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NEW NEARCTIC COLLEMBOLA¹

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Since Packard, in 1873, described a number of springtails which were collected in Texas by Belfrage, the collembolan fauna of this large region has been untouched. A number of his names have fallen into synonymic discard, but it was with considerable interest that collecting was carried on during the fall and winter of 1930 in the vicinity of College Station, Texas, to see which of his species might be rediscovered. Belfrage's material was collected at Waco, about ninety miles north of College Station, and the fauna of the two localities should not differ greatly. Only one of Packard's species has been taken thus far, *Drepanocyrtus bipunctatus* (Packard), a fine large chocolate-brown form which was very abundant throughout the fall.

During the course of these collections four new species were taken, and they, together with two new species from Iowa and one from Louisiana, comprise this paper. Two species of Isotomidæ and five of Entomobryidæ are represented, namely:

Proisotoma bayouensis, new species *Entomobrya pseudoperpulchra*, new species
Folsomia prima, new species *Entomobrya sabulicola*, new species.
Entomobrya guthriei, new species. *Drepanocyrtus reinhardi*, new species.
Lepidocyrtus folsomi, new species

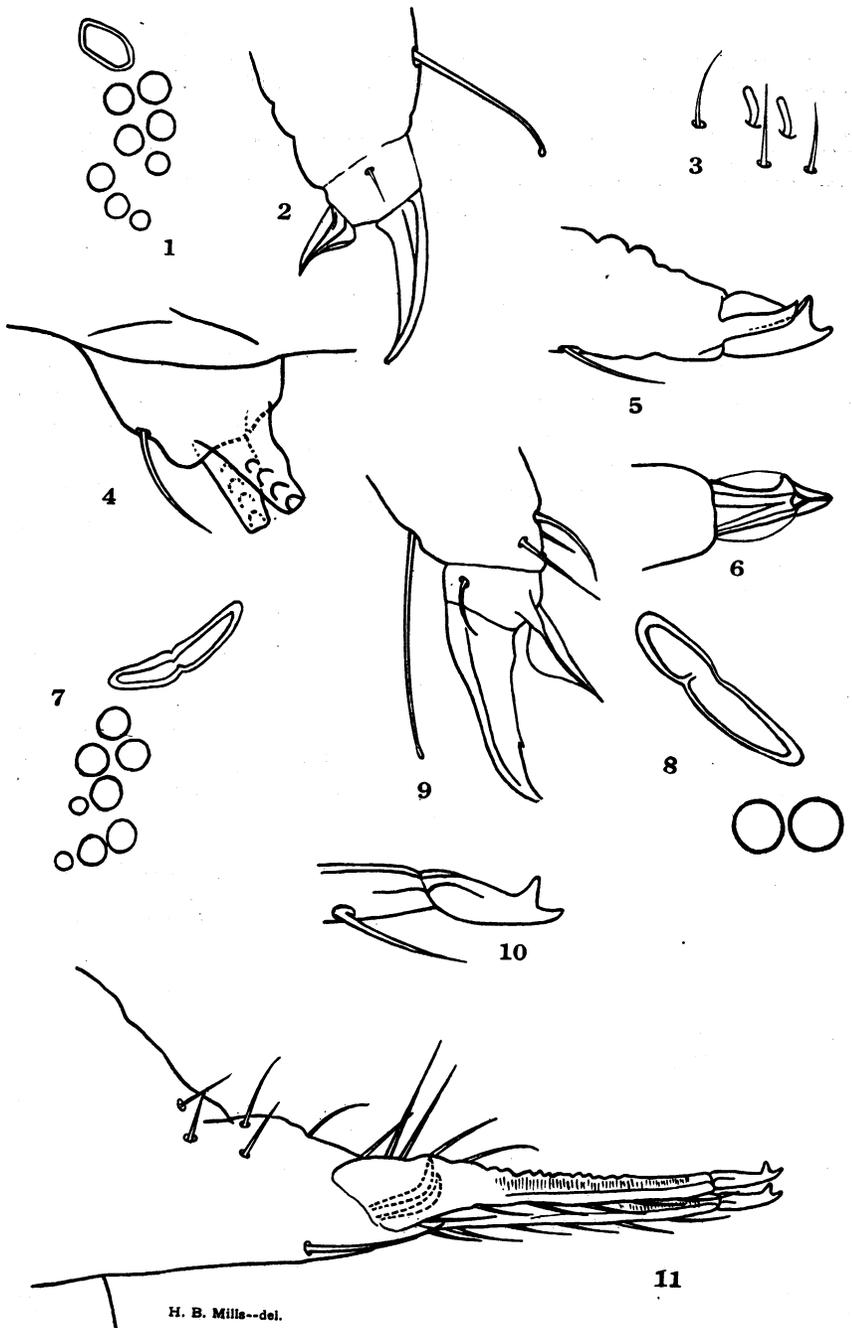
Cotypes of these species have been placed in The American Museum of Natural History, New York City.

The writer is deeply indebted to Dr. J. W. Folsom of Tallulah, Louisiana, who has read the manuscript of this paper for the identification of material, the use of rare literature, and for the most valuable aid which he has received in all of his systematic endeavors.

***Proisotoma bayouensis*, new species**

Light to dark indigo blue; gray to black to the unaided eye. Pigment broken by white spots, various in size, mostly rounded. Intersegmental regions unpigmented, appearing as narrow white bands. Both the spots and the bands are more evident in darker individuals. Antennæ, legs, and furcula blue. Eyes (Fig. 1), eight on each

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Figs. 1 to 6. *Proisotoma bayouensis*. 1, Eyes, left side; 2, left hind foot; 3, right antennal organ; 4, left of tenaculum; 5, left mucro; 6, dorsal view of right mucro.

Figs. 7 to 11. *Folsomia prima*. 7, Eyes, right side; 8, left postantennal organ; 9, right hind foot; 10, left mucro; 11, left view of furcula.

side of the head; the two inner proximal ones in each patch smaller than the rest. Postantennal organ (Fig. 1) suboval; twice as long as the width of an adjacent eye. Antennæ and head subequal in length. Antennal segments telescopic; of the ratio 5:7:6:13 or 17:29:25:54, the last segment stout, elliptical. Sense organ of third antennal segment (Fig. 3) with a pair of basally bent sense clubs. Olfactory hairs present on the fourth segment but not greatly differing from the other antennal setæ. Prothorax relatively little reduced, pigmented dorsally; the other segments slightly imbricate. Tibiotarsus occasionally with a distal subsegment. Unguis (Fig. 2) curving, rather slender, without lateral or inner teeth. Unguiculus extending half as far as the unguis, broad basally, acuminate, with two inner basal lamellæ. A single tenent hair present, usually slightly curved at the tip. Genital and anal segment not ankylosed. Fourth abdominal segment considerably longer than the third (as 11:7). Furcula appended apparently to the fifth abdominal segment, reaching to the ventral tube, tapering but slightly distally. Proportions of manubrium to dens to mucro about as 83:71:15; manubrium thus a little longer than the dentes; dorsally with short, stiff bristles and ventrally with one pair (rarely with two pairs) of ventrolateral subapical bristles which are inserted closer to the sides of the manubrium than to each other. Dentes with short, stiff bristles dorsally and on the apical half ventrally; dorsally with from twelve to fifteen very irregular semicircular transverse folds. Mucro (Figs. 5, 6) short, stout, about two-thirds the length of a hind unguis, tridentate, bilamellate; apical tooth slightly curving, anteapical tooth larger and erect, third tooth lateral, nearly superimposed on the second tooth from a lateral view. The inner lamella connects the tip of the anteapical tooth with the mucronal base, and the outer lamella extends from the tip of the lateral tooth to the mucronal base. Rami of tenaculum quadridentate; corpus with one strong anterior seta. Clothing of sparse, sohr, reclinate setæ. Erect sensory hairs were seen only on the fifth abdominal segment. Length, 0.8 mm.

The posterior margins of the mesonotum, metanotum, and first three abdominal segments are often irregular in outline across the mid-dorsal line.

This species was taken beneath moist boards at the edge of a bayou at Tallulah, Louisiana, July 31 and August 1, 1930.

***Folsomia prima*, new species**

Bluish green with pale spots scattered throughout head and body pigment. Pigment absent on anterior borders of segments from the metanotum to the fourth abdominal segment inclusive, antennæ blue throughout. Legs weakly pigmented. Manubrium pigmented lightly. Dentes colorless. Eyes (Fig. 7) eight on each side on elongate eye-patches; the two inner proximal eyes on each side reduced. Post-antennal organ elongate, about six times as long as wide, with a notch near the middle of both the anterior and posterior borders (Fig. 8). Antennæ subequal to the head, the first segment two-thirds the second, which is subequal to the third; the fourth segment twice the length of the third. Sense organ of third antennal segment with two elongate sense clubs and three guard setæ. The three last abdominal segments ankylosed. Unguis (Fig. 9) slightly curving distally with two lateral teeth and occasionally a single minute inner tooth slightly beyond the middle. Unguiculus extending two-thirds as far as the unguis, with an inner lamella which is roundly dilated basally. One, occasionally two feebly-knobbed tenent hairs (which are subequal in length to

the unguis) present on each tibiotarsus. Furcula short, reaching just to, or slightly beyond the posterior margin of the second abdominal segment. Manubrium and dentes subequal or the dentes slightly the longer. Manubrium with erect, dorsal setæ; naked ventrally but for two, strong subapical setæ. Dentes (Fig. 11) smooth distally, with irregular dorsal crenulations beginning about one-third its length from the apex. Each dens bears basally several obliquely inserted setæ, one of which is long and suberect. There are also from five to seven ventral dental setæ. Mucro (Fig. 10) about three-fifths the length of the hind unguis, bidentate, the apical tooth almost straight and the anteapical tooth erect. Rami of tenaculum quadridentate; corpus without setæ, but two strong setæ are present on the mid-ventral line just anterior to the corpus. Body clothing of short reclinate setæ and erect, simple, sensory hairs. Length, 1 mm.

This slender species was taken beneath bark with *Isotoma cinerea* Nicolet, at Ames, Iowa, February 21, 23 and March 31, 1930. It does not appear to be abundant.

Entomobrya guthriei, new species

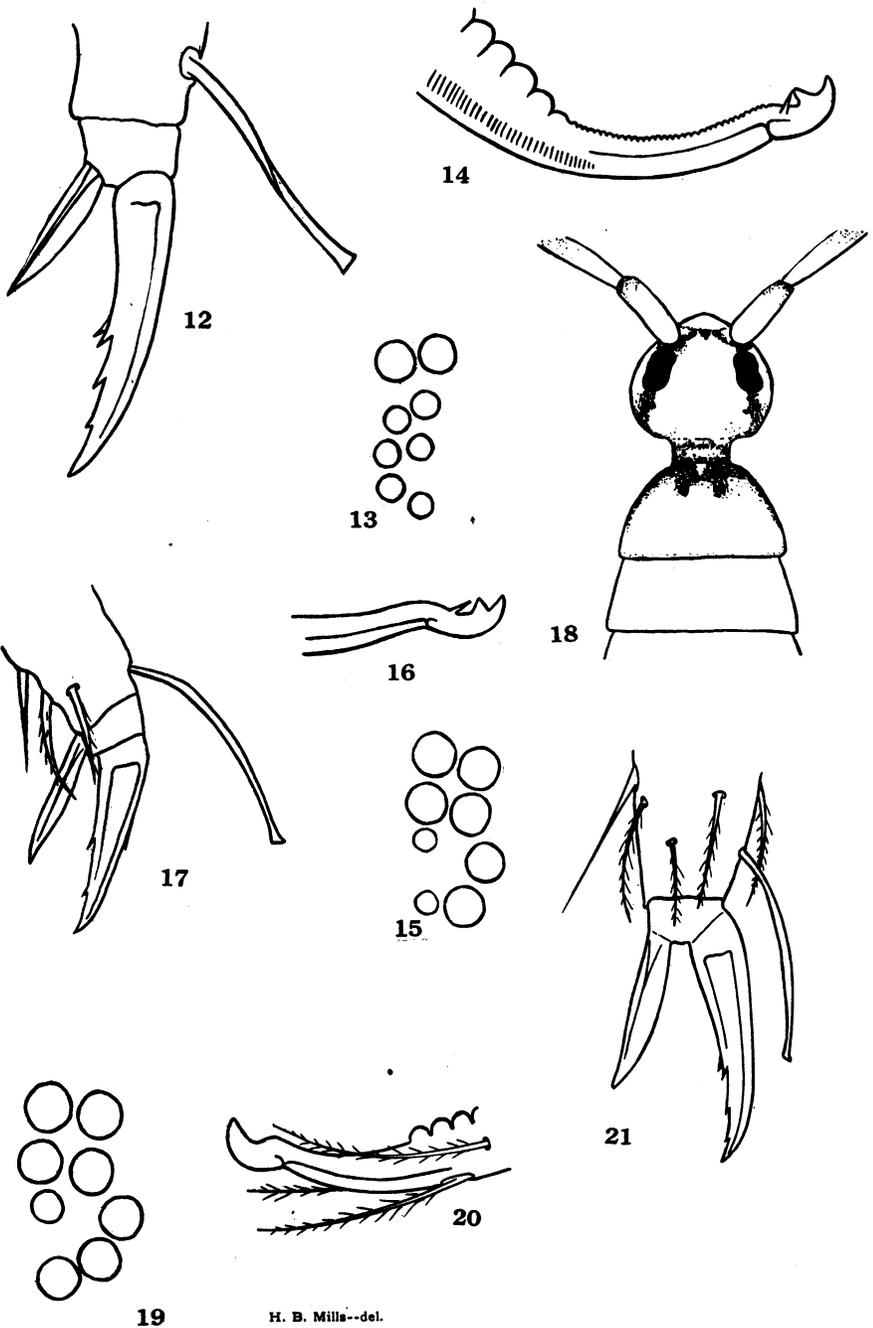
General cast light yellow. Body color white to yellow, pigmented with minute purple or rusty-brown flecks which are absent along the sutures of the body segments and very weak along the median-dorsal line. Vertex lightly spotted. Some pigmentation around the eye-spots. A rather indefinite band extends from the anterior inner corner of each eye-spot forward and inward, meeting in a large, elongate-oval pigmented area; the spots of which sometimes coalesce along the anterior border to form an irregular, dark spot. Pronotum colorless. Mesonotum lightly speckled, the pigment darkening laterally and fading on the posterior margin. Metanotum also darkening laterally and free of pigment posteriorly. First abdominal segment lightly pigmented through the center. Second segment colorless on the anterior and posterior borders. Third segment smoothly colored, the pigment extending ventrolaterally onto the paratergite of the fourth segment. Fourth segment colorless or nearly so on the anterior half and very lightly pigmented on the posterior half. Fifth and sixth segments practically colorless. First antennal segment with considerable purple, second segment colorless, third and fourth segments darkening evenly toward the tip. Legs colorless but for some pigment on the precoxal segments and in the darker specimens on the apices of the femora. Manubrium with a slightly purple cast; dentes colorless. Eyes eight on each side (Fig. 13), the two anterior in each eye-patch considerably larger than the other six which are subequal. Antennæ half again as long as the head, segments of the proportions 5:9:7:13. Fourth abdominal segment about four times the length of the third segment dorsally. Unguis (Fig. 12) rather straight, curving slightly distally, with three pairs of extra large teeth on the inner margin. First pair about half-way from the base and not quite opposite, the hind tooth being the more proximal. Unguiculus rather narrowly lanceolate, extending just beyond the basal pair of teeth on the unguis. Tenent hair with a triangular distal swelling; nearly as long as the unguis. Furcula reaching the ventral tube. Dentes longer than the manubrium (as 35:45) with strong dorsal crenulations which stop nearly four times the length of the mucro from the tip of the dens (Fig. 14), minute crenulations continuing to the base of the mucro. Mucrones (Fig. 14) of the usual entomobryan

type, but distinctive in that the anteaical tooth points slightly forward. Clothing of many small reclinate hairs and long clavate, fringed setæ which are most abundant on the meso- and metanotum and which extend onto the first two antennal segments. Length, 1.5 mm.

This species is named for Prof. J. E. Guthrie of the Department of Zoölogy and Entomology, Iowa State College, through whom the writer became interested in this group. The specimens were taken from decaying wood in which termites had been living. The termites, together with the wood, and without doubt the springtails, came to the Department of Zoölogy and Entomology of the above-named college from Berkeley, California.

***Entomobrya pseudoperpulchra*, new species**

Color deep yellow to orange with purple pigment becoming blackish where dense. Head and legs sometimes nearly white. First antennal segment purple at the tip, second segment with the distal third colored, third segment with the distal half colored, fourth segment all purple, but lighter at the base. Eye-spots connected through the antennal bases by an indefinite line which forms an irregular median spot on the front. Poorly defined lines extend posteriorly also from the eye-spots to the prothorax which bears dorsal pigment. Mesothorax bordered laterally and anteriorly with more dense pigment which is light along the midline. Irregularly placed purple spots are found occasionally on the mesothorax, metathorax, and the first abdominal segment. In dark specimens the entire antennæ may be purple except the base of the first segment. A few specimens were taken in which the precoxal pieces of the first two pairs of legs, the posterior margin of the mesothorax, the metathorax, and all of the first abdominal segment except a narrow band along the anterior and one along the posterior margin were colored, in addition to the typical body pigmentation described above. Furcula light, sometimes nearly colorless. Eyes eight on each side (Fig. 15), the two inner proximal eyes on each side reduced in size. Antennæ more than twice the length of the head, the first two segments subcylindrical, the third subclavate, and the fourth elongate-elliptical. Fourth abdominal segment slightly more than three times the length of the third along the dorsal midline. Unguis (Fig. 17) straight, curving but slightly at the tip, with a pair of inner teeth midway between the base and the tip, and a second but smaller pair between the basal pair and the tip. An outer tooth is present nearly opposite the basal inner pair. Unguiculus slender, pointed, two-thirds the length of the unguis. Tenent hair gently curving, with a distal triangular swelling; as long as, or somewhat longer than, the unguis. Furcula reaching the ventral tube. Manubrium about two-thirds the length of the dentes, with long pinnate hairs dorsally. Dentes strongly corrugated dorsally, the folds ending about two and one-half times the length of the mucro from the tip of the dens. The pinnate hairs of the manubrium extend onto the base of the dens. Mucrones (Fig. 16) small, with the usual apical tooth, anteaical tooth, and basal spine. Each of the two rami of the tenaculum bears four teeth; the corpus bears a single large anterior seta which curves strongly at the tip. Clothing of small, reclinate hairs which are longer on the fifth and sixth abdominal segments; also larger, fringed, clavate hairs which are most abundant on the head, meso- and metathorax.



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Figs. 12 to 14. *Entomobrya guthriei*. 12, Left hind foot; 13, left eyes; 14, left mucro.
 Figs. 15 to 18. *Entomobrya pseudoperpulchra*. 15, Right eyes; 16, left mucro; 17, right hind foot; 18, color pattern of head and thorax.
 Figs. 19 to 21. *Entomobrya sabulicola*. 19, Right eyes; 20, right mucro; 21, right hind foot.

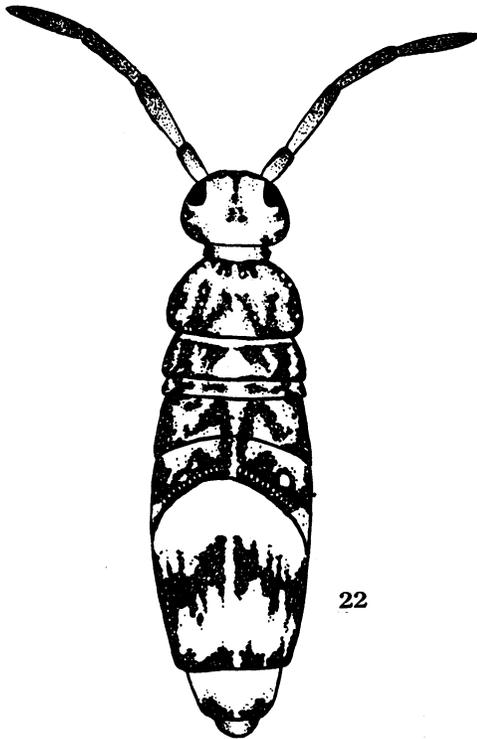
Bothriotricha were seen on the fourth abdominal segment. Comparatively long curving hairs occur on the first three antennal segments and are replaced on the fourth by many short strongly curved hairs. Length, 0.9 mm.

Nymphs of this species are nearly transparent and the dark contents of the digestive tract can readily be seen through the body wall. This species was taken solitarily or in small numbers beneath boards at College Station, Texas, throughout October and November, 1930.

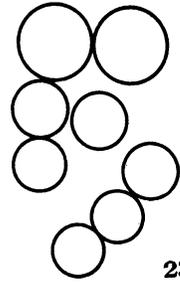
As its name denotes, this species resembles *Entomobrya perpulchra* Packard (Fifth Annual Report of the Trustees of the Peabody Academy of Science, p. 38, 1873). So far as his description goes, the species in hand agrees fairly well with it, and it was at first taken for Packard's species. The writer is indebted to Dr. J. W. Folsom for tracings of drawings of *E. perpulchra* from Packard's types in the Museum of Comparative Zoölogy, which show the mucro to be falcate in that species, a condition entirely different from that in the species here described as new.

***Entomobrya (Drepanura) sabulicola*, new species**

Body color gray, sometimes yellowish, with blue pigment. Color pattern intricate and somewhat variable. Figure 22 represents a dark specimen. From a lateral view the body seems to be marked with two indistinct lines on each side; the lower ones connected around the anterior margin of the mesonotum and extending more or less obscurely to the fifth abdominal segment, and the upper ones from the middle of the mesonotum to and including the third segment. Antennæ dark at the tip, shading to light at the base, each segment with a dense portion distally. Eyes connected over the front by a black line which often extends back on the midline over the vertex. A dark line connects the eye patches with the prothorax laterally, and in dark specimens this line covers most of the genæ. Prothorax colored laterally. Mesothorax margined anteriorly and laterally; with a variable pattern on the disk, sometimes a single line, sometimes a fork, and sometimes a loop on each side. Metathorax with irregular blotches of pigment. First abdominal segment but lightly colored dorsally, with two patches on each side. Second abdominal segment with the two lateral patches and irregular markings dorsally. The lateral patches are usually connected on the third segment, with the dorsum rather well covered with pigment. A row of light spots often extends around the posterior margin. Paratergite of fourth segment usually colored. Fourth segment with two bands, a broad one across the middle and a narrow posterior one. Fifth segment pigmented posteriorly. Sixth segment lightly colored laterally. A median colorless line divides all of the dorsal pigment. Legs colorless save the coxæ and precoxæ in densely pigmented specimens. Furcula practically colorless. Eyes eight (Fig. 19) on each side; the third eye from the front on the inner row of each patch slightly reduced. Head three-fifths the length of the antennæ. Of one specimen the ratio of the antennal segments was 8:18:15:20. Fourth abdominal segment about four times the length of the third dorsally. Unguis (Fig. 21) straight, rather slender, curving slightly at the tip; with a pair of teeth near the middle that are not opposite, the distal tooth being on the posterior lamella, and one (sometimes two) small teeth between the first pair and the tip



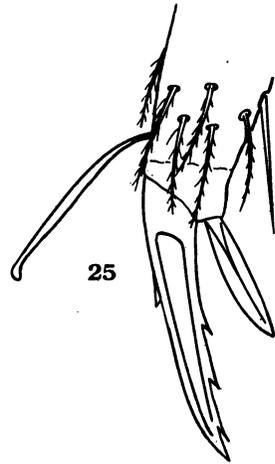
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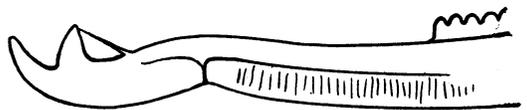
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Fig. 22. *Entomobrya sabulicola*, dorsal view.

Figs. 23 to 25. *Drepanocyrtus reinhardi*. 23, Right eyes; 24, left mucro; 25, left middle foot.

Figs. 26 and 27. *Lepidocyrtus folsomi*. 26, Left hind foot; 27, right mucro.

No lateral teeth present. Unguiculus broadly lanceolate, two-thirds the length of the unguis. Tenent hair long and slender, subequal to the unguis. Furcula reaching the ventral tube. Manubrium slightly more than two-thirds the dentes. Dens strongly corrugated dorsally, the corrugations ending about twice the length of the mucro from the tip of the dens. Mucro (Fig. 20) falcate with no basal spine. The two rami of the tenaculum quadridentate with a single anterior bristle on the corpus which curves back strongly at the tip. Body covered densely with close-lying hairs which are very long laterally, and the usual fringed clavate hairs which are most abundant on the thorax. Bothriotricha were seen as follows: one pair on the second abdominal segment, one pair on the third abdominal segment, and two pairs on the fourth abdominal segment. Manubrium and dentes quite hairy. Long fringed hairs occur on the first three abdominal segments, those on the first segment are often clavate. Ventral tube with a number of long curving anterior hairs and short spines surrounding the tip. Length, 1.5 mm.

This species has been taken only on sandy soil where it occurs abundantly. Its gray color so perfectly camouflages it against the sand that it can seldom be seen, except when it is moving. It was taken at Bryan, Texas, throughout October and November.

Drepanocyrtus reinhardi, new species

Color entirely silvery white but for the intensely black eye-spots and the antennæ which fade from light purple at the tip to white at the base. Eyes (Fig. 23) eight on each side, the anterior pair on each side somewhat larger than the others which are subequal. Antennæ long, a little less than three times the length of the head, segments of the proportions 11:18:19:26. Fourth abdominal segment about four times the length of the third on the dorsal midline. Unguis (Fig. 25) straight, with three inner pairs of teeth, the first two pairs fairly large and sharp, the third or distal pair acicular. An external pair is also present about a third of the distance from the base. Unguiculus extending to a point midway between the first and second pairs of teeth of the unguis, lanceolate. Tenent hair nearly straight, a little shorter than the unguis, enlarged but slightly at the tip. Furcula reaching the ventral tube. Manubrium five-eighths the length of the dentes. Dentes coarsely corrugated dorsally, the corrugations ending about one and one-half times the length of the mucro from the tip of the dens. Mucro (Fig. 24) falcate, without a basal spine. Body covered with large obovate scales which bear fine striations. The first three antennal segments bear rather long reclinate hairs and longer, nearly erect, sensory setæ; the fourth segment with short recurving hairs of about equal length. Head with many fringed, feebly clavate hairs. A dense collar of them occurs on the anterior border of the mesonotum, and numbers of them on the mesonotal disk. They also occur in fewer numbers on the posterior halves of the metanotum and the first three abdominal segments. A number of fine short hairs are found at the base of these large fringed hairs on the metanotum and first three abdominal segments. The fourth abdominal segment bears a number of the large fringed hairs rather evenly over the dorsum. Some of these hairs are not at all distally clavate, and are exceptionally long (one and one-half times the length of the third abdominal segment). The large hairs become more numerous and are rather strongly curved on the fifth and sixth abdominal segments.

Manubrium and dentes with many pinnate hairs dorsally and scales ventrally. Pinnate hairs from the dentes extend to the tip of the mucro. Legs with many close-lying hairs, and longer sensory hairs; a very long sensory hair at the base of each tibiotarsus on the external surface. Ventral tube with many long, curving anterior bristles and two types of short hairs near the tip, strongly curving hairs (which resemble the olfactory hairs of the antennæ of the Isotomidæ and Poduridæ), and a slender, erect series. Rami of the tenaculum quadridentate, the single anterior bristle of the corpus bending strongly at the tip, and exceeding the tips of the rami. Bothriotricha were seen on the fourth abdominal segment. Length, 3 mm.

This fine large species is noteworthy in the presence of the exceptionally long sensory setæ which are borne basally and externally on the tibiotarsi. These hairs on the first pair of legs are somewhat shorter than on the second and third pairs, but are still quite long. It is named for H. J. Reinhard of the Texas Agricultural Experiment Station, who procured all of the specimens. Every one was taken beneath a desk light in the Experiment Station building where it was found hopping about, seemingly attracted to the light. Specimens in vials were found to be positively phototropic. The writer is indebted to Dr. J. W. Folsom for the drawing of the eyes of this species.

***Lepidocyrtus folsomi*, new species**

Color entirely white, the scales lending a silvery appearance. Eyes absent. Antennæ nearly twice the length of the head; the segments varying in length but about as 10:20:20:35; the first three segments subcylindrical and the fourth elongate-elliptical. Mesonotum massive, hiding the pronotum dorsally. Fourth abdominal segment about four times the length of the third dorsally. Unguis (Fig. 26) curving apically, with a pair of baso-lateral outer teeth, a pair of large basal inner teeth, and a single inner tooth between the basal pair and the tip. The basal pair are not exactly opposite, the one on the anterior lamella being slightly more distal. Unguiculus narrowly lanceolate, acute at the tip, extending nearly to the single distal tooth of the unguis. Tenent hair slender, feebly knobbed, shorter than the unguis. Furcula reaching the ventral tube. Manubrium and dens subequal or the manubrium slightly the shorter; scaled ventrally and bearing rather numerous heavy hairs dorsally. Dentes tapering evenly to the tip; very uniformly but finely corrugated dorsally, the corrugations ending slightly more than the length of the mucro from the dental apex; bearing ventral scales and a row of long pinnate hairs on each side of each dens. Both the ventral scales and lateral hairs of the apices of the dentes exceed the tips of the mucrones. Mucrones large (Fig. 27), with the usual apical and anteapical teeth and the basal spine, which attains and sometimes surpasses the tip of the anteapical tooth. Rami of tenaculum quadridentate, the corpus bearing a single anterior seta which curves strongly at the tip, and does not extend beyond the tips of the rami. Head and body densely clothed with large oval to obovate scales which bear fine striations. A row of sharp, forward pointing bristles is borne on the posterior margin of the head. The genæ bear minute spines and larger bristles which become more abundant toward

the mouth. The anterior border of the mesonotum bears a dense row of short, clavate, fringed hairs. The rest of the body is sparsely covered with simple or but slightly clavate fringed hairs, which are abundant and strongly clavate on the fifth and sixth abdominal segment. Two pairs of bothriotracha were seen on the fourth abdominal segments. Coxæ with rows of extra long smooth setæ externally. Femora and tibio-tarsi densely clothed with hairs. Scales mostly round or oval. Maximum length, 2. mm.

This species was taken beneath boards at College Station, Texas, October 20, and at Bryan, Texas, October 31. It resembles *Lepidocyrtus violentus* Folsom from which it is easily distinguished by the claws, the comparatively longer fourth abdominal segment, and the larger size. It is very different from the above species in its actions, for when it is disturbed it exhibits none of the nervousness of *L. violentus*.

