 34, (♀), 1907.

Gonatopus mimoides Perkins, Rep. Exp. Sta. Hawaii, Bull. 11, p. 13, 1912.

Female: Ferruginous or testaceous, petiole black, mandibles pale yellow. Antennæ black, three basal joints pale. Pronotum very

minutely punctate with sparse short hairs, thoracic constriction long; propodeum closely and minutely punctured, posteriorly transversely rugulose. Abdomen sparsely pilose. Length, 3 mm.

Nogales, Arizona. Collected.

16. G. brunnescens (Perkins).

Neogonatopus brunnescens Perkins, Rep. Exp. Sta. Hawaii, Ent. v. 1, p. 44, (♀), 1912.
Gonatopus brunnescens Perkins, Rep. Exp. Sta. Hawaii, Ent. Bull. 11, p. 13, 1912.

Female: Brown or yellow-brown, abdomen dark brown to black, or sordid testaceous; propodeum posteriorly dark brown or pitchy. Basal two or three antennal joints and all legs pale colored. Head very little concave on vertex. Head and propodeum smooth, abdomen pilose. Length, 2.5–3 mm.

Columbus, Ohio. Bred from *Euscelis (Athysanus) curtisii.*

17. G. pallidiceps (Perkins).

Neogonatopus pallidiceps Perkins, Rep. Exp. Sta. Hawaii, Ent. v. 1, p. 45, (♀), 1905.
Gonatopus pallidiceps Perkins, Rep. Exp. Sta. Hawaii, Ent. Bull. 11, p. 13, 1912.

Female: Black; head, apical margin of pronotum, and the neck in front of it, three basal antennal joints, and all legs pale, yellow, or ferruginous. Head smooth, pronotum very finely punctured, propodeum with minute surface sculpture, posteriorly very finely transversely rugose. Abdomen deep black. Length, 2.5 mm.

Alameda, California. Collected.

Tribe *Anteonini*.

Anteoninæ, Kieffer, Andre, Spec. Hym. Eur., v. 9, p. 510, 1906.
Anteonini, Kieffer, Das Tierreich, 41 L, 1914.

Thorax not divided into two nodes by a constriction. Wings almost always developed, only atrophied in *Mystrophorus*. Pronotum attaining the tegulæ. Pterostigma broad, half ellipsoidal in shape, only small and elongate in *Deinodryinus;* venation composed of costa, subscota, a radius not reaching the fore wing margin, medial, submedial, a basal vein originating at the distal end of the subcosta and a transversal vein, other veins obliterated, only visible as transparent lines. Fore-legs not strongly elongated and not excessively slender, coxa and trochanter short, fore tarsus with a chela in the female, lateral chela arm always without lamellæ.

Genus *Chelogynus* Haliday.

Gonatopus (part), Dalman, Svenska Ak. Handle, p. 81, 1818.
Dryinus (part), Dalman, Analecta Ent., p. 9, 1823.
Chelogynus Haliday, Ent. Mag., v. 5, p. 518, 1838.
Antæon (part), T. A. Marshall, Cat. Brit. Hym., Oxyura, p. 7, 1873.
Anteon (part), Kieffer, in Andre, Spec. Hym. Eur., v. 9, p. 130, 1905.
Neochelogynus and **Prosanteon** (part), Perkins, Rep. Exp. Sta. Hawaii, Ent. v. 1, p. 60, 66, 1905.

Distinguished from *Anteon* by the fourth joint of the front tarsus, which in the female is longer than the metatarsus, by the median chela arm, which is provided ventrally with rows of lamellæ and whose free distal end is as long or longer than the basal. As in *Anteon* the parapsidal furrows are at least lacking behind, the eye is bare, the radius mostly angled, the proximal part much longer than the distal.

KEY TO *Chelogynus*.

1. Wings hyaline.....2
   Wings with one or two dark transversal bands.....6
2. Antennæ brown.....3
   Antennæ partly red or testaceous, at least the distal end black.....4
3. Pronotum longer than mesonotum and coarsely punctate.....4. *osborni*
   Pronotum as long as the mesonotum and very finely punctate...3. *canadeniss*
4. Only the end joint of the antennæ black, the others testaceous.....1. *lusus*
   Not only the end antennal joint black.....5
5. Coxæ black for the greatest part, pronotum with rugulosities....9. *funestus*
   Coxæ pale .....2. *melanacrias*
6. Wings with one dark band, head and thorax red.....5. *atriventris*
   Wings with two dark bands.....7
7. Entirely ferruginous .....6. *ferrugineus*
   Black.....8
8. Frons with three longitudinal ridges, sides of face reddish brown..7. *grandis*
   Frons without longitudinal ridge, face black.....8. *henshawi*

1. C. lusus Perkins.
Rep. Exp. Sta. Hawaii, Ent. v. 2, Bull. 4, p. 50, (♀), 1907.

Female: Black, head and pronotum densely minutely shagreened, mesonotum with fine surface sculpture, scutellum polished, propodeum rugose, posteriorly dull, with very dense and fine rugulosity. Mandibles white, antennæ except apical joint concolorous and testaceous. Length, 2 mm.

Tucson, Arizona. Bred from jassid nymph.

2. C. melanacrias Perkins.
Rep. Exp. Sta. Hawaii, Ent. v. 2, Bull. 4, p. 49, (♀), 1907.

Female: Differs only from *C. lusus* in color and sculpture as follows: antennæ testaceous on basal joints, four apical joints black. Pronotum somewhat transversely rugulose anteriorly. Length 2–2.5 mm.

Nogales, Arizona. Collected.

3. C. canadensis Ashmead.
Bull. U. S. Mus., v. 45, p. 93, (♀), 1893.

Female: Black; head finely punctate, pronotum as long as mesonotum very finely punctate, mesonotum and scutellum smooth, propodeum rugose. Length, 2.5 mm.

Ottawa, Canada. Collected.

4. C. osborni n. sp. Plate I, Fig. 6.

Female: Black, antennæ brown, scape testaceous, flagellum brown except third flagellar joint which is dark brown, legs testaceous except middle and hind coxæ and trochanters which are fuscous, and distal end of hind femora which is darkened. Mandibles testaceous except teeth

which are brown, maxillary palpi pale testaceous with three joints visible. Ocelli in triangle, the anterior situated medianly on the vertex, the lateral ones closer together than to eyes and three times their diameter distant from the anterior. Eyes oval and bare. Antennæ somewhat elbowed, the scape long, the flagellum slightly clavate, three two-thirds as long as one, more slender and twice as long as two, four shorter than three but longer than five, six to nine subequal twice as long as wide, ten slightly longer than nine and pointed. Vertex with few scattered very fine punctures, pronotum with few large punctures, longer than the smooth mesonotum. Parapsidal furrows distinct, extending half-way length of mesonotum, converging. Scutellum smooth, over half as long as mesonotum, with deep transverse furrow across anterior margin and a row of punctures across base. Metanotum half length of scutellum, shining with deep furrow across anterior margin. Propodeum distinctly reticulately rugose with middle rugulose area marked by raised lines. Median chela arm with two rows of lamellæ distally which converge into a single row medianly, tip spoon-shaped with cluster of lamellæ. Wings ciliated, clothed with fine hairs, with two basal cells, radius straight, the distal part very short and angled. Abdomen globose, shortly pedunculate, polished, black. Entire body pubescent, face thickly so, vertex and dorsal part of thorax with few scattered hairs, propodeum with numerous hairs, abdomen with few indistinct hairs. Differs from *C. canadensis* chiefly in character of antennæ, and body sculpture. Length, 2.5 mm.

Described from two specimens. Sandusky, Ohio. Bred from *Chlorotettix unicolor* nymphs. Type deposited in Entomological Museum, Ohio State University. Paratypes in writer's collection.

5. C. atriventris (Cresson).

Dryinus atriventris Cresson, Trans. Amer. Ent. Soc., v. 4, p. 193, (♀), 1872.

Female: Ferruginous, with pale pubescence. Face, mandibles, and base of scape pale yellowish; tips of antennæ black, propodeum rugose, posterior face depressed and transversely aciculated. Length, 4.5 mm.

Texas. Collected.

6. C. (?) **ferrugineus** Brues.

Bull. Wis. Soc., v. 3, p. 183, (♀), 1905.

Female: Ferruginous, except darker tips of antennæ and tarsi, scape white at base below, mandibles yellow. Head rugose-punctate, prothorax finely punctured shining covered with short pubescence; mesonotum shorter, polished, with few punctures and distinct parapsidal furrows; propodeum finely reticulated; abdomen polished and unpunctured. Length, 5 mm.

Texas. Collected.

7. C. (?) **grandis** Brues.
Bull. Wis. Soc., v. 3, p. 184, (♀), 1905.

Female: Black, legs black except four anterior tibiæ and tarsi, base of anterior trochanters, and tips of anterior femora. Sides of face below and antennæ except five apical joints, rufous, mandibles black, maxillary palpi fuscous. Occiput shining, finely punctured, and sparsely pubescent. Prothorax strongly contracted; pronotum closely punctured; mesonotum polished delicately punctate; scutellum shining; propodeum finely rugulose. Length, 7 mm.

Riverside, Massachusetts.

8. C. (?) **henshawi** Ashmead.
Bull. U. S. Mus., v. 45, p. 93, (♀), 1893.

Female: Black; antennæ and legs pale rufous; the six terminal antennal joints fuscous; clypeus and mandibles rufous. Head and prothorax finely rugose; mesonotum and scutellum smooth; propodeum coarsely rugose. Wings hyaline with two transverse fuscous bands. Length, 5 mm.

Milton, Mass. Collected.

9. C. funestus Perkins.
Rep. Exp. Sta. Hawaii, Ent. v. 2, Bull. 4, p. 48, (oo), 1907.

Female: Black; basal four antennal joints ferruginous; front femora pale to black; mandibles yellow. Head and frons dull, minutely rugulose; antennal flagellum subclavate, pronotum with extremely fine transverse rugulosity; mesonotum with few shallow punctures; scutellum smooth and shining; propodeum truncate, rugose, posteriorly minutely rugulose without a definite central area. Length, 2–5 mm.

Male: Black; anterior tibiæ and tarsi testaceous, middle and hind tarsi pale or brown. Head sculptured as in female, antennæ as long as head and thorax, flagellum submoniliform, mesonotum with faint surface sculpture, scutellum polished; propodeum as in female. Length, 2 mm.

Tuscon, Arizona. Bred from jassid nymphs found on small bush.

Tribe *Aphelopini*.

Anteoninæ (part), Kieffer, Andre Spec. Hym. Eur., v. 9, p. 495, 1906.
Aphelopinæ, Perkins, Rep. Exp. Sta. Hawaii, Ent. Bull. No. 11, p. 7, 1912.
Aphelopini Kieffer, Das Tierreich, 41 L., p. 214, 1914.

Distinguished from the *Anteonini* as follows: Wings hairy and ciliated, with costa, subcosta, radius and a broad truncate pterostigma; the rest of the veins obliterated. Legs not thickened, fore legs without chela in ♀.

Genus *Aphelopus* Dalman.

Gonatopus (part) Dalman, Swenska A. k. Handl., p. 82, 1818.
Dryinus (Aphelopus) Dalman, Anatecta ent., p. 14, 1823.
Aphelopus Haliday, Ent. Mag., v. 1, p. 273, 1833.
Ceraphron (part), Ratzeburg, Ichneum, v. 2, p. 141, nr. 2, 1848.

Head transverse, anteriorly slightly narrowed, posteriorly deeply arcuate. Eyes almost reaching the hind margin, oval, with a short, scattered, indistinct pubescence. Ocelli forming a triangle, the lateral ones nearer the hind edge than to the eye, farther apart than from the eye. Mandible twice as long as broad, distally truncate and three-dentate, the teeth three-angled, of equal length, the middle often with a little tooth at its base. Maxillary palpus with fine long joints, labial palpus two or three jointed. Antennæ originating close or the clypeus and farther apart than from the eyes, pubescent. Pronotum barely visible from above; mesonotum convex, transverse, anteriorly rounded, with two posteriorly converging parpasidal furrows extending only part way down the mesonotum, seldom without such. Scutellum posteriorly rounded, anteriorly with a transverse impression; propodeum large, at first horizontal, then gradually sloping; propleura concave; mesopleura strongly convex, with an oblique longitudinal furrow, separated from the metapleura by a ridge reaching from the wing bases to the hind edge of the middle coxæ. Venation as above given. Hind wings without distinct veins, with four frenula. Spur of fore tibia hairy, narrowed on the whole ventral side to a base, hyaline lamella, which is discontinued suddenly before the distal end of the spur, this thus appearing two-lobed, all claws simple. Abdomen strongly laterally compressed, as long or shorter than the thorax.

Key to Species of *Aphelopus*.

1. Thorax without white color.....2
   Thorax in part white, at least first two pairs of legs white or pale yellow..10
2. Radius very short one-third as long as the pterostigma, abdomen reddish brown .....1. *rufiventris*
   Radius at least as long as the pterostigma, abdomen black.....3
3. Propodeum with a smooth median field, head without red coloring.....5
   Propodeum without a medium field.....4
4. Face, clypeus, mandible and genæ ferruginous.....2. *affinis*
   Face white to just above bases of antennæ.....9. *comesi*
   Face black .....3. *dikraneuri*
5. Mesonotum smooth and shining.....5. *americanus*
   Mesonotum dull and coriaceous.....6
6. Head with mandibles above white.....7. *arizioncus* (♀)
   Head with white facial markings.....7
7. Clypeus alone white .....4. *microleucus*
   More than clypeus white.....8
8. White facial markings extending a little above the antennæ....8. *viduus*
   White facial markings extending at least as far as the anterior ocellus, along the eye margins.....9
9. Mesonotum densely minutely shagreened.....7. *arizonicus* (♂)
   Mesonotum coriaceous .....6. *varicornis* (♀)
10. Only pronotum and prosternum white, the rest of the thorax black.....
    10. *albopictus*
    Mesonotum, except middle section, pleura, and sternum white.....
    11. *pulcherrimus*

1. A. rufiventris Ashmead.
Bull. U. S. Mus., v. 45, p. 100, (♀), 1893.

Female: Head and thorax black, minutely punctate; abdomen rufous; antennæ and legs honey yellow. Antennæ short, subclavate. Propodeum coarsely rugose. Length, 2 mm.

Jacksonville, Florida. Collected.

2. A. affinis Ashmead.
Bull. U. S. Mus., v. 45, p. 102, (♀), 1893.

Female: Black, face from frons ferruginous; antennæ brown; legs except posterior tibiæ which are fuscous, honey yellow. Head and thorax minutely punctate, propodeum rugulose. Length, 2.2 mm.

Canada. Collected.

3. A. dikraneuri n. sp. Plate I, Fig. 3.

Black; clypeus ferruginous, mandibles yellow, maxillary palpi long, white, extending beyond the base of the head with four segments visible. Legs fuscous to brown; fore legs may be testaceous, if so coxæ are fuscous. Antennæ brown entirely. Ocelli in triangle, the anterior located medianly on the vertex and farther from the lateral ones than they are from the hind margin of the head, these nearer to the eyes than to each other. Eyes oval, without hairs. Antennæ filiform, two same length and width as one in male, both wider than three; one somewhat longer than two in female; four-nine equal in length three times longer than wide, ten distinctly longer than nine, tapering at tip. Vertex and mesonotum minutely reticulately sculptured. Parapsidal furrows distinct, converging and extending half way the length of the mesonotum in male, shorter and not extending to middle in female. Scutellum finely reticulately sculptured, metathorax smooth and shining, propodeum reticulately rugose without median smooth area. Radius slightly curved and part beyond usual point of angelation obliterated. Abdomen compressed laterally. Head and thorax pubescent, abdomen with numerous hairs on ventral half of side and posteriorly. Length, 1.5 mm.

Columbus, Ohio. Bred from *Dikraneura fieberi*, adults. Described from one male and three females. Type deposited in Entomological Museum, Ohio State University. Paratypes in writer's collection.

4. A. microleucus Perkins.
Rep. Exp. Sta. Hawaii, Ent. v. 2, Bull. 4, p. 55, (♀), 1907.

Male: Black; clypeus and mandibles white, two basal antennal joints dark brown, all coxæ and trochanters pale yellowish white or white, front legs testaceous; middle legs darker, and hind legs black. Head and thorax minutely sculptured, propodeum reticulately rugose, small smoother area on posterior face. Antennæ filiform. Length, 2 mm.

Nogales, Arizona. Bred from *Erythroneura* sp.

5. A. americanus Ashmead.
Bull. U. S., Mus. v. 45, p. 100, (♀), 1893.

Male: Black; antennæ reaching to middle of abdomen; brown except scape which is yellow. Legs honey yellow, posterior femora and tibia fuscous or black. Finely punctate, except mesonotum and scutellum which are smooth with few indistinct scattered punctures. Length, 1.5 mm.

Jacksonville, Florida. Collected.

6. A. varicornis Brues.
Bull. Wis. Soc., v. 4, p. 143, (♀), 1906.

Female: Black; legs and first two antennal joints light yellow; face below ocelli and maxillary palpi white. Head finely shagreened, shining; mesonotum shagreened. Parapsidal furrows distinct extending two-thirds the length of mesonotum. Propodeum rounded behind, areolated and rugulose. Radius a little longer than stigma, faintly curved at tip. Length, 1.75 mm.

Woods Hole, Massachusetts. Collected.

7. A. arizonicus Perkins.
Rep. Exp. Sta. Hawaii, Ent. v. 2, Bull. 4, p. 53, (♂♀), 1907.

Female: Black; basal two antennal joints yellow or yellow-brown, legs testaceous, except hind femora and tibiæ which are black or pitchy. Head and mesonotum finely shagreened, antennæ sub-clavate, propodeum finely reticulately rugose, posteriorly with smooth shining area.

Male: Similar. Two basal antennal joints darker brown, face yellow below, legs entirely testaceous, antennæ more elongate. Length, 2 mm.

Nogales, Arizona. Bred from *Dikraneura* sp.

8. A. viduus Perkins.
Rep. Exp. Sta. Hawaii, Ent., v. 2, Bull. 4, p. 54, (♀), 1907.

Male: Black, lower part of face and mandibles pale yellow or cream-colored. Front and middle legs pale yellow, tarsi infuscate, hind femora, tibiæ, and tarsi, pitchy. Head and mesonotum densely shagreened. Antennæ long, slender and filiform. Propodeum reticulately rugose, a postina median area present. Length, 2 mm.

Nogales, Arizona. Collected.

9. A. comesi n. sp.

Male: Black, face white to just above bases of antennæ. Mandibles, palpi, and short antennæ brown, the basal two joints testaceous. Fore legs, coxæ and trochanters of middle and hind legs and femora of middle legs white, tibiæ of middle leg darkened, femora and tibiæ of hind legs fuscous, tarsi of middle and hind legs sordid yellow. Abdomen brown. Head finely coriaceous shining, clypeus truncate. Eyes oval with fine, almost invisible pubescence. Antennæ filiform, three shorter than four,

which is shorter than five, seven and eight almost equal, slender, longer than four or five, more than twice as long as wide, ten long, slender. Head dull, finely coriaceous, mesonotum coriaceous with indistinct parapsidal furrows, converging and being obliterated slightly beyond the middle and almost indistinguishable anteriorly. Propodeum without median field and distinctly rugosely sculptured. Wings hyaline, radius pale, curved extending nearly to margin of wing. Abdomen with sparse hairs, smooth. Length, 1.5 mm.

Described from one specimen. Columbus, Ohio. Bred from *Erythroneura comes*, adult. Type deposited in Entomological Museum, Ohio State University.

10. A. albopictus Ashmead.
Bull. U. S. Mus., v. 45, p. 101, (♀), 1893.

Black, face below front ocellus, maxillary palpi, anterior and middle legs, pronotum to tegulæ, and propectus white or yellow-white. Antennæ dark brown. Head finely punctulate, propodeum rugose. Length, 1.5 mm.

Washington, D. C., and Bladensburg, Md. Collected.

11. A. pulcherrimus Perkins.
Rep. Exp. Sta. Hawaii, Ent., v. 2, Bull. 4, p. 54, sex? 1907.

Sex?: Black, whole face white, scape, legs white or pale yellow, mesonotum exteriorly to the parapsidal furrows, whole thorax beneath and pleural portion, cream colored. Antennæ except scape testaceous. Head and thorax densely shagreened, posterior area of metanotum minutely shagreened. Length 1.5 mm.

Nogales, Arizona. Bred from *Erythroneura* sp.?