

A MONOGRAPHIC REVISION OF THE SPECIES OF
CENTRONOPUS SOLIER INHABITING AMERICA
NORTH OF MEXICO

(COLEOPTERA: TENEBRIONIDAE)

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(Plates X and XI)

In the following review two new species will be described, as well as notes on the species known to inhabit Mexico. In 1859, LeConte created the genus *Scotobaenus* to receive a species which he described as *parallelus*. LeConte's generic term was suppressed as a synonym of *Centronopus*, founded by Solier in 1848. Three species have been described from Mexico and with those of the United States raises the number of species to six.

My technique in the present study has been the same as that given in my Monograph of the Eulabes.¹ The facts presented are based on a considerable series in my own collection, supplemented by those in the collections of Dr. Edwin C. Van Dyke, The Museum of the California Academy of Sciences, The Academy of Natural Sciences of Philadelphia, Chas. Liebeck of Philadelphia and Roy S. Wagner of Fresno, California. Comparison has been made with the LeConte type of *parallelus* in the collection of the Museum of Zoology of Harvard University at Cambridge, Massachusetts, by Mr. Nathan Banks.

As usual in my studies the recorded facts are based on dissections and carefully made camera lucida drawings. The study of the genital structures has proved as significant as previously reported for the Eleodiini and Eulabes. The studies of Sharp and Muir* have clarified our knowledge of the general anatomy of the third lobe and which I accept; variations of far reaching importance are to be found in the different taxonomic grades.

¹ Trans. Amer. Ent. Soc., LVIII, pp. 36-100, pl. 1-6, (1932).

* Trans. Ent. Soc. London, 1912, p. 477-642.

Dried laboratory material is not useful for determinate studies, but sufficient for generic and specific definitions; fresh specimens are necessary for phylogenetic and anatomical investigations. Their dissection requires high technical skill.

CENTRONOPUS Solier

1848. *Centronopus* Solier, Studi Ent., i, p. 154 and 258. (Essai Collappterides, p. 8 and 112.)
 1859. *Centronopus* Lacordaire, Gen. Col., v, p. 360. (nec Horn).
 1859. *Scotobaenus* LeConte, Proc. Acad. Nat. Sci. Phila., 1859, p. 87.
 1870. *Scotobaenus* Horn, Proc. Amer. Philos. Soc., xiv, p. 340. (Revis. Tenebr.)
 1885. *Centronopus* Champion, Biol. Centr.-Amer., iv, pt. 1, p. 99. *Centronipus* Dejean in litt.

Form elongate oblong, moderately depressed, elytra not connate, wings rudimentary (Pl. XI, fig. 15). Head somewhat transverse, front hemihexagonal, epistoma plane, frontal suture rather strongly impressed; labrum broadly rounded at apex (Pl. X, fig. 17). Mentum distinctly trilobed; middle lobe small, subhexagonal, free and prominent anteriorly, apex more or less sinuato-truncate, surface convex along the middle, strongly foveate within the lateral margins, coarsely punctate; lateral lobes small and inflexed, angles acute. Antennae (Pl. X, fig. 8) moderate in length, slightly thickened apically, second segment short, third twice as long as the latter, distal four segments rounded. Gular peduncle moderate. Epipleurae terminating opposite base of fifth abdominal segment. Legs moderate, more or less dissimilar in the sexes; femora (Pl. X, figs. 1, 2, 3 and 4) more or less clavate and compressed, in the male the inferior surfaces of the middle and posterior feebly or not margined, densely or more or less sparsely pubescent in about basal one-half; in the female the ventral surface of the femora are glabrous and not pubescent. Tibiae slender, each slightly curved at apex, apical external angle evenly rounded and there is a dense tuft of short pubescence on the inner face of the apex partly obscuring the spurs (Pl. X, figs. 9 and 10); ventral surface of the middle tibiae of the male feebly and imperfectly grooved; the anterior distinctly grooved with margins more or less prominent, the external irregularly tuberculate. Tibiae of the female not grooved. First four segments of the tarsi clothed beneath with dense yellow pubescence; metatarsi two-thirds as long as their tibia, first segment as long as the fourth. Tibial spurs (Pl. X, figs. 9 and 10) short, robust, about a half longer than wide and equal.

Generic Genital Characters

Male. Edeagophore² (Pl. XI, figs. 1 to 9) elongate flax-seed-shaped, about four and a half times as long as wide, comparatively feebly arcuate, glabrous, well chitinized and castaneo-piceous in color. Apicale elongately triangular, a little more than twice as long as wide at base, dorsally a distinct median groove is present in about apical third, apex feebly emarginate or very slightly cleft; a fusiform group of spinules on the lateral margin from the mid-point to apical fourth, which are directed basad and laterad; inflexed sides of the dorsal plate continuous with the ventral without suture, the alae (Pl. XI, fig. 8H, and fig. 9I) extending basad between the inflexed sides of the basale (valvifer) to about basal third. Genital fissure elongately fusiform, of moderate width, exposing the apex of the middle lobe (Sharp and Muir) within the genital fossa (Pl. XI, figs. 7F and 8G). The middle lobe is strongly chitinized apically, hamate and decurved at apex and with a post-apical uncus directed ventro-basad. Basale (Pl. XI, fig. 4C) oblong, more or less depressed semi-cylindrical, moderately convex, three times as long as wide, comparatively feebly arcuate basally.

Female. Genital segment (aedeaga³) (Pl. XI, figs. 10 to 14) elongate, strongly chitinized, a little more than twice as long as wide, subconical, somewhat compressed apically, directed upward at an angle of about 30 degrees to the longitudinal axis of the basale (valvifer of Tanner). Valves in full adduction when in a state of physiological rest, completely enclosing the pudendal membranes; dorsal plates arcuately in continuity with the latero-ventral plates without suture or line of demarcation. Ventral plates formed by three sclerites each, the apical with a slightly oval stylifer which occupies the entire apex of each valve from the dorsal to the ventral suture. Appendages (styli) short, as long as wide, cylindrical and supporting at apex a pencil of about six long setae which are equal in length to the distance between the fossae with the valves at rest; fossae round, shallow and large. Middle sclerites very short and transverse, more or less at a tangential angle between the apical and basal sclerite, not or only partly visible when viewed from the side. Basal sclerite oblong, about twice as long as wide. Basale very elongate, bilateral, separated by a narrow membranous interval ventrally, obscured by the anal canal dorsally and connate

² A Monograph of the Eleodiini. *Bull. 63, U. S. Nat. Mus.*, p. 20, (1909).

³ See Comments, p. 222.

laterally with the paraprocts (Tanner⁴ speaks of the latter as a part of the ninth tergite which has been shifted around, in the present case in juxtaposition with the valvifer of the ventral region), chitinized and glabrous; the stiffening rods or baculi are recognized as black lines in the chitinous lateral walls.

Characters Common to the Species North of Mexico

Color black, mouth-parts piceous, integuments more or less shining to subopaque. Head and prothorax finely and moderately densely punctate. Head (Pl. X, fig. 17) moderate, about a fifth narrower than the pronotal apex. Pronotum (Pl. X, fig. 18) wider than long, a little narrowed posteriorly, sides broadly arcuate, broadly but not deeply sinuate before the basal angles; base and apex emarginate, apical angles rounded, the basal acute and moderately prominent. Elytra usually not wider than the pronotum, base transverse, humeri small, obtuse and more or less slightly prominent anteriorly; surface sculptured with rows of punctures in short impressed lines; interstitial surface moderately densely punctate, punctures small, more or less transversely creased between the rows of punctures, the creases starting mainly from the punctures. Femora glabrous, finely and very sparsely punctate; tibiae densely and coarsely punctate.

GENOTYPE: *Centronopus extensicollis* Solier as *Tenebrio suppressus* Say, 1835, a Mexican species.

Up to the present time the only species known to occur north of Mexico has been *parallelus* LeConte. It was collected in the Sacramento Valley of California by Mr. S. S. Rathvon. LeConte has stated in connection with his definition of the generic term *Scotobaenus* that it is most closely allied to *Upis*, *Centronipus* and *Nyctibates*. Without any doubt *Centronopus* is most closely related to *Scotobates* Horn as the genital characters are of the same peculiar type. Horn reviewed the genus and species in his Revision of the Tenebrionidae of America, North of Mexico. Neither LeConte or Horn, as well as Champion in the *Biologia Centrali-Americana* have referred to the pubescence of the ventral surfaces of the femora and tibiae.

In order to properly observe the pubescence it is absolutely essential that the insect be free from all oily exudate. It is

⁴ Trans. Amer. Ent. Soc., LIII, p. 19, (1927).

necessary to subject the specimens to a chloroform bath to restore the golden color of the pubescence. Discolored specimens is probably the reason why those characters have not been observed and mentioned before.

Mr. Roy S. Wagner of Fresno, California, very recently called my attention to marked differences in the form of the metafemora of certain specimens, as well as in the distribution and character of the pubescence of the femora. As a result of the keen observations of Mr. Wagner, two new species will be described below. The taxonomic, generic and specific values of structural characters are not invalidated because they happen to be confined to certain parts or appendages, while the body for the greater part remains homomorphic in the species. Structural characters are of generic significance, while their modification by sculpturing, size, color and pubescence give specific values. It happens that in *Centronopus* Solier the specific characters are found in the legs and to some extent in the primary genital characters. The species may now be defined as follows:

***Centronopus parallelus* (LeConte)**

1859. *Scotobaenus parallelus* LeConte, Proc. Acad. Nat. Sci. Phila., Feb., p. 88.
 1870. *Scotobaenus parallelus* Horn, Proc. Amer. Philos. Soc., xiv, p. 340, pl. 5, fig. 9. (Revis. Tenebr.)
 1873. *Scotobaenus parallelus* Crotch, Check-List Col. Amer. North Mex., p. 105.
 1885. *Centronopus parallelus* Henshaw, List Col. Amer. North Mex., p. 119.
 1920. *Centronopus parallelus* Leng, Cata. Col. Amer. North Mex., p. 235.

In both sexes the metafemora are strongly clavate (Pl. X, fig. 2), inflated in apical one-half, thence rapidly narrowed and subcylindrical to base. In the male the middle third of the ventral surface of each metafemora (Pl. X, fig. 13) is evenly and extremely densely clothed with short, very fine and soft yellow pile. The mesofemora are similarly pubescent but to a less degree. Ventral surface of each metatibia (Pl. X, fig. 10) is clothed with coarser, short pubescence in apical three-fifths; in about middle third the hairs become considerably longer forming an elongate tuft which somewhat intrudes upon the inner surface of the tibiae, (Pl. X, fig. 7) to become distinctly visible as such when viewed obliquely from behind and within when the legs are pulled away from against the body. Ventral surfaces of the profemora not pubescent: those of the protibiae grooved, external margin of the groove most prominent near base and apically, the intervening sinuation rather strong and irregularly tuberculate (Pl. X, fig. 5), inner margin not prominent and with very

TRANS. AM. ENT. SOC., LIX.

small tubercles. Mesotibiae not or very feebly and imperfectly grooved ventrally and with four or five tubercles (Pl. X, fig. 6). In the female the femora are not pubescent; ventral surfaces of the tibiae are not grooved, punctures with short setae; the protibiae are straight and gradually widened from base to apex (Pl. X, fig. 11).

Measurements: Length 18.5 mm.; width 7.0 mm.

Genital Characters.—Male. Edeagophore (Pl. XI, figs. 3, 5 and 9) moderately stout, little more than four times as long as wide. Apicale sparsely and more or less subobsoletely punctulate; sides slightly arcuate and convergent to apical fourth, thence briefly sinuate and parallel to the feebly emarginate and obtuse apex, slightly prominent at the spiculate area, spicules subdentiform; base subtriangularly lobed, broadly and feebly sinuate laterally; dorsal surface rather strongly convex, dorsal groove in apical half may be more or less interrupted, an elongate oval and shallow median impression may be present, laterally rather broadly and arcuately declivous, continuous with the ventral plates without suture—viewed from the side under oblique illumination there appears to be optical lines of demarcation passing from the apex of the basale to the spiculate area and apical margin of the genital fissure, indicating the line of greater convexity scarcely defined from the evenly convex ventral surface. The ventral plates and alae are not more prominent basad to the genital fissure, the latter rather widely fusiform, exposing the apex of the middle lobe within the genital fossa, the uncus is rather long and subacute. Margins of the alae contiguous for a distance nearly equal to the length of the fissure, thence separated by a narrow and deep membranous cleft between the middle third of the inflexed sides of the basale, beyond which they become connate, slightly convex and without a suture (Pl. XI, fig. 9I), ending in the membrane at basal fourth of the interval. A short and quite distinct chito-membranous paralar cleft (Pl. XI, fig. 9J) is present each side at apex of the inflexed sides of the basale, between the alae and inflexed side of the apicale near base. Basale three times as long as wide, less depressed, dorsal surface moderately strongly convex and somewhat broadly and arcuately continuous with the convex inflexed sides, ventral margins broadly arcuate and parallel; apex adapted to the base of the apicale and slightly emarginate laterally (Pl. XI, fig. 3) at an optical longitudinal line of demarcation.

Female. Genital segment (aedeaga) (Pl. XI, figs. 10, 11 and 13) finely, sparsely and distinctly punctate. Dorsal plates (Pl. XI, fig. 11P) angulate laterally at middle, surface lines straight longitudinally. The angulate sides divide the segment into a conical apical and a basal subquadrate part. Apical part: sides convergent and broadly, feebly sinuate to the moderately narrow

and evenly rounded apex—viewed in full adduction. Dorsal plates broadly and arcuately continuous with the ventral from the dorsal to the ventral suture without a line of demarcation; base of each oblique from without inward and basad, conjointly angulate at the suture beneath the anal canal. Punctures of the stylifers setigerous, setae short, fine and erect. Basal part: sides straight and parallel. Ventrally the base of each apical sclerite is oblique from the angulation inward and basad to the ventral suture, and there conjointly sharply angulate at the medial ends of the middle sclerites; the latter about one-fifth as long as the basal sclerites, their apical and basal margins slightly arcuate, the sutures correspondingly sinuate. The apical sutures end at the angulation, from which point a short raised line or carinule extends briefly apicad. Basal sclerites oblique at apex and sinuato-arcuate at base, adapted to the middle sclerite and basale respectively, feebly punctulate laterally; arcuately continuous with the dorsal plates without lateral demarcation.

Basale (valvifer of Tanner) (Pl. XI, fig. 10 O) subcylindrical in transverse section, nearly three times as long as wide; sides parallel, divergent in about basal third, ventral margins separated by a membranous interval of varying width and which dilates in basal third between the arcuately divergent margins of the chitinous plates. Dorsal wall covered by the anal and rectal canal, connate laterally with the paraprocts (Pl. XI, fig. 11R). Dorsal wall of the anal and rectal sheath chito-membranous between the summits of the paraprocts which are separated above and permit of the distention and contraction of the rectal canal. Sutural margins of the dorsal plates, sclerites and basale slightly inflexed.

Location of type.—The LeConte type is in the collection of the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts.

Distribution.—OREGON: Jackson County—Colestin, July 30, 1918, (E. P. Van Duzee). CALIFORNIA: Lassen County—(F. W. Nunenmacher). Siskiyou County—McCloud, October 15, 1918; Shasta City [formerly Sissons], July, (Blaisdell); Mt. Shasta, July 4, 1905, elev. 6000 ft., (Blaisdell); Shasta Retreat, July, elev. 2416 ft., (Blaisdell). Shasta County—Cayton, July 16, 1913, (E. P. Vanduzee). Eldorado County—Bijou, July 21, 1921, (Blaisdell); Fallen Leaf Lake, September 7, 1913, (J. R. Slevin). Placer County—Truckee, June 19, 1927; Cisco, Summit of the Sierra Nevada Mts., June, 1911, (L. Slevin). Plumas County—June 8, 1913, (F. W. Nunenmacher). Yuba County—Challenge, July 15, 1928, (Roy S. Wagner). Calaveras County—Big Trees, July, and above toward Alpine County, elev. 5500 ft., July 13, 1907, (Blaisdell); Mokelumne Hill, March, elev. 1300 ft., (Blaisdell). Alpine County—Lombardi's Meadow [formerly Blood's Meadow], July, 1914, (Blaisdell).

Centronopus wagneri new species

Male. Metafemora less clavate (Pl. X, fig. 1), more gradually widened apically; ventral surface of each with an area of longer pubescence (Pl. X, fig. 14) on the median line, at about middle third of the length; the hairs are more or less erect and directed apicad and from each side toward the median plane; remaining surface more or less sparsely punctate and glabrous. Mesofemora with similar pubescence but smaller in area. Metatibiae with the ventral surface narrowly grooved, margins of which are clothed with short yellow pubescence, the inner densely so, tuft absent. Mesotibiae more or less obsolete grooved on ventral surface with a line of short yellow hairs and about three to five small tubercles. Ventral surface of the protibiae grooved and smooth, external margin of the groove less prominent basally and apically, the intervening sinuation less evident and less strongly tuberculate.

Female. Ventral surface of the metatibiae and mesotibiae linearly margined, not grooved and sparsely setose, setae short. Protibiae not grooved, rather less widened apically; ventral surfaces setose, setae short.

Measurements: (Types) Length 20 to 21 mm.; width 7.5 to 7.8 mm.

Holotype.—Male, No. 3719, and *allotype*, female, No. 3720, in the author's collection, Museum of the California Academy of Sciences. Collected in General Grant National Park, North of Sequoia National Park on the Fresno-Tulare County line, June 10, 1923, by Roy S. Wagner of Fresno, California.

Paratypes in Mr. Wagner's collection and that of the Author. A pair have been also deposited in the collection of the Academy of Natural Sciences of Philadelphia.

The author takes great pleasure in dedicating the species to Mr. Wagner.

Distribution.—CALIFORNIA: Eldorado County—Fallen Leaf Lake, July, 1931, (O. H. Swezey). Madera County—Chiquito Creek, July 23, 1920, elev. 4100 ft. and Northfork, March 19, 1920, (Henry Dietrich). Fresno County—Huntington Lake, July 28, 1919, elev. 7000 ft., (Van Duzee and Blaisdell). Tulare County—Giant Forest, December 16, 1923, (Chas. Fox); General Grant National Park, June 10, 1928, (Roy S. Wagner).

Genital Characters.—Male. Edeagophore (Pl. XI, figs. 2, 4 and 7) somewhat slender, nearly six times as long as wide, moderately arcuate in basal third. Apicale (Pl. XI, fig. 4B) very

sparsely punctulate on disk and laterally, twice as long as wide at base; sides feebly arcuate and convergent, slightly more prominent at the spiculate area, thence slightly sinuate, a little narrower and parallel in apical fifth to the very obtusely rounded, feebly cleft apex, spicules slender; dorsal surface moderately and evenly convex, a median and moderately impressed groove in apical half; base strongly and arcuately lobed in middle third, rather broadly sinuate laterally. Laterad the dorsal plate becomes more gradually, strongly and arcuately continuous with the lateroventral plate; viewed from the side under oblique illumination the lateral border appears somewhat more strongly convex and the ventral plate rather broadly and longitudinally impressed, so that it is more prominent at the fissure and distinctly angulate basad thereto. The genital fissure is fusiform and moderately narrow, within it can be seen the hamate and uncinately strongly chitinized apex of the middle lobe (Pl. XI, fig. 2D and 7F) projecting within the genital fossa. The median margins of the alae are contiguous basad to the fissure where they are most prominent ventrally, thence they are separated by an elongate, deep and narrow fissure opposite the apical half of the inflexed sides of the basale, basad to which the alae become connate without evidence of a suture, oblong in outline, ending at basal third of the basale where the interval becomes membranous. Basale (valvifer) oblong, about three and a half times as long as wide, moderately convex, depressed semi-cylindrical; sides parallel, the arcuately inflexed sides moderately wide with margins broadly arcuate, separated by the alae and membrane of the interval.

Female. General characters similar to *parallelus* Lec. Genital segment (aedeaga) (Pl. XI, fig. 14) more compressed, apex narrowly rounded vertically; punctures of the surface with fine short setae. Dorsal plate not angulate laterally but as in *punctatus* (see below), but more arcuately continuous with the ventral sclerites; sides feebly and very broadly arcuate and convergent to apex. Styli with a pencil of about five long slender setae. Ventral margins of the apical sclerites more rapidly and upwardly convergent to apex rendering it more narrowly rounded vertically. Middle sclerite short, subequal in width, parallel, visible laterally and on the same plane as the general surface. Styli more oval, fossa slightly oval and shallow.

Basale (valvifer) more definitely connate and less defined from the paraprocts (Pl. XI, fig. 14S), line of demarcation obliterated; dorsally the paraprocts are more prominent and inflexed, gradually and triangularly widened toward base to meet more or less on the median line to enclose the rectal canal, dorsal sheath of the latter chito-membranous.

Centronopus punctatus new species

Male. Metafemora gradually widened from base to apex (Pl. X, figs. 3 and 4), very feebly inflated apically; ventral surface in basal half not margined, rather coarsely and sparsely punctate, (Pl. X, fig. 15), peripheral punctures smaller, each with a short, appressed seta directed toward apex. Mesofemora similarly punctate but less so. Each metatibia loosely clothed with yellow pubescence on ventral surface, hairs at about middle are longer and denser, forming a short tuft which is less conspicuous than in *parallelus* Lec. when viewed from behind and within. Profemora moderately inflated, more or less arcuate, gradually narrowed in basal third. Ventral surface of the protibiae grooved, outer margin slightly more prominent near base and apically, the intervening situation moderate and sparsely, irregularly tuberculate; margins with short setae. Ventral surface of the mesotibiae with the groove feeble or obliterated, roughly sculptured, sparsely setose and with about three or four small tubercles along middle third.

Female. Femora without pubescence, ventral surfaces straight, not grooved, sparsely setose. Tibiae roughly sculptured and not grooved; protibiae gradually widened from base to apex as in *parallelus* Lec.

Measurements: (Types) Length 19 to 19 mm.; width 7.5 to 7.8 mm.

Holotype.—Male, No. 3721, and *allotype*, female, No. 3722, in the author's collection, Museum of the California Academy of Sciences. Collected at Huntington Lake, Fresno County, California, at an elevation of 7000 ft., on July 8 and 27, 1919.

Paratypes in the collections of the author and Roy S. Wagner of Fresno, California. A pair has been deposited in the collection of The Academy of Natural Sciences of Philadelphia, Pa.

Distribution.—CALIFORNIA: Mariposa County—Yosemite Valley, May 14, 1929, (L. Slevin); August 26, 1916; June 12, 1914, (F. W. Nunenmacher). Tuolumne County—Big Tree Grove, May 16, 1929. Fresno County—Huntington Lake, July 10, 1919, elevation 7000 ft., (E. P. Van Duzee).

Genital Characters.—Male. Edeagophore (Pl. XI, figs. 1, 6 and 8): Apicale sparsely punctulate dorsally and laterally, punctules varying in size; sides slightly arcuate and convergent to about apical fourth, thence parallel to the obtusely rounded and feebly emarginate apex. Spiculate areas extend from the mid-point to apical fourth, spicules somewhat dentiform; base strongly and arcuately lobed in middle third, thence slightly sinuato-arcuate laterally; dorsal surface less than moderately convex, gradually more strongly and arcuately continuous with the ventral plates, under oblique illumination a line of slightly

greater convexity seems to mark the point of transition; discal groove linear, well impressed in less than apical half. Each lateral moiety of the apex separately convex. Latero-ventral plates moderately convex basad to the genital fissure, less so apically; the surface is linearly and longitudinally slightly subangulate from the middle of the apex of the basale ventrally to the lateral margin of the spiculate area. The alae are contiguous for a short distance basad to the fissure, thence separated by an elongate, narrow and deep fusiform depression, to again become contiguous at a distinct suture, becoming gradually attenuate with apices subacute, ending in the membranous interval at about basal third between the inflexed sides of the basale.

Basale oblong, three times as long as wide, sides feebly arcuate and parallel; surface moderately convex from side to side, sinuate at apex and adapted to base of the apicale; laterally the apex is feebly emarginate at a feebly subangulate line of demarcation between the dorsal and ventral surfaces, as observed under oblique illumination. Inflex sides rather wide, ventral margins broadly arcuate, separated by the chitinous alae and membrane in basal third.

Female. Similar to *parallelus* Lec., except: Genital segment (aedeaga) (Pl. XI, fig. 12) compressed as in *wagneri*. Punctures not visibly setigerous. Dorsal plate not angulate laterally at middle, evenly and arcuately continuous with the ventral sclerites. Sides broadly, not strongly arcuate and convergent at apex. Styli short mammilliform with a pencil of five or six long setae at apex. Styliifer oval as in *parallelus* Lec., floor convex, with a large oval impression in which the large, shallow fossa is located; punctures sparse bearing fine, short hair-like setae.

Synopsis of Differential Specific Characters

Ventral surface of metafemora and mesofemora pubescent in basal half.

Pubescence abundant, dense, very short and of the nature of soft pile; meso- and metafemora distinctly clavate; metatibiae each with a tuft of longer hairs as observed from within and behind. *parallelus* LeConte

Pubescence of ventral surface longer, not abundant, arranged along median line longitudinally; femora not or very moderately clavate; metatibiae without tuft of longer hairs.

wagneri new species

Ventral surface of the metafemora and mesofemora rather sparsely punctate in about basal half; punctures with short and inconspicuous setae; meso- and metafemora gradually widened toward apex; metatibiae with pubescent tufts.

punctatus new species

Synoptical Statement of Male Specific Genital Characters.

Alae connate and oblong, without evidence of a suture, at termination between the inflexed sides of the basale.

Edeagophore somewhat robust; apicale rather strongly convex both dorsally and ventrally, disk with a shallow, broad impression on median line in middle third; spicules more dentiform; basal lobe subtriangular. . . . *parallelus* LeConte

Edeagophore more elongate; apicale less convex, ventral surface of each side longitudinally impressed, prominent at sides of genital fissure and angulate just basad thereto; spicules slender; basal lobe strongly arcuate. . . . *wagneri* new species

Alae not connate at termination, but attenuated and subacute at apex, contiguous at a suture. Apicale rather strongly convex both dorsally and ventrally, not prominent basad to the genital fissure; basal lobe strongly arcuate; spicules more dentiform; genital fissure rather large. Basale (valvifer) less slender, inflexed sides less convex.

punctatus new species

Synoptical Statement of Female Specific Genital Characters

Genital segment angulate at middle of the lateral margin of the dorsal plates; middle sclerites tangentially oblique to the surface plane and scarcely visible from the side.

parallelus LeConte

Genital segment more conical, not angulate at side of dorsal plates, but with the sides arcuate from base to apex and more compressed; middle sclerites very short and on same surface plane as the apical and basal. Basale (valvifer) more fully connate with the paraprocts.

Apex of the segment more broadly rounded dorso-ventrally, dorsal and ventral surface planes less convergent apically; stylifers feebly oval with surface flat. . . *punctatus* new species

Apex of the segment less broadly rounded dorso-ventrally, dorsal and ventral surface planes more convergent apically; stylifers distinctly oval with their surface convex and impressed at center, depression oval from which arises the stylus. . . . *wagneri* new species

COMMENTS AND DISCUSSION

In the present treatment of the species of *Centronopus* Solier, I have given as usual much care to the dissection and description of the primary genital characters. Facts are recorded as I have observed them, in a manner uninfluenced by the opinions of other

writers. I am expressing below, my views concerning the use of the term aedeagus and an answer to certain criticisms.

Τὰ αἰδοία signifies the private parts and is a general term. Sharp and Muir have acknowledged this fact. It is used in Anatomy in combination as aedoeology and aedoeogotomy. To give it a special limited meaning is arbitrary. Sharp and Muir consider the term aedeagus as applied to the male a "useful name for the combination of sclerites in the two adjacent layers of the male tube in the Coleoptera."⁶ In my previous writings I have in part used the term in a general sense. From a grammatical standpoint it is a latinized Greek noun of the second declension, the plural being aedeagi. Sharp and Muir also acknowledge that a term must be found for the female structures. I propose that the term aedeaga be applied to the combination of sclerites in the female sexual segment. The primary sexual organs of the two sexes possess homologous parts, those that appertain to the particular function of each sex will be found vestigial in the opposite sex: In the male to fertilize and the essential mechanism to accomplish that purpose; in the female to be fertilized and to perpetuate the species by ovulation. I believe that the term aedeaga can be so applied and that it will be found as useful and valid as that used for the opposite sex. I have heard it remarked that the term would be liable to cause confusion. There should be no more confusion than in Latin and other romanic languages where the gender is indicated by the terminal letters us and a, or o and a.

In 1909,⁶ I created the term aedeagophore, for the male genital structures—a particular type of aedeagus—as exists in the Tenebrionidae. I am not prepared to state that it is applicable throughout the Tenebrionoidea. Its etymology is evident, being derived from αἰδοία + φέρειν (to bear) and may be defined as a capsule or sheath bearing the middle lobe of Sharp and Muir, which contains within its depths the copulatory filament, duct or sac.

In my recent Monograph of the Eulabes,⁷ I have tentatively applied the term aedeagus to the organs of both sexes without

⁶ Trans. Ent. Soc. of London, p. 484, (1912).

⁶ Bull. 63, U. S. Nat. Mus., p. 20, (1909).

⁷ Trans. Amer. Ent. Soc., LVIII, pp. 99-101, (Apr. 13, 1932.)

giving a gender termination, (which I have done in the present paper) and I began there also, the correlation of my terminology with that of other authors. Sharp and Muir in their Memoir on the Comparative Anatomy of the Male genital tube of the Coleoptera,⁸ listed a few synonyms of the terms used by them. Their studies resulted in the recognition of eight Coleopterous Series.

A discussion of the synonymy may prove helpful, bearing in mind that I am at present only concerned with the Tenebrionidae: Edeagophore (Blaisdell) is the tegmen of Sharp and Muir; it consists of two parts—the apicale (Blaisdell), lateral lobes of Sharp and Muir, inner lobes of Packard, united coxites of Tanner; basale (Blaisdell), basal piece of tegmen of Sharp and Muir, external lobes of Packard, valvifer of Tanner.

The middle lobe (Sharp and Muir) is the central part of the aedeagus, upon which the median orifice or external opening through which the enclosed copulatory filament or essential organ is evaginated; the lobe may be liguliform (Eleodes), tubular (Centronopus) or partially tubular so as to form a pallium (Blaps),⁹ the latter ensheathing more or less the essential organ mentioned above. The homology of the clavae and pallium need special study. Concerning the middle lobe, I refer the reader to the Monograph of the Eleodiini¹⁰ and Eulabes,¹¹ for I have illustrated and discussed it in those papers. In the figures given by Sharp and Muir of the edeagophore of *Eleodes dentipes* Esch.¹² are apparently diagrammatic for they do not agree in detail with my figures,¹³ for the clavae are too curved and robust. In those figures the clavae or lateral processes of the middle lobe are lettered "ma," but no reference is given to them in the "Explanation of double letters" used. It is very unfortunate that the authors did not express their views regarding them, especially from the standpoint of homology. The clavae

⁸ Trans. Ent. Soc. of London, p. 477, (1912).

⁹ Bull. 63, U. S. Nat. Mus., p. 503, pl. 9, fig. 4, (1909).

¹⁰ Bull. 63, U. S. Nat. Mus., p. 21, pl. 9, figs. 11 and 12, (1909).

¹¹ Trans. Amer. Ent. Soc., LVIII, pl. 4, figs. 8 and 15, (1932).

¹² Trans. Ent. Soc. of London, pl. 68, figs. 163 and 163a, (1912).

¹³ Bull. 63, U. S. Nat. Mus., pl. 9, figs. 6, 11 and 12, (1909).

are present in all species of the Eleodiini and recent dissections show them present in *Cratidus osculans* Lec. of the subfamily Adeliinae.

Sharp and Muir have wrongly interpreted the term fornix edeagi,¹⁴ confusing it with the "opening or area on the median lobe through which the internal sac or duct is evaginated." It has nothing whatsoever to do with the apical opening. I have defined it as follows: "Opposite the attachment of the clavæ ventrally the surface membrane is reflected upon the internal wall of the apicale, forming the fornix edeagi." It is the line or angle of reflection of the membrane lining the genital fossa to the surface of the middle lobe at its base. As an illustration to make the fact clear (perhaps), it is analogous to the fornix valvulae which I have defined as the angle of reflection between the lateral pudendal membrane and the valvular membrane in the female genital segment (See page 23 of the Monograph).

ADDENDUM

List and Salient Characters of the Species of Centronopus Known to Inhabit Mexico

Centronopus suppressus (Say)

1835. *Tenebrio suppressus* Say, Boston Jour. Nat. Hist., 1, p. 187.

1848. *Centronopus extensicollis* Solier, Studi Ent., 1, p. 260 pl. 11, figs. 4-8.
(Essai Collapterides, p. 114.) Chev. Dej. Cat., p. 226.

1859. *Centronopus suppressus* LeConte, Compl. Writ. Thomas Say, 11, p. 659.

1875. *Centronopus suppressus* Horn, Trans. Amer. Ent. Soc., v, p. 151.
[Mexico.]

1885. *Centronopus extensicollis* Champion, Biol. Centr.-Amer. Col., iv, pt. 1, p. 100, pl. 5, fig. 9 ♂.

Black. Head densely but minutely punctate, clypeus a little reflexed. Pronotum densely and minutely punctate, rather large; a large, slightly impressed spot on posterior margin; basal angles acute, margin with an impressed line. Elytra with impressed, punctate and crenate striae, interstitial spaces convex, impunctate, lateral edge acute. Protibiae with a strong tooth. Length $\frac{1}{2}$ inch.

Habitat.—MEXICO: San Antonio de Arriba, Orizaba, Las Vigas and Cordova. Plentiful according to Hoge.

¹⁴ Trans. Ent. Soc. of London, p. 482, (1912).

Centronopus grandicollis Champion

1885. *Centronopus grandicollis* Champion, Sturm in litt., Biol. Centr.-Amer., Coleop., iv, pt. 1, p. 100, (July).

Black, slightly shining. Head finely and very closely punctured in the male, anterior margin rounded and reflexed; in female epistoma truncate and anterior margin scarcely reflexed. Basal angles of the pronotum very prominent and subacute, base broadly emarginate within; disk broadly but feebly impressed before the base. Elytra long, depressed; sides abruptly narrowed just before the base. Length, male and female: 14.5 to 16 mm.

Habitat.—MEXICO: Jalapa, Hacienda de San Miguelito.

Centronopus bimaculatus Champion

1892. *Centronopus bimaculatus* Champion, Biol. Centr.-Amer., Coleop., iv, pt. 1, p. 521, (Nov.)

Elytra each with a large, transverse, reddish-yellow patch a little below the base, extending to the lateral margin but not to the suture. The male has all the tibiae triangularly toothed within. Head very broadly and deeply excavated between the eyes. Length, male and female: $11\frac{1}{3}$ to 13 mm., breadth 4.5 to 4.75 mm.

Habitat.—MEXICO: Paso de San Juan in Vera Cruz, (Hoge), Actopan, (vide Flohr), Temax in North Yucatan, (Gaumer).

EXPLANATION OF PLATES

PLATE X

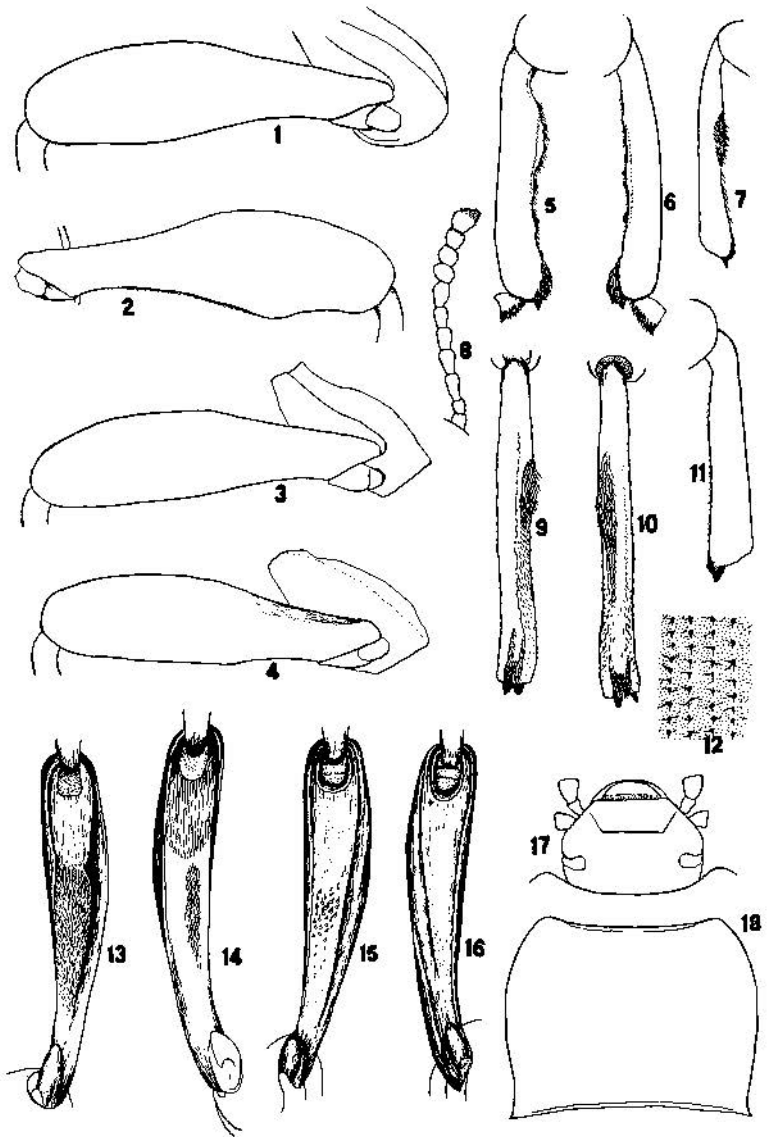
- Fig. 1.—Right metafemur of *Centronopus wagneri* new species, male. Note that the femur is gradually narrowed from middle to base.
- Fig. 2.—Left metafemur of *Centronopus parallelus* Lec., male. Note that the femur is distinctly and more rapidly narrowed from middle to base, as well as more inflated apically (in both sexes).
- Fig. 3.—Left metafemur of *Centronopus punctatus* new species, male. Note that the femur is very gradually narrowed from middle to base.
- Fig. 4.—Right metafemur of *Centronopus punctatus* new species, female. Femora similar in the sexes.
- Fig. 5.—Right protibia of *Centronopus parallelus* Lec., male. Ventral surface grooved and smooth, edges prominent and irregularly tuberculate.
- Fig. 6.—Left mesotibia of *Centronopus parallelus* Lec., male, showing less irregular margins.
- Fig. 7.—Right metatibia of *Centronopus parallelus* Lec., male, showing pubescent tuft as viewed from behind and within.

- Fig. 8.—Antenna of *Centronopus* Sol.
- Fig. 9.—Right metatibia of *Centronopus punctatus* new species, male, showing pubescent area and short tuft. The latter not developed in *wagneri*, new species.
- Fig. 10.—Left metatibia of *Centronopus parallelus* Lec., male, showing elongate pubescent tuft.
- Fig. 11.—Left protibia of *Centronopus* Sol., female.
- Fig. 12.—Elytral sculpturing in *Centronopus* Sol.
- Fig. 13.—Ventral surface of right metafemur of *Centronopus parallelus* Lec., male. Note the extent of the pubescent area, which is of short, soft and dense pile.
- Fig. 14.—Ventral surface of left metafemur of *Centronopus wagneri* new species, male. Note the smaller pubescent area, composed of longer hairs which are directed apicad and toward the median plane of the femur, situated in the middle third or two-fourths of the surface in middle third of length.
- Fig. 15.—Ventral surface of right metafemur of *Centronopus punctatus* new species, male. Note the sparse punctures, each with a short seta appressed to surface and directed apicad.
- Fig. 16.—Ventral surface of left metafemur of *Centronopus* Sol., female. Note that it is not pubescent, but only finely punctulate basad.
- Fig. 17.—Head of *Centronopus* Sol., male.
- Fig. 18.—Pronotum of *Centronopus* Sol., male.

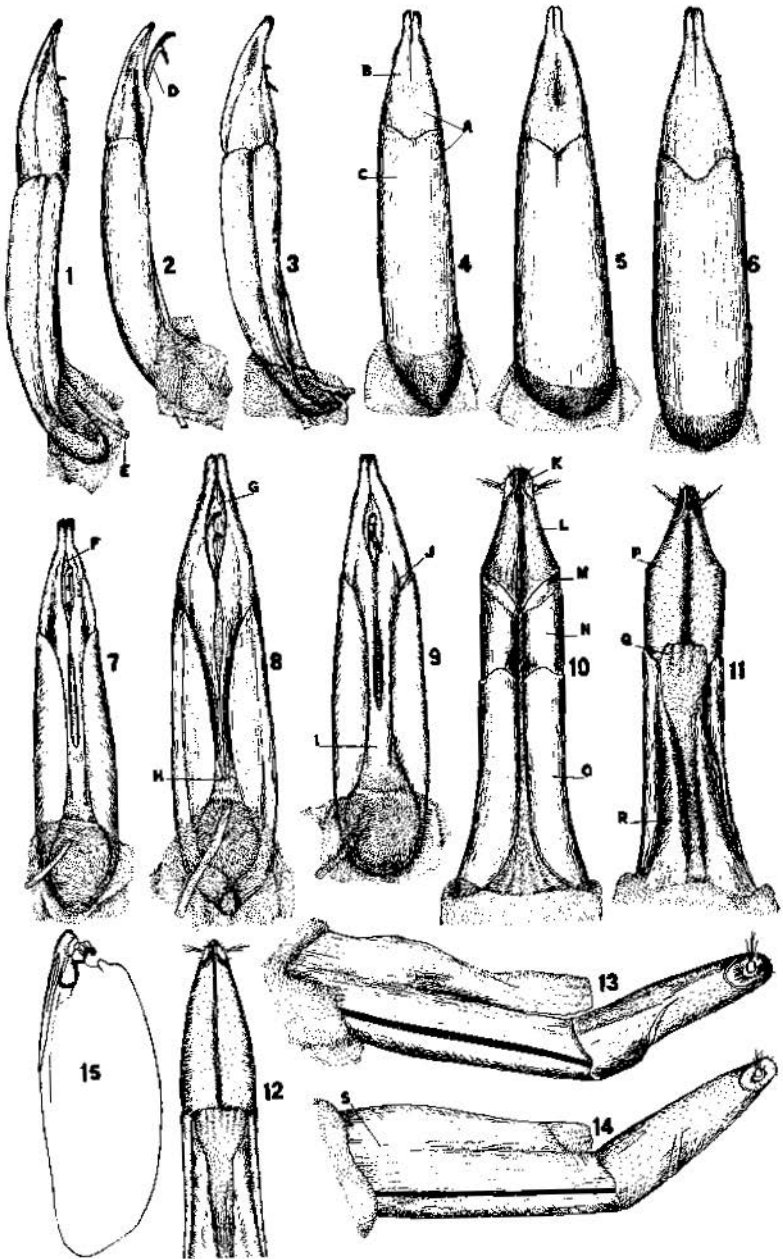
PLATE XI

- Fig. 1.—Lateral view of edeagophore (tegmen of Sharp and Muir) of *Centronopus punctatus* new species; E, ejaculatory duct.
- Fig. 2.—Lateral view of edeagophore of *Centronopus wagneri* new species; D, median lobe of Sharp and Muir.
- Fig. 3.—Lateral view of edeagophore of *Centronopus parallelus* Lec.
- Fig. 4.—Dorsal view of edeagophore of *Centronopus wagneri* new species; A, tegmen of Sharp and Muir; B, apicale (apical piece of tegmen—Sharp and Muir); C, basale (basal piece of tegmen—Sharp and Muir).
- Fig. 5.—Dorsal view of edeagophore of *Centronopus parallelus* Lec.
- Fig. 6.—Dorsal view of edeagophore of *Centronopus punctatus* new species.
- Fig. 7.—Ventral view of edeagophore of *Centronopus wagneri* new species; F, narrower fusiform genital fissure.
- Fig. 8.—Ventral view of edeagophore *Centronopus punctatus* new species; G, wider fissure and genital fossa; H, attenuated alae united by a suture and acute at apex.
- Fig. 9.—Ventral view of edeagophore of *Centronopus parallelus* Lec.; I, alae connate and oblong at apex without suture; J, paralar cleft.
- Fig. 10.—Ventral view of genital segment of *Centronopus parallelus* Lec. female; K, stylifer; L, apical sclerite; M, middle sclerite; N, basal sclerite; O, basale.

- Fig. 11.—Dorsal view of genital segment of *Centronopus parallelus* Lec. female; P, dorsal plate of valve; Q, anus; R, paraproct of Tanner connate with the basale.
- Fig. 12.—Dorsal view of genital segment of *Centronopus punctatus* new species, female.
- Fig. 13.—Lateral view of genital segment of *Centronopus parallelus* Lec., female.
- Fig. 14.—Lateral view of genital segment of *Centronopus wagneri* new species, female; S, paraproct connate with the basale.
- Fig. 15.—Wing of *Centronopus* Sol., rudimentary in the species, measuring 8 by 3 mm.



BLAISDELL—AMERICAN CENTRONOPUS



BLAISDELL—AMERICAN CENTRONOPUS