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Review of the species of PLEOCOMA, with a discussion of its systematic position in the Scarabæidæ.

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The recent publication of a translation of Dr. Gerstaecker's elaborate discussion of Pleocoma, in the "Entomologica Americana," brings the matter now very fairly and prominently before those who are unable to read it in the original.

It has been my desire to reply to the article, which diametrically opposes the views of Dr. LeConte, and to which I am made a co-respondent, willingly, I admit, by virtue of my association in the second edition of the "Classification."

At the present time there are three undescribed species in my cabinet, these give the opportunity for a review and comparison of all those now known. The females of three species have been studied, two were known to LeConte, one of which lacked the important antennæ. Two of the females belong to the four-lamellate males and one to the seven lamellate.

The larva described by Baron Osten-Sacken as that of Pleocoma has been placed beyond controversy as the true larva by the arguments of Dr. Gerstaecker in the contrary direction.

We have, therefore, the history of Pleocoma far more complete than of many genera of which the species are more numerous and individuals more abundant.

Through the liberality of friends, whose kindness will be acknowledged in their proper places, sufficient material has been obtained to permit of all necessary dissection, so that the details of Pleocoma will be more thoroughly given than heretofore. At the same time drawings have been prepared to illustrate the parts and to enforce the argument which will follow.

In the following pages I propose to begin with the generic details and to continue with sufficient descriptions of the species, after which the "Literature" will review Pleocoma from its beginning to the criticism by Dr. Gerstaecker in the "Stettin Zeitung" for 1883.

PLEOCOMA Lec.

FORM broadly oval and convex, dorsum slightly depressed, body beneath and legs clothed with moderately long reddish-yellow hair, in one species black, upper surface without hair, the margins fimbriate. Under wings well developed.

HEAD relatively small, rather deeply inserted, eyes large, globular and prominent; vertex with a short erect horn obtuse or slightly emarginate at tip; genæ prolonged each side partly dividing the eye and forming a more or less acute free angle.

CLYPEUS reflexed, forming a rather broad horn more or less emarginate and broader at apex.

ANTENNÆ eleven-jointed, the first joint stout and conical, second globular, but as thick; club long in the male, composed of a variable number of lamellæ from four to seven, the first lamellar joint always glabrous, the others opaque, with sensitive surface.

LABRUM broadly oval, placed either perpendicularly to the axis of the body or slightly obliquely, connate with the clypeus, but with the suture well marked.

MANDIBLES visible only by dissection, placed close together against the roof of the mouth, doubtless immovable, when viewed laterally, of triangular form, the base resting against the roof of mouth, the perpendicular against the inner side of clypeus, outer side ciliate with long hairs.

MAXILLÆ small, the inner lobe in the form of a plate surrounding the outer lobe, the latter a little longer, terminated by an obtusely conical process; surface ciliate within by moderately long hairs.

MAXILLARY PALPI relatively long; first joint short; second longest; third half as long, conical; fourth fusiform, nearly as long as the first.

MENTUM oval, longer than wide, apex arcuate, base emarginate, supported by a broad peduncle of the submentum, the free face roughly punctured, with long hairs.

LIGULA free, arising behind the apex of the mentum, corneous, form short and transverse, slightly emarginate.

LABIAL PALPI as long or even longer than the mentum and ligula, arising from the apex of the ligula, three-jointed, the last joint as long as the two preceding and more slender.

PROTHORAX transverse, the sides broadly arcuate.

SCUTELLUM transversely oval.

ELYTRA longer than wide conjointly, the apices obtuse; disc with a sutural costa, three oblique discal costæ, limited usually faintly, by geminate striæ, a feeble submarginal costa.

ANTERIOR COXÆ large, conical and prominent, with a large trochantin.

MIDDLE COXÆ large, very narrowly separated.

POSTERIOR COXÆ transverse as usual, rather short, contiguous at middle, but not prominent.

METASTERNAL episterna narrow, the epimeron distinct.

ABDOMEN with six segments, all freely movable, the first concealed by the coxæ and broadly membranous at middle, segments nearly equal in length. By dissection an anal segment is observed, which is always closely retracted. Dorsal portion of abdomen consists of eight semi-membranous segments.

ABDOMINAL SPIRACLES, seven on each side, are situated in the connecting membrane which unites the dorsal and ventral plates.

ANTERIOR TIBIÆ with three large teeth occupying the apical half of the outer edge; four or five smaller teeth above.

MIDDLE TIBIÆ broader at apex, the apical margin undulated or subdigitate, a strong transverse carina at middle of outer edge.

POSTERIOR TIBIÆ similar in form, the apex, however, less undulated.

TARSI slender, as long as the tibiæ, the first four joints slightly decreasing in length, last joint as long as the three preceding. Onychium distinct, trisetose at apex.

CLAWS slender and moderately long.

TIBIAL SPURS moderately long, middle and posterior tibiæ each with two.

The preceding description is applicable more especially to the male.

The females are shorter, more robust and convex; body without wings. The cephalic processes are less developed than in the male, the clypeal horn scarcely emarginate. The eyes are smaller than in the male and quite flat. The legs are shorter and more robust, although otherwise similar to the male. The tarsi are scarcely half as long as the tibiæ.

As a whole the mouth parts of Pleocoma are small and feebly developed, and so enclosed as to be, apparently, of no use to the insect in taking food. It is probable that during their short life in the imago state very little or no food is taken.

The antennæ vary in their construction according to the species. The club is not placed at a right angle to the stem, but forms quite an acute angle with it. The lamellæ are not of the same form, the lower edge being more or less irregular or undulating. Nor are the lamellæ directly superimposed, as they overlap each other in such a manner as to be misleading without considerable care. The accompanying sketches of the antennæ are to a certain extent diagrams representing all the lamellæ of their proper length brought into vision at the same time. The middle joint of the club is always longer, from this inward and outward the joints are slightly shorter. The first joint of the club is more or less glabrous, at most the edges only have the sensitive surface, the proximal side is fimbriate with moderately long hairs, while the edges of all the lamellæ have shorter and stiffer bristles.

The following species are now known:

Third joint of antennæ shorter and narrower than the first, the club with but four long lamellæ.

Seventh joint of antennæ merely transverse, not prolonged in a process; hairs of underside of body black..... **Rickseckeri.**

Seventh joint prolonged in a process one-third as long as the following joint; hairs of underside yellow ..... **fimbriata.**

Seventh joint prolonged in a process two-thirds as long as the eighth: hairs yellow ..... **Behrensii.**

Third joint of antennæ nearly as long and as stout as the first joint.

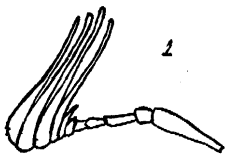
Thorax convex in front, with at most a slight depression.
Punctures of thorax rather fine, not greatly coarser in front, surface not hairy ..... **conjungens.**
Punctures of thorax relatively coarse, very conspicuously coarser, denser and deeper in front, the surface with semi-erect hairs..... **hirticollis.**
Thorax retuse in front, i.e. suddenly declivous in front and broadly impressed behind a transverse elevation, surface rather finely punctured, not hairy.
Hind angles of thorax distinct, but obtuse; fourth joint of antennæ very little prolonged; sutural and geminate striæ of elytra deeply impressed ..... **Ulkei.**
Hind angles of thorax broadly rounded; fourth joint of antennæ prolonged in a process fully half as long as the following joint; striæ deeply impressed..... **Staff.**

From data given principally by Mr. L. E. Rickseckeri, Pleocoma appears after the first soaking rain usually in October, sometimes November. The males are in far greater number than the other sex, flying in search of the females, whose habit is to remain concealed in burrows or holes in the soil, rarely appearing above ground.

The four species known to Dr. LeConte have been so well described that I do not propose to deal with them in any detail, merely giving such characters as may seem to require fuller explanation.

P. Rickseckeri n. sp.—Oval, one-third longer than wide, black, shining, margins fimbriate and underside clothed with long black hair. Front coarsely and closely punctured, horn of vertex broader and emarginate at apex. Thorax more than twice as wide as long, narrowed in front, widest at base, sides arcuate, the hind angles distinct, but obtuse; disc convex, a slight flattening behind the head, punctures small, not closely placed, sparser near the sides. Elytra a little broader behind the middle, dorsum slightly depressed, sutural striæ deep, the four pairs of geminate striæ on each elytron faintly indicated not punctured, the intervals wrinkled. Body beneath rather densely clothed with long black hair concealing the sculpture. Legs black. Length .80 inch; 20 mm.

Male.—Antennæ piceous, club pale brown; first joint elongate conical, second globular, as wide as first; third narrower, half as long as the first; fourth and fifth together as long as third; sixth short, transverse; seventh shorter and twice as wide as sixth, joints eight to eleven forming an elongate club; ninth joint longest.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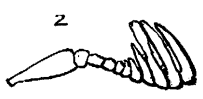
Female.—Form more robust, ovate, broader behind, more convex, brownish, shining, fimbriate and clothed beneath with moderately long reddish-brown hair. Clypeal horn short, not emarginate, the vertical horn short and broad, emarginate at apex. Thorax less transverse than in the male, more coarsely and closely punctured. Elytra broadest at apical third, the sutural stria moderately deep, the geminate striæ feeble.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Legs much shorter than in the male, the femora more robust. Tarsi short, the posterior pair very little more than a third the length of the tibia. Antennæ much shorter than in the male, terminated by a four-jointed club, the lamellæ short and thick.

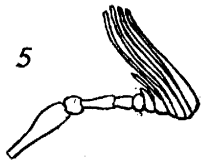
The oral organs of the female, as far as can be seen without dissection, are similar to those of the male, except that the palpi are shorter.

This species most closely resembles *Behrensii*, but differs in the structure of the male antennæ, the color of the hair of the underside, the finer punctuation of the thorax and its true black color.

In dedicating this species to Mr. L. E. Ricksecker, it gives me pleasure to acknowledge his great kindness at all times in aiding my studies. To him I am indebted for both sexes of the present species captured by him near Sylvania, California, Nov. 28, 1887.

P. fimbriata Lec.—Broadly oval, slightly depressed, piceous, shining, margins fimbriate and underside densely clothed with yellowish-brown hair. Thorax more than twice as wide as long, broadest slightly in front of middle, hind angles obtusely rounded. Elytra scarcely broader behind the humeri, sutural stria not deep, the interval very little, if any, broader at apex, the geminate striæ very faintly impressed. Length 1.00—1.10 inch; 25—26.5 mm.

Male.—Antennæ as in *Ricksecker*i from joints one to six, seventh prolonged nearly half the length of the eighth, last four joints forming an elongate club as in that species.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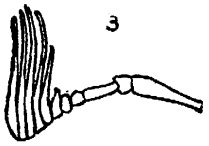
At the time Dr. LeConte published his notes on Pleocoma (Trans. Am. Ent. Soc. 1874, p. 82) no good specimens were known of this insect. I have recently obtained two fine examples through the kindness of W. G. W. Harford, of California.

Collected in El Dorado County; also in Fresno County, Cal.

It is highly probable that the mouth parts described briefly by Dr. LeConte (Proc. Acad. 1859, p. 71) and attributed to this species may belong to some other. This has no great importance, except as to the distribution of the species.

P. Behrensii Lec.—Oblong oval, sides nearly parallel, piceous, feebly shining, underside and legs castaneous, the margin and body beneath with moderately long, reddish-yellow hairs. Vertical horn scarcely emarginate. Thorax more than twice as wide as long, widest at middle, slightly narrower at base, hind angles rounded, disc in front faintly impressed, a slight impression of the median line at base, surface with moderate punctures not dense, except in the anterior depression, where they are denser and coarser, each side of middle and equidistant, from median line and base a small round fovea. Sutural stria of elytra moderately impressed, the interval very little wider at apex, the geminate striæ distinct, but not deep. Length .85 inch; 21 mm.

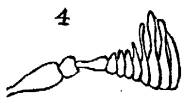
Male.—Antennæ very nearly as in *Rickseckeri* from joint one to five, sixth a little more transverse, seventh nearly three-fourths as long as the eighth, joints eight to eleven as in that species.



Captured by Mr. James Behrens near Sauzalito, Marin County; also near Berkeley, Cal., by J. J. Rivers.

The small fovea on each side of the thorax mentioned in the above description is probably not a constant character. A counterpart of it exists in every other species, but is not constant. In *fimbriata* and *Behrensii* there is a well marked, short, oblique depression; in *hirticollis* a vague concavity, while in the other species all trace of it seems to be obliterated by the broad transverse depression.

The female of this species resembles that of *Rickseckeri*, but is a little larger and rather more robust. The antennæ differ from each other in much the same manner that those of the males differ. In the present species the club is truly four-lamellate, the seventh joint more than half as long as the eighth, while in *Rickseckeri* the eighth joint is not longer than the seventh of *Behrensii;* joints four to seven are more transverse than in *Rickseckeri.*



The original from which LeConte described the female passed again to Mr. Behrens, the one now before me belonging to the LeConte cabinet, was collected at Berkeley, Cal., by Mr. J. J. Rivers in the month of May, "nearly dead and too feeble to make a burrow."

P. conjungens n. sp.—Form rather broadly oval, convex, dorsum slightly flattened, piceous and shining above, beneath brown, fimbriate at sides and clothed beneath with reddish-yellow hairs. Clypeal horn deeply triangularly notched, narrowed at base, a slight emargination between it and the lateral processes, vertical horn emarginate at tip. Thorax more than twice as wide as long, very similar in form to *hirticollis*, the sides behind the middle nearly straight and divergent, hind angles very distinct, but obtuse, disc not concave in front, surface sparsely finely punctate as in *fimbriata*, the punctures a little coarser at middle in front, surface entirely without hairs. Elytra a little broader behind the humeri, sutural stria moderately deep, the interval a little broader behind, the geminate striæ indicated by rows of punctures, the interspace sparsely punctate, not wrinkled. Legs piceous. Length .92 inch; 23.5 mm.

Male.—The antennæ do not seem to differ appreciably from those of *hirticollis.*

At first glance this species would be mistaken for *fimbriata*, but the structure of the antennæ approaches it to *hirticollis*, from which it differs by the absence of hairs from the thorax as well as by the style of punctuation.

Three ♂ specimens have been seen, one of them kindly given me by Mr. J. J. Rivers, of Berkeley, Cal. Two of them have the fourth antennal joint prolonged in a process, one as figured for *hirticollis*, a second shorter, a third without any process. The latter is smaller than the others and probably is merely a feebly developed specimen, although antennal differences are usually specific. All were taken in the same flight.

Occurs near Santa Cruz City, California.

P. hirticollis Schaufuss.—Oval, slightly oblong, not broader behind, piceous and shining above, castaneous beneath, fimbriate and clothed beneath with yellowish hair. Clypeal horn with rather strongly divergent sides, a distinct notch separating it at base from the lateral processes. Thorax more than twice as wide as long, sides more abruptly narrowed from the middle to apex, broadest at base, hind angles distinct, but obtuse; disc somewhat declivous in front and broadly flattened, the surface more coarsely and closely punctured than in the other species, the punctures in the depression very coarse, deep and close, with semi-erect hairs sparsely scattered over the thorax, more numerous in front. Elytra with feebly arcuate sides, sutural stria deep, the interval distinctly broader behind, the geminate striæ very faint, the surface sparsely punctate, comparatively smooth. Length .80 inch; 20 mm.

Male.—First two joints of antennæ very like *fimbriata*, third nearly as large as the first; fourth short, with a slender process one-half as long as the lamella of the fifth; joints five to eleven forming a long club, the lamellæ gradually larger to the eighth, then gradually shorter.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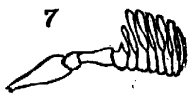
Female.—Ovate, robust, convex, reddish-brown. Clypeal horn short, broad and feebly emarginate, vertical horn short, rather deeply emarginate. Thorax similar in outline to the male, but not more than twice as wide as long, not impressed in front, moderately strongly and closely punctate, nearly equally over the entire surface, median line smooth, without erect hairs. Elytra broadest behind the middle, sutural stria not deeply impressed, the interval not wider behind, geminate striæ very faintly indicated, surface more sparsely punctate than the thorax. Legs very robust. Length 1.32 inch; 33 mm.

The antennæ of the female are of the same type as the male, but much shorter and with the lamellæ short. First joint conical, second globular as well as first, third more slender, half as long as first, fourth short, transverse, angulate on inner side, fifth prolonged in a lamella, three-fourths as long as sixth, joints six to ten nearly equal in length, the eleventh shorter.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When the leaves of the lamellæ are closed the apices are contiguous, but the joints at middle are separated.

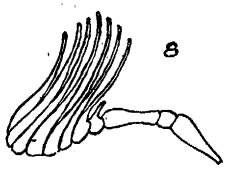
The description of the female is taken from a perfect specimen in the LeConte cabinet, the one originally described has been in my possession since he received the other.

The male specimens have brownish or yellowish-brown elytra, they may possibly be somewhat immature, although I suspect they are never so dark in color as *fimbriata* and *Behrensii.*

For the specimens in my cabinet I am indebted to Mr. Henry Edwards, who collected them Nov. 3, 1866, near Nevada City, Cal., drowned in a small stream of water.

P. Ulkei n. sp.—Oblong-oval, convex, dorsum depressed, surface shining, margin fimbriate and body clothed with reddish-yellow hair. Head piceous, clypeal deeply oval emarginate, ante-ocular processes auriculate (not triangular and acute). Thorax piceous, a paler space at the sides, more than twice as wide at middle, as long, widest at middle, very strongly arcuately narrowed in front, slightly narrowed to the basal angles, which are distinct, but rounded, disc retuse (rather abruptly declivous) in front, a transverse obtuse elevation at middle, behind which the disc is slightly concave, surface sparsely finely punctate, a little more coarsely toward the sides. Elytra pale castaneous, sutural stria deep, the interval convex and wider behind, geminate striæ deeply impressed and punctured, the intervals sparsely punctate, not rugose. Legs castaneous. Length .96 inch; 24 mm.

Male.—First three joints of antennæ as in *hirticollis*, fourth joint short, with a slight prolongation, joints four to eleven forming an elongate club as in *hirticollis.*



Of this species I have seen but one specimen. It is, therefore, not possible to say whether the paler elytra are due to immaturity or represent the full color.

It gives me pleasure to dedicate this splendid species to my friend, Henry Ulke, of Washington, whose name has often been mentioned in our writings as a synonym for kindness and liberality.

Collected in Utah. Remarkable as the first species known outside of the California fauna.

P. Staff Schaufuss.—Oval, slightly oblong, convex, dorsum scarcely depressed, head and thorax piceous, elytra pale chestnut-brown, beneath and legs brownish, the margin fimbriate and clothed beneath with pale brown hair. Clypeal horn deeply emarginate, very little narrower at base, vertical horn short, conical; ante-ocular processes auriculate. Thorax more than twice as wide as

long, much narrowed in front, sides broadly arcuate, hind angles very broadly rounded, disc retuse in front and broadly concave behind an obtuse transverse ridge at middle, surface finely not closely punctured, punctures coarser toward the sides. Elytra very little broader behind the middle, sutural stria deep, interval a little broader at apex, geminate striæ deep and coarsely punctured, the interspaces sparsely punctate with intermixed punctures. Length 1.05 inch; 26.5 mm.

Male.—The first five joints alone remain on the specimen examined; these are almost an exact repetition of those of *hirticollis.*

This species and *Ulkei* have a close superficial resemblance in form, color and sculpture. In the present species the hind angles of the thorax are so broadly rounded that the sides and base are really continuous. The fourth joint of the antennæ is merely transverse in *Ulkei,* while in *Staff* it is prolonged in a process half the length of the fifth joint.

As remarked by Dr. LeConte, this species is recognizably described by Mr. Schaufuss; at the same time the name given was dropped and *Edwardsii* substituted. While I fully agree with LeConte in all he says about keeping our literature and "scientific nomenclature free from all personal, political or religious prejudices or expressions of opinion," I cannot accept an arbitrary change of the name as an adequate amendment of an unwise obtrusion of a scientific name given under those influences. Prejudices are, for the most part, very ephemeral, but an ill-conceived scientific name remains as a monument to the folly of the individual who gave it.

California. The precise locality unknown.

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For an account of the habits of Pleocoma we are probably more indebted to the publications and letters of Mr. L. E. Ricksecker than to any other observer. The following summary has been prepared mostly from private letters from him and others.

The first rains of the wet season in California fall at variable times in October and November. After the first fall of sufficient extent to moisten the soil for a depth of six inches or more the specimens emerge and the males are found flying about, usually in considerable numbers in their search for the females.

Mr. Ricksecker writes, "no females have yet been found really *on* the surface of the ground, and it is at present a matter of doubt

whether they actually emerge and walk away to some distance to re-enter the earth or whether they only approach the surface and open a way for the males to find them. The female sent you was found four inches underground, going downwards, with three males following her."

Mr. Rivers found one female on the surface nearly dead and too feeble to make a burrow.

While nearly all the individuals of a brood emerge at the same time it seems that some are retarded, so that of two females of *Rickseckeri*, of which I have data, one emerged with the vast majority of the brood Oct. 16, 1886, a second "after a warm rain Dec. 7, 1886, being either a straggler from a deeper burrow, or more probably one that had not been previously found by any male and had approached the surface a second time. A male was near by where the female was found just under the surface."

After the flight all the specimens disappear, the males dying, or are captured by insectivorous birds and mammals, the females entering the burrows to deposit their eggs.

PLEOCOMA Lec.

Proc. Acad. Nat. Sci. 1856, p. 24.

P. Rickseckeri n. sp.

P. fimbriata Lec., Proc. Acad. 1856, p. 24; Pacific R. R. Rep. ix, App. 1, p. 40, pl. 1, fig. 13;* Proc. Acad. 1859, p. 71 (describes mouth parts); Trans. Am. Ent. Soc. 1874, vol. v, p. 82.

P. Behrensii Lec., Trans. Am. Ent. Soc. 1874, vol. v, p. 83.

P. conjungens n. sp.

P. hirticollis Schaufuss, Nunquam Otiosus, Dresden, 1870, vol. ii, p. 51; Lec., Trans. Am. Ent. Soc. v, p. 83; Lec., Pacific R. R. Rep. loc. cit. p. 40, note †

P. Ulkei n. sp.

P. Staff Schaufuss, Nunquam Otiosus, ii, p. 50.
adjuvans Crotch, Check List, 1874.
Edwardsii Lec., Trans. Am. Ent. Soc. 1874, p. 83.

* The outline figure is fair, the antenna is not accurate, and in addition does not belong to *fimbriata*.

† The note was evidently hurriedly written, for reasons given, and the specimens supposed to belong to *fimbriata* are *hirticollis*.

Literature of Pleocoma.

Proceedings Acad. Nat. Sci. Phila., 1856, p. 24.

In this article Dr. LeConte established the genus and described *P. fimbriata.*

The original specimen (Pl. 1, fig. 1) was badly mutilated, having been partially eaten by a bird. The oral organs were destroyed, the abdomen entirely gone; one antenna and part of the legs remained.

In this article, at the beginning of a paragraph, LeConte says of Pleocoma, "apparently belonging to the Dynastidæ," and after some speculations concerning resemblances to Syrichthus and Athyreus (our species are now Bradycinetus) concludes the paragraph as follows: "Doubt must, therefore, be entertained whether the genus should be placed with the Dynastidæ or Geotrupidæ."

Considering the material at his disposal I think the article is an evidence of his wonderful analytical powers.

Pacific R. R. Reports, 47th parallel, vol. ix, App. i, p. 40, pl. I, fig. 3.

In this article LeConte again says, "as the oral organs and the abdomen are destroyed I cannot tell whether this genus belongs to the Dynastides or Geotrupides; in either case the four-jointed antennal club is equally remarkable. The affinities, so far as I can understand them, seem to be rather with Geotrupes."

In a foot note, written on the eve of a journey, the author speaks of the arrival of a perfect specimen closely resembling *fimbriata,* differing in having a seven-jointed antennal club. This he suspected might be a sexual difference. The foot note contains this expression, "Although agreeing with Geotrupidæ in the eleven-jointed antennæ, the form of the antennæ is entirely anomalous in that and allied groups, and the small size of the oral organs would seem to indicate a new group between Geotrupidæ and Copridæ."

The specimen referred to in the foot note belongs to *P. hirticollis,* and it seems to me unfair that Gerstaecker says that LeConte changed his diagnosis of the genus when the remark, by LeConte's statement, applies to the insect just at that moment received.

Proceedings Acad. Nat. Sci. Phila., 1859, p. 71.

In this article LeConte briefly describes the oral organs obtained in a fragmentary condition from the stomach of a woodpecker, and concludes with these words: "It will be seen that combined with the eleven-jointed antennæ with polyphyllous club, the characters

above detailed are abundantly sufficient to establish this genus as a new group, related to the Geotrupidæ and Copridæ, with, however, a strong tendency toward the Dynastide group of Scarabæidæ pleurosticti."

Classification of the Coleoptera of North America, 1861, p. 128.

Here the tribe Pleocomini is defined and placed after the Geotrupini.

Nunquam Otiosus, vol. ii, 1870.

Dr. L. W. Schaufuss describes two new species of Pleocoma.

Trans. Am. Ent. Soc. v, 1874, pp. 81-84.

Dr. LeConte gives a table of the species known to him, describes one new, renames one of those described by Schaufuss and describes the females of two of the species. Sketches of the antennæ are given not very accurately drawn.

Following this paper is a description of the larva of Pleocoma by Baron R. Osten-Sacken.

Classification of the Coleoptera of North America, 1883, p. 244.

This work is a revised edition of that mentioned above, in which it was my privilege to be associated with Dr. LeConte in authorship. The genus Pleocoma occupies the same position as in the former work.

In reviewing the work of Dr. LeConte there will be seen a very consistent evolution of opinion based on more and better material, but from the first he has insisted on the evident relationship of Pleocoma with the Geotrupini. As early as 1861 all reference to any Dynastide affinity diappeared from his writings, having continued from 1856 to 1859, in what was the period of extremely poor and limited material for study.

Without wishing to anticipate I may here state that the opinion published by us in the "Classification" of 1883 was not adopted without a careful study of the comparatively abundant material then before us.

Stettiner Entomologische Zeitung, 1883, pp. 436-450.

Dr. Gerstaecker publishes, under the title, "On the position of the genus *Pleocoma* Lec. in the Lamellicorn system" a lengthy article, full of interesting information, in which he deduces results calculated to destroy our faith in the analytical power of Dr. LeConte, but—the deductions are not warranted by the actual facts of the case.

We owe to John B. Smith, of the National Museum, a carefully prepared translation, so that those unacquainted with the language of the original may read the views of Gerstaecker in "Entomologica Americana" vol. iii, pp. 202–211.

I propose to pass the paper of Gerstaecker in review as briefly as consistent with accuracy, while the reader will have in the preceding pages and the plate, the material on which my arguments are founded. Gerstaecker begins with the statement of the well known fact that the larger divisions, called families among insects, divided more or less naturally and sharply into subordinate groups, but that genera often occur with such varied relationships that it is difficult to place them, as different authors will give greater regard to characters subordinated by others.

After stating what material he has studied, he says he has examined the superficial characters and those not immediately visible, and hesitates no longer in asserting that *Pleocoma* belongs to a group remote from Geotrupini.

Then follows a resumé of LeConte's writings, as has been given in the preceding pages, quoting more liberally than I have done. He seems not to have seen the second edition of the "Classification."

Dr. Gerstaecker correctly surmises that *Pleocoma* cost LeConte considerable thought, but the changes of opinion are merely the dropping off of supposed affinities, first "Dynastiform" disappears, then "Coprini," but the Geotrupide idea is permanently retained. The first perfect specimen LeConte saw fixed the idea that its affinities were with Geotrupes.

Then Gerstaecker proceeds to picture the train of thought which caused LeConte to arrive at his final conclusion, but the thought does not seem to have arisen in Gerstaecker's mind that probably LeConte examined the spiracles. That LeConte did examine the spiracles I can assert positively, and the specimens used were those mentioned in the foot note in the paper in the Pacific R. R. Reports.

"But what, actually, is the structure of the abdomen?" asks Gerstaecker. "This examination proved, positively what I fully expected,—that the large spiracles of the second and third, and the smaller ones belonging to the fourth and fifth abdominal segments had, in *Pleocoma, precisely the same situation as in Melolontha,* that is on the superior portion of the ventral segments, and not on the membrane connecting the corneous, dorsal and ventral plates, as in Geotrupes."

At this point I wish to assert positively that the abdominal spiracles, seven in number, *are all situated in the connecting membrane*, the last spiracle is concealed by the closing together of the last dorsal and the last visible ventral segments. Consequently Pleocoma *is a Laparostict Lamellicorn!*

In order that the position of the spiracles may be seen by those who do not have a Pleocoma, much less a specimen to dissect, I have had the accompanying photographic block prepared from a dissection spread between glass plates. The photographic method has reversed the sides, this being the same preparation as that sketched on Plate II. The ventral portion is to the left. The small terminal segment is not visible, except by dissection, being completely retracted within the abdomen. The accompanying figure is about two and a half times the size of nature.

The argument drawn from the oral organs by Gerstaecker seems to me of but little value. Pleocoma, as already stated, has but a brief existence, the mouth parts are reduced in size and so crowded as to be of little use in taking food. As far as the mouth parts are concerned Pleocoma differs no more from Bradycinetus (*Athyreus* ‡ olim) than the latter does from Aphodius (pl. ii, figs. 6–16), and I think there can be no doubt that these are equally Laparostict Lamellicorns. Atrophy of the mouth parts is observed in more than one family of Coleoptera and indicates, usually, a very ephemeral life in the species.

After having stated several times that Pleocoma is *not* a Laparostict, Gerstaecker discusses the question whether it should constitute a distinct tribe. It is not necessary to follow his argument here unless it be conceded that the position of the spiracles is Pleurostict, then he may be right, otherwise wrong.

Gerstaecker then discusses the structure of the antennæ. It must be admitted that these are entirely anomalous for a Laparostict and suggest the polyphyllous clubs of many of the Melolonthidæ well known to every one. This is, however, one of those instances abundant everywhere in zoology in which an animal, with a fundamental structure of some well recognized series, has a superadded peculiarity possessed by some other group not otherwise related.

In a resumé Gerstaecker again refers to the oral organs and states that the figures given by Erichson (Entomographien, pl. 1, figs. a–e, g–i) of the mouth parts of Elaphocera and Pachypus might be referred to *Pleocoma*. I can see no such resemblance as any one can realize by comparing the figures quoted with those prepared by myself of *Pleocoma*.

"After having, in the preceding remarks, disproved all the arguments brought forward by LeConte to justify his placing *Pleocoma* near *Geotrupes* by proving its Melolonthid character—in the imago—," Dr. Gerstaecker proceeds to discuss the larva described by Baron Osten-Sacken as that of *Pleocoma*.

I will admit that I had grave doubts of the accuracy of the determination of that larva until I had read the remarks of Gerstaecker denying that it could possibly be the larva of *Pleocoma*. His opposition and all he says convince me that inasmuch as *Pleocoma is* a *Laparostict*, and that the larva "made known by Osten-Sacken belongs to the Scarabæidæ Laparosticti, admits, indeed, of no doubt"—all this satisfies me that we have truly the larva of *Pleocoma*, as there is not that well explored part of California from which the larva was obtained any other Laparostict Scarabæide, or Lucanide of any size approaching that required by a larva 50 mm. long, or even of a larva 30 mm. long.

"To compare a 50 mm. long larva with Geotrupini and Trogini is strange to begin with." I can hardly see what size had to do with comparisons based on structure. Objection might be as well made to the comparison of the larvæ of *Rhynchophorus palmarum* and *Calandra oryzæ*, which differ more greatly in size, although nearly identical otherwise.

Certain other statements regarding the plication of the segments in Geotrupini and Lucanidæ are certainly open to very severe criticism, but this is foreign to the object of these remarks. I will only say that Gerstaecker's reference of the larva to Lucanidæ is singularly unfortunate from every point of view.

Having gone as thoroughly over Gerstaecker's remarks as seems necessary, I will give the following as a summary of the results of my study:

1. Pleocoma is an undoubted Laparostict.

2. There are six free ventral segments, the first almost entirely concealed by the coxæ. A small anal segment exists, always retracted, visible only by dissection.

3. Antennæ eleven-jointed, the club ♂ elongate with 4-7 lamellæ.

4. Pleocoma should form a distinct group, related more closely to the Geotrupini than any other group of Laparosticti.

5. Any relationship with the Melolonthidæ must be deduced (1) from the elongate antennal club (2), the geminate, oblique striæ of the elytra which represent the feeble costæ of the Rhizotrogini (3), the long hair of the underside. The first alone has substantial value.

6. It seems to me of but little moment whether Pleocomini is placed before, after, or alongside of Geotrupini, the fact remains that, inasmuch as *Pleocoma* is a Laparostict, Geotrupini is its nearest ally. It has nothing to do with the Dynastini.

7. The larva described by Osten-Sacken is undoubtedly that of *Pleocoma*. Mr. James Behrens, who obtained the larva, has given me sufficient evidence apart from the structure. As these data will probably be published by Mr. Behrens, I merely state the fact and leave the other evidence to him.

DESCRIPTION OF PLATES.

PLATE I.

This plate has been produced by Mr. F. Gutekunst by means of the Phototype process from photographic negatives taken directly from the specimens. The figures are, therefore, accurate reproductions of the form and appearance of the species.

Fig. 1. *Pleocoma fimbriata** Lec. The original type. The artist seemed pleased to find that many of the defects had been concealed by the arrangement of the light. The figure looks far better than the specimen.
Fig. 2. the same, a perfect specimen.
Fig. 3. *P. conjungens* Horn.
Fig. 4. *P. Behrensii* Lec.
Fig. 5. *P. Behrensii** Lec., a female.
Fig. 6. *P. Ulkei* Horn.
Fig. 7. *P. Rickseckeri* Horn.
Fig. 8. *P. Rickseckeri* Horn, a female.
Fig. 9. *P. Staff** Schaufuss.
Fig. 10. *P. hirticollis* Schaufuss.
Fig. 11. *P. hirticollis** Schauf., a female.
Fig. 12. *P. hirticollis* Schauf., a larger female.

* I am indebted to the kindness of the authorities of the Museum of Comparative Zoology at Cambridge, through Dr. Hagen, for the facilities extended in the preparation of the necessary negatives for the specimens indicated.

PLATE II.

Fig. 1. Right half of abdomen, showing the position of spiracles in *Pleocoma*.
Fig. 2. Diagram in transverse section showing the relation of spiracle to adjacent parts.
Fig. 3. Anterior and posterior tibiæ of *P. fimbriata*.
Fig. 4. Lateral view of head of *P. hirticollis*, the mouth parts removed.
Fig. 5. Front view of clypeus and labrum.
Fig. 6. Head beneath, showing the relation of parts, the maxillæ are not so plainly visible in nature.
Fig. 7. Mandibles as seen from beneath *in situ*.
Fig. 8. Right mandible as seen from side.
Fig. 9. Right mandible (more enlarged) as seen from the upper side.
Fig. 10. Left maxilla, the side adjacent to mentum.
Fig. 11. same the side adjacent to mandible.
Fig. 12. Right maxilla *a* lower side, *b* upper side of *Bradycinetus ferrugineus*.
Fig. 13. Mentum and ligula of same.
Fig. 14. Mandible of same.
Fig. 15. Maxilla of *Aphodius erraticus* (after Duval).
Fig. 16. Mentum and ligula of same (after Duval).
Fig. 17. Form of maxilla of larva of Pleocoma from a sketch of the cast skin.
Fig. 18. Mentum and ligula of same.

Descriptions of the larvæ of Glyptus, Platypsylla and Polyphylla.

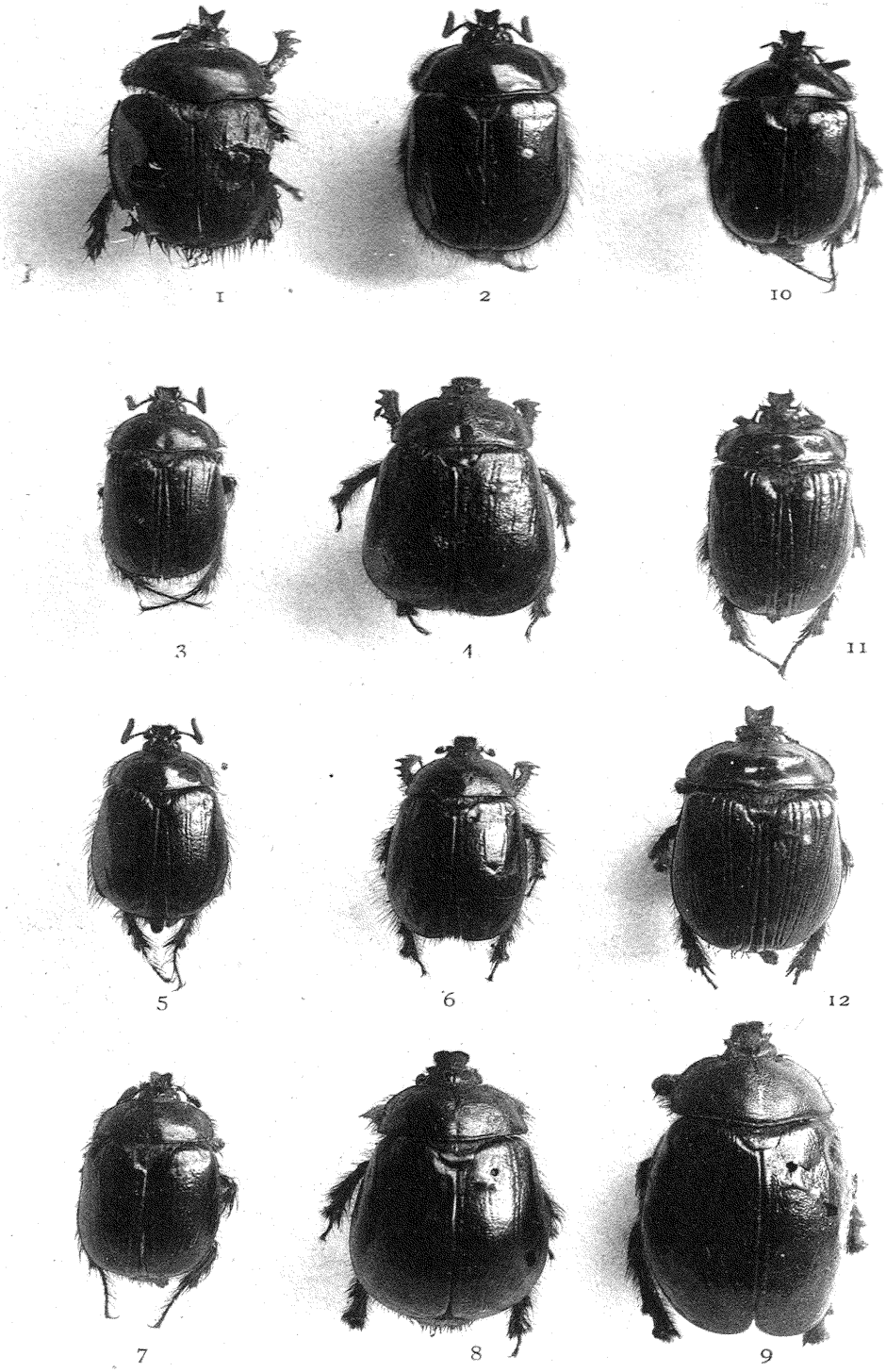
BY GEORGE H. HORN, M.D.

The larvæ of Coleoptera will doubtless yield facts of taxonomic value, and may aid in settling disputed relationships among the imagines. Some attempts have already been made in this direction, notably by Erichson and others among the Scarabæidæ, and more recently by Rey in Elateridæ. Some families have yielded very little, from the fact that the species have almost the same mode of life as Cerambycidæ, Buprestidæ, and the majority of the Rhynchophora.

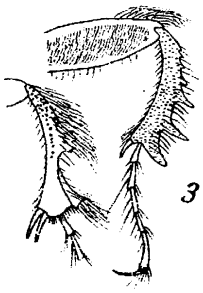
At present too little attention seems to be paid to study of this sort, and every student of classification should consider it a duty to describe any authentic larva known to him with such figures of form and detail as may be useful hereafter.

Recently three larvæ have come into my possession, two of which are entirely new, the third merely showing the almost absolute identity of our form with that of European species, and in accordance with the idea above explained the following descriptions are given with figures and details on the accompanying plate.

PLEOCOMA.



1–P. fimbriata (*type*)
2–P. fimbriata
3–P. Behrensii
4–P. Behrensii ♀
5–P. Rickseckeri
6–P. Rickseckeri ♀
7–P. hirticollis
8–P. hirticollis ♀
9–P. hirticollis ♀
10–P. conjungens
11–P. Ulkei
12–P. Staff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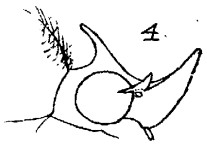
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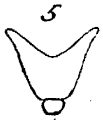
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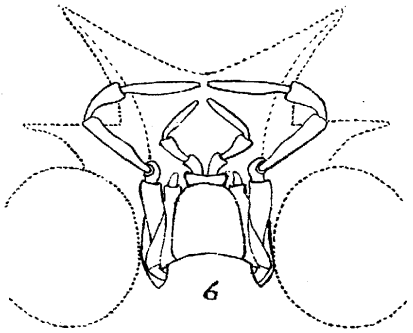
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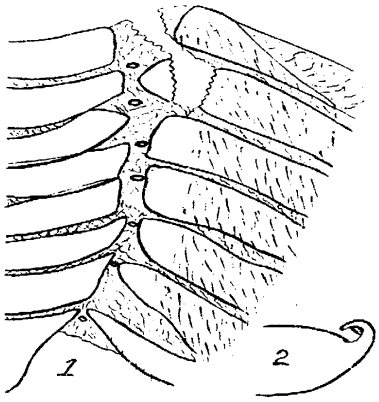
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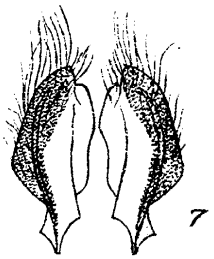
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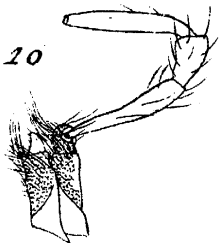
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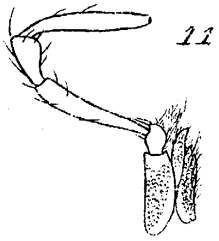
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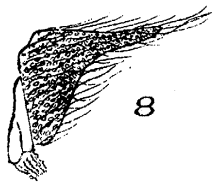
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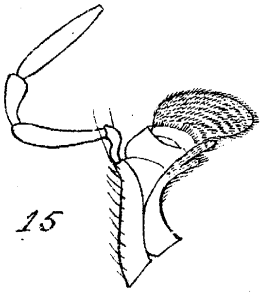
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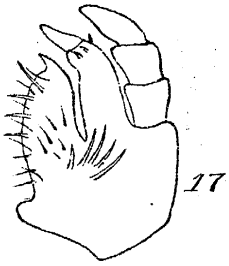
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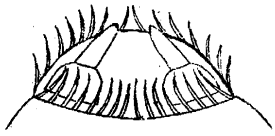
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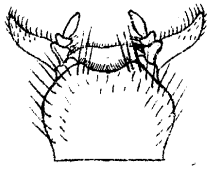
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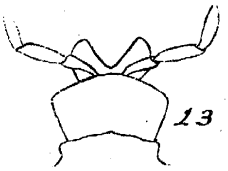
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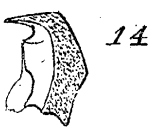
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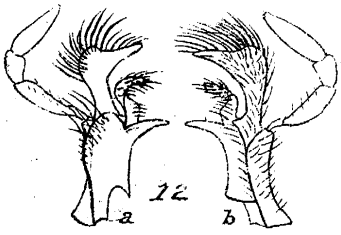
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