its markings to *ornatus*. There is, however, no humeral dark spot; the umbone is prominent and less punctured. The sexual ventral characters are as in the other Trichodes.

The two specimens before me, (the ♂ was kindly loaned by Mr. Ulke), were obtained by Mr. Otto Luggar, (of Baltimore), from Arizona.

In the above wood cut the white portions are yellow, the lined spaces ferruginous, and on the margins of the yellow are the black borders. The male in the cabinet of Mr. Ulke, is smaller and the dark colors are lighter, so that, what is described as black in the female is brown, and the brown is dirty ochreous.

The sexual characters of North American CICINDELIDÆ with notes on some groups of CICINDELA.

BY GEORGE H. HORN, M. D.

The present paper is the first of a series which I hope to continue from time to time, in which the sexual characters of each genus in our fauna will be fully exposed, and noticing at the same time any special characters whether sexual or not, likely to prove useful to the systematist.

I am not aware that any similar work has ever been attempted, while its great utility must be acknowledged by all. In most of the larger works on the genera of Coleoptera, mention is made of the more prominent sexual characters, while others less obvious but often more useful are entirely omitted, and it is to these that I desire to devote special study.

It is often annoying in studying a generic synopsis to find groups indicated in which the males do or do not possess a given character, and this is frequently the only sexual character spoken of at all, its absence being peculiar to all the females and a portion of the males, and there is no additional character given which will absolutely distinguish all males from the females.

It is my desire to bring together in one paper all the sexual characters heretofore known, and to add whatever new it may be my good fortune to discover. Some characters may be overlooked, but with the present as a basis, others may be added as each investigator may find them.

CICINDELIDÆ.

The sexual characters of this family as a whole may be stated to be as follows:

Anterior tarsi dilated and last ventral segment deeply emarginate in the males.

Amblychila is an exception to the above, having special characters in the hind trochanter ♂.

The MANTICORINI in both sexes have the middle tibiæ pubescent on the outer side, the MEGACEPHALINI and CICINDELINI the males alone have the middle tibiæ pubescent, while in two species of *Cicindela* (*Dromochorus*), *Pilatei* and *maga*, the middle tibiæ are glabrous in both sexes.

With these preliminary remarks, the reader is referred to the special characters of the genera and species.

AMBLYCHILA, Say.

Male.—Hind trochanter elongate, oval and acute at tip, with one moderately deep groove on the inner side and a trace of a second. Last ventral segment broadly rounded at tip, and with a vague marginal groove and large setigerous punctures on each side of middle.

Female.—Hind trochanter oval, very obtuse at tip, not grooved. Last ventral segment slightly longer than that of the male, middle slightly prominent with a sinuation on each side, and with a feeble median longitudinal impression.

To Mr. H. A. Brous, of Kansas, we are indebted for all that we at present know of the habits of *Amblychila*. Having had the pleasure of a visit from him, he has kindly furnished the following notes:

This insect is nocturnal or crepuscular, rarely appearing before sunset or after sunrise, except on cloudy and rather warm days. During periods of rain or cold it remains concealed. Its hiding places are holes usually excavated by itself in clay banks where there is but little wash, otherwise the holes would be filled up. They are solitary in their habits although several may live in close proximity, but never in the same burrow, and from the fact that they are often found mutilated it is probable that pugnacity is a highly developed trait. In moving about they have a swaggering gait, with the antennæ in constant motion.

They are like all the Cicindelidæ, predaceous, locusts and other insects falling an easy prey at night, although they have been observed feeding on excrementitious matter.

From what has been observed, and from the remains found, it is probable that *Amblychila* is by no means rare, but its peculiar habits and mode of life have caused it to be overlooked by all the collectors who have visited the plains.

Its habitat is Kansas and Colorado, south of the Platte River, southwestern Arkansas, Indian Territory, probably northern Texas, New Mexico and eastern Arizona.

OMUS, Esch.

Male.—Three joints of anterior tarsi dilated, (the dilatation not bilateral, but more internal than external), and densely spongy pubescent beneath. Last ventral segment deeply emarginate at middle.

Female.—Last ventral segment oval at tip and entire, and with a marginal groove composed of large deeply impressed punctures, each bearing a short seta.

TETRACHA, Hope.

Male.—Anterior tarsi dilated as in Omus. Last ventral segment broadly triangularly emarginate. Tip of elytra sub-truncate, sutural angle rectangular.

Female.—Last ventral segment broadly oval at tip. Tip of each elytron rounded, sutural angle obliterated.

CICINDELA, Linn.

General sexual characters.

Male.—Three joints of anterior tarsi dilated, with short silken pubescence beneath. Last ventral segment broadly emarginate. Middle tibiæ pubescent on the outer side.

Female.—Anterior tarsi slender. Last ventral segment longer than in the male, slightly compressed at the sides, posterior half with a longitudinal impression varying in depth according to the species. Middle tibiæ glabrous.

The emargination of the sixth ventral segment of the male allows the seventh segment to become very plainly visible, divided into two symmetrical portions, the left overlapping the right, the whole constituting by this modification part of the genital armature.

A careful examination of the females of certain species convinces me that the last ventral segment is composed of parts which represent the sixth and seventh segments of the male. That portion which corresponds with the sixth of the male may be seen distinctly defined by an obsolete suture in those species in which the abdomen is rufo-testaceous, (*marginipennis*, etc.), and the seventh segment of the male is that portion of the female sixth in which the longitudinal impression is included, the bottom of the impression representing the joint of the halves of the male segment.

In addition to the sexual characters above given, and which are

common to all the species of the genus, there are others found in various portions of the body peculiar to and at times definitive of groups. These occur in first, the mandibles; second, the labrum; third, the thorax; fourth, the elytra; and may be again tabulated in the following manner.

MANDIBLES.—Normal form: Similar in the sexes and both sides equal. Abnormal form: Right mandible of male furnished with a tooth, of greater or less length, on the lower margin near the tip, (*dorsalis*, *marginata* and *hamata*).

LABRUM.—This organ may vary in length in the sexes, that of the female being longer, (*unipunctata*, *longilabris*), or in color, white in the male and black in the female, (*longilabris*, var. *montana*, *Pilatei*, *striga*). In some species (*scutellaris* and its races), the labrum varies in color regardless of sex. The teeth of the labrum are sometimes more marked in the female, as in *striga*.

THORAX.—The normal form may be either trapezoidal, narrower at base, or very nearly cylindrical, and in each case similar in the sexes. In many species the hind angles become prominent, and the base broader than the apex or as broad, and the transverse basal impression deeper, (*hirticollis*, *dorsalis*, *hamata* and *marginata*). These are all maritime species.

ELYTRA.—In nearly all the species the usually more robust form of the female enables that sex to be distinguished at a glance, the form is, however, identical in the sexes. The differences worthy of comment are, those (1), of general form, (2), the sub-apical sinuation, or (3), the tip and sutural angle. While the males have the normal form, the females have the elytra much more broadly arcuate at the sides in all the maritime species above noted, and rather strongly sub-angulate behind the humeral angle in *dorsalis*. These species furnish the only examples of marked difference in outline. The elytra narrow at tip, by being gradually arcuate or oblique, and while these typical styles merge insensibly, the latter form is gradually modified by becoming more and more sinuate, especially in the females, until a well marked tooth appears varying in the degree of its acuteness. This is especially marked in certain of our fluviatile species in which the elytra have the additional basal spot, (*cuprascens*, *macra*, *puritana*, etc.) The tip adjacent to the suture may be in the form of an acute angle, rectangular, truncate or rounded. In most of the species the form does not vary sexually, but may be any one of the above forms

in either sex, and when a sexual variation does occur, the male makes the nearest approach to the acute angle, *e. g.*

dorsalis, ♂ subtruncate, ♀ rounded.
marginata, ♂ subtruncate, ♀ rounded, suture retracted.
cuprascens, ♂ acute, ♀ rounded.
puritana, ♂ acute, ♀ truncate.
macra, ♂ acute, ♀ sinuate and acute.
Gabbii, ♂ obtuse, ♀ broadly rounded.

These examples are sufficient to show the amount of sexual variation of this character. *C. marginata*, ♀, is remarkable for having the tip retracted in such a manner that a portion of the sutural region is vertical. The suture in many species bears a spine of greater or less length, common to both sexes and usually longer in the female.

The serration of the apical regions has been noted at times, this however, varies so greatly in both sexes that nothing general can be said.

Dromochorus, Guerin.—I must acknowledge that I entirely agree with Dr. Leconte in the suppression of this genus. There is no character of sufficient moment for its separation, the only one known to me which can be used is found in the middle tibia of the male. This member is glabrous on the outer edge, like the female and entirely lacks the pubescence so characteristic of the other species of Cicindela as far as known to me. In *Amblychila* and *Omus* both sexes have similarly pubescent middle tibiæ. *Tetracha* and *Cicindela* agree in having the males pubescent only, while *Dromochorus* is not pubescent in either sex. In every other sexual character *Dromochorus* does not differ from *Cicindela*.

Group *dorsalis*.

The form of the thorax of the female is the special character of this group. The thorax is broader at base and the hind angles obtusely prominent, and between them is a deep basal impression.

The claws are long and slender, as long or longer than the last joint of tarsus. Posterior trochanters metallic in color. The posterior angles of the third and fourth abdominal segments are very feebly prolonged. The last two joints of the maxillary palpi equal.

The three forms constituting this group seem to me to be merely varieties of one species. The right mandible of the male bears on its lower side near the tip a tooth, long and acute in *dorsalis*, shorter and less acute in *media*, and still less prominent in *Saulcyi*. There

are no other characters excepting size, the last mentioned form being the smallest, and as we find all grades of size in body and mandible tooth, I prefer uniting them.

This species is distributed along the Atlantic and Gulf coasts from the Middle States to Texas, and becomes smaller as it approaches the latter locality.

Group *marginata*.

This group contains two maritime species, and has the following characteristics.

Thorax scarcely differing in the sexes, elytra differing in shape. Right mandible ♂, toothed beneath. Last joint of maxillary palpi slightly longer than the preceding. Hind trochanters red. Claws long and slender. Third and fourth segments of abdomen moderately prolonged.

Elytra with median basal spot, humeral lunule oblique but straight, hooked at tip.

The presence of the mandibular tooth in the male, and the retraction of the suture of the female, seem to me worthy of use as group characters.

The two species differ, especially as indicated by pl. I, fig. 19, (*hamata*), and 20, (*marginata*).

C. hamata, Brullé.

Male.—Feeble mandibular tooth. Elytral apex rounded.

Female.—Suture retracted, and with an emargination and a spiniform prolongation of the inflexed portion.

C. marginata, Fab.

Male.—Moderate mandibular tooth. Apex of elytra with slight sinuation near the suture, which is acutely but feebly prolonged.

Female.—Suture retracted, and with a slight emargination and the inflexed portion squarely truncate.

Group *cuprascens*.

The only defining character of this group is the presence of a sinuation, and often a tooth on the female elytron one-fourth from the tip.

The elytra in the two sexes do not vary to any marked extent in form. The mandibles are not toothed in the male. The thorax is similar in the sexes, very slightly more impressed in the female, the trochanters red, claws long and slender, and with abdominal segments feebly prolonged.

This group is capable of subdivision in the following manner:

1.—Abdomen glabrous at middle and with very few punctures.
Elytra with basal white spot.
Females with a distinct sinuation limited by an evident angulation or tooth. Elytral markings rather slender, not confused.....**A.**
Females with a feeble sinuation only. Elytral markings broad and confused.....**B.**
Elytra without basal spot.
A strong sinuation in the female with moderate tooth, markings slender..**C.**
2.—Abdomen pubescent at middle and finely and rather densely punctured.
A small basal spot joined to the humeral lunule, markings broad and confused.....**D.**

The species of section A of this group contains five species, one of which however, may be viewed with some doubt. (*Magdalenæ*). The following remarks with the figures already published, will assist in identifying them.

Humeral lunule oblique, suddenly hooked at tip.
Median band sinuous and long.....**cuprascens, macra, puritana.**
Median band short, terminated by a short hook.....**Wapleri.**
Humeral lunule curved as in *repanda*.
Median band moderately long, not sinuous at tip; a sutural stripe near the base.....**Magdalenæ.**

The first three species have always proven very troublesome to all students. They have similar elytral markings, broader in *cuprascens*.

cuprascens.	**puritana.**	**macra.**
Color.....—Cupreous. Elytra coarsely and rather densely punctured.	Bronzed. Elytra more finely and less densely punctured.	Bronzed. Elytra finely and sparsely punctured.
Elytra ♀.—Strongly sinuate near the tip, tooth acute and prominent. Tip rounded. Pl. I, fig. 21.	Strongly sinuate, tooth rectangular. Tip obtusely truncate. Fig. 22.	Less sinuate, tooth rather obtuse. Tip slightly prolonged, suture spinous. Fig. 23.
Elytra ♂.—Tip obtuse.	Tip subacute.	Tip slightly prolonged.

An additional character of less value is seen in the median band, which bears at its tip in *cuprascens* and *macra* a broad, triangular spot, while in *puritana* the tip is scarcely at all dilated except in very rare instances. The elytra of *cuprascens* and *macra* have been figured. (Synopsis, Leconte, Trans. Am. Phil. Soc., XI, pl. I).

C. Wapleri, Lec., Trans. Am. Ent. Soc., 1875, p. 158.

The female is unknown, but the species belongs here rather than with *blanda*. The figure gives the markings very accurately.

C. Magdalenæ, Lec., Proc. Acad., 1873, p. 321; Trans. Am. Ent. Soc., 1875, p. 159, with figure.

I had very little opportunity to do anything with this species, except prepare a sketch from which the wood cut above cited was made. It is even doubtful if the species belongs to our fauna. The type is in the museum of Magdalen College, Oxford, England.

One species (*blanda*), constitutes section B. It has very broad elytral markings, very badly defined in the two specimens I have seen. The humeral lunule unites with the basal spot, the median band is sinuous as in *cuprascens*, or even more so. The female has no tooth near the tip of the elytron, and the sinuation is very feeble. (Fig. 24). This species is a lead in the direction of the *Gabbii* group.

Section C contains two species which differ from all the others in the group, in the absence of the basal spot, and by the markings being usually disconnected along the margin.

C. sperata, Lec.—Dark bronze; labrum with median tooth; median band with long, moderately sinuous longitudinal portion; anterior end of apical lunule moderately prolonged.

Male.—Elytra slightly sinuous near the tip, the latter acute with sutural spine.

Female.—Elytra rather strongly sinuous, and with a distinct angulation. Tip less prolonged than in male but with sutural spine.

C. nevadica, Lec.—Coppery bronze, labrum without median tooth. Elytral markings widely disconnected along the margin. Median band with rather short, feebly sinuous longitudinal portion. Apical lunule not prolonged in front.

Male.—Elytra broadly subsinuate near the tip.

Female.—Elytra strongly sinuous, the anterior angle of the sinuation rounded.

For fuller description and figure, see (Trans. Am. Ent. Soc., 1875, p. 159).

Section D contains two species especially characterized by the entire abdomen being punctured, and covered at middle with similar pubescence as at the sides.

C. hirtilabris, Lec.—Labrum rather densely clothed with prostrate hairs. The markings are similar to those of *gratiosa,* but less extended, so that the sutural dark space is broader.

Male—Elytra very feebly sinuate, tip obtuse.

Female.—Sinuation deeper, limited in front by a distinct angulation, tip obliquely truncate. (Fig. 25).

By some accident the measurement given (Trans. Am. Ent. Soc., 1875, p. 161), is incorrect, it should be .38 inch, not .62 as printed.

C. gratiosa, Guerin.

The description and figure in the synopsis suffice to distinguish this species.

The group *cuprascens,* through its members exhibits affinities in many directions. The group as a whole, naturally follows the *dorsalis* and *marginata* groups; *Magdalenæ* seems to me to point toward *lepida*, *sperata* toward *Gabbii,* and *gratiosa* toward *togata* and its allies.

The presence of the sutural vitta is of rare occurrence in our fauna, being present only in *Magdalenæ* and *lepida.* In these two species it exists as an independent marking, and is in no way similar to the dilated humeral lunule of *dorsalis.*

———o———

C. Schauppii, n. sp.—Head and thorax dark bronze, sparsely hairy. Elytra velvety black. Body beneath metallic blue, sides of metasternum brilliantly cupreous, entire abdomen and posterior trochanters red. Labrum

white, slightly longer in ♀, truncate at middle and slightly sinuate each side. Eyes moderately prominent, head slightly strigose near the eyes. Thorax slightly narrowed behind, impressions distinct. Elytra with velvety surface, smaller punctures obsolete, a row of larger greenish punctures near the suture and others near the humerus; margin narrowly white, slightly dilated at the humerus and again behind it, median band reduced to a straight, oblique line, apical lunule slightly prolonged in front. Legs bluish green, femora cupreous beneath. Length .42 inch; 10.5 mm.

The elytra at tip are conjointly rounded, very finely serrulate, and the suture slightly spinous.

This species belongs near *circumpicta* and *prætextata*, and resembles the latter considerably in its markings, but differs in its entirely red abdomen, It also differs from nearly every other red-abdomen species in the entire absence of any labrum tooth.

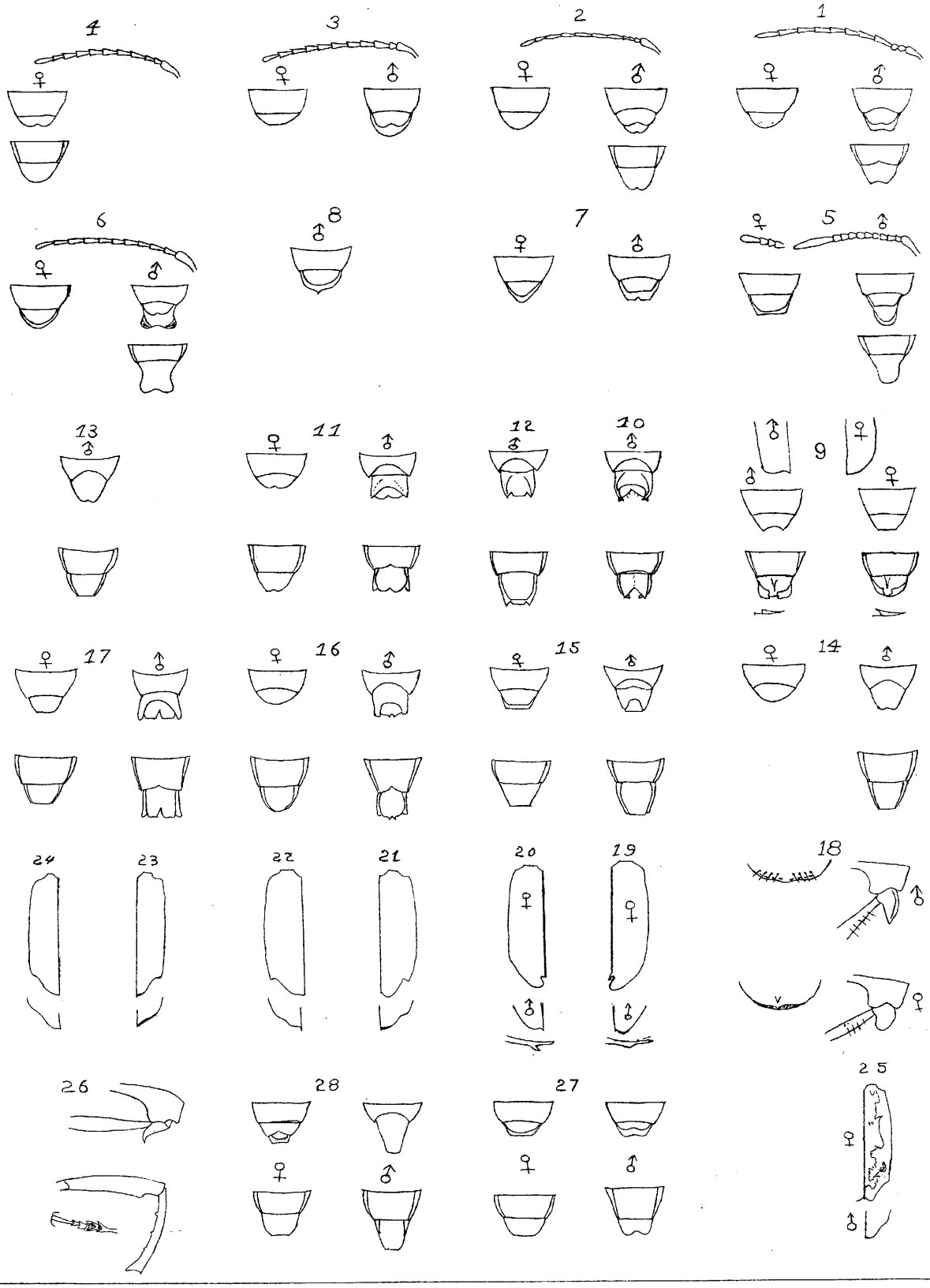
Two specimens, Corsicana, eastern Texas.

It gives me great pleasure to dedicate this species to Mr. F. G. Schaupp, of Brooklyn, and at the same time acknowledge my indebtedness for this and many other very interesting additions to my cabinet.

EXPLANATION OF PLATE I.

Fig. 1.—*Cymatodera longicornis*, Lec. Antenna. Male fifth and sixth abdominal segments, dorsal and ventral view; female ventral view.
Fig. 2.—*C. puncticollis*, Bland. Same as above.
Fig. 3.—*C. Xanti*, Horn. Antenna. Male and female fifth and sixth ventral.
Fig. 4.—*C. usta*, Lec. Antenna. Female fifth and sixth ventral and dorsal.
Fig. 5.—*C. brunnca*, Mels. Same as 1.
Fig. 6.—*C. bicolor*, Say. Same as 1.
Fig. 7.—*C. inornata*, Say. Male and female fifth and sixth ventral.
Fig. 8.—*C. fascifera*, Lec. Male fifth and sixth ventral, with last dorsal prolonged.
Fig. 9.—*C. californica*, Horn. Elytra ♂ and ♀. Dorsal and ventral aspect of last two segments, also the carina ♂ and ♀.
Fig. 10.—*C. morosa*, Lec. Fifth and sixth segments ♂ dorsal and ventral aspect.
Fig. 11.—*C. Belfragei*, Horn. Dorsal and ventral views of fifth and sixth segments of each sex.
Pig. 12.—*C. oblita*, Horn. Dorsal and ventral views of ♂ fifth and sixth segments.
Fig. 13.—*C. punctata*, Lec. Same as above.
Fig. 14.—*C. fuscula*, Lec. Same as 1.
Fig. 15.—*C. undulata*, Say. Dorsal and ventral views of segments five and six, male and female.
Fig. 16.—*C. angustata*, Spin. Same as 15.
Fig. 17.—*C. ovipennis*, Lec. Same as 15.
Fig. 27.—*Elasmocerus terminatus*, Say. Same as 15.
Fig. 28.—*Trichodes bibalteatus*, Lec. Same as 15.
Fig. 18.—Hind trochanter and last ventral ♂ and ♀ of *Amblychila*.
Fig. 19.—Tips of elytra ♂ and ♀ and right mandible ♂ of *Cic. lacerata*.
Fig. 20.—Ditto of *C. marginata*.
Fig. 21.—Tips of elytra ♂ and ♀ of *Cic. cuprascens*.
Fig. 22.—Ditto of *Cic. puritana*.
Fig. 23.—Ditto of *Cic. macra*.
Fig. 24.—Ditto of *Cic. blanda*.
Fig. 25.—Ditto of *Cic. hirtilabris*.
Fig. 26.—Hind trochanter, middle tibia and anterior tarsus of *Calosoma Sayi* ♂.

Remarks.—The accompanying plate has been prepared and engraved by myself, and it may seem hardly necessary to state is not up to the standard of high *artistic* merit. It is to be hoped that the sketches will assist the student in forming a better idea of the curious sexual differences, so difficult to express in words, than could be obtained by description only.



G.H.H. del. et sc.