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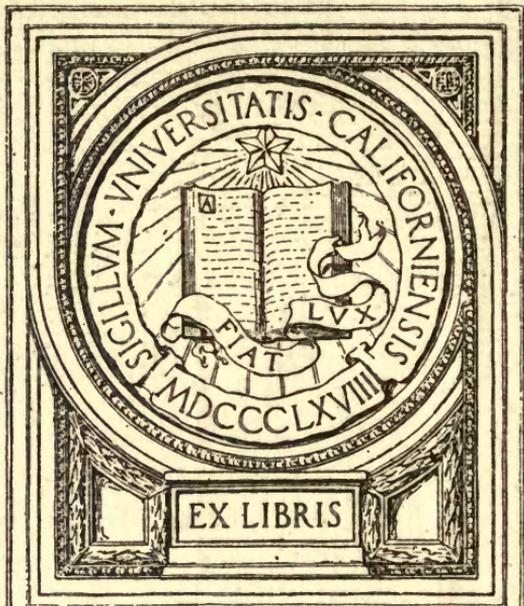
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LARVAL HISTORY OF PACIFIC COAST COLEOPTERA.

RIVERS

1886

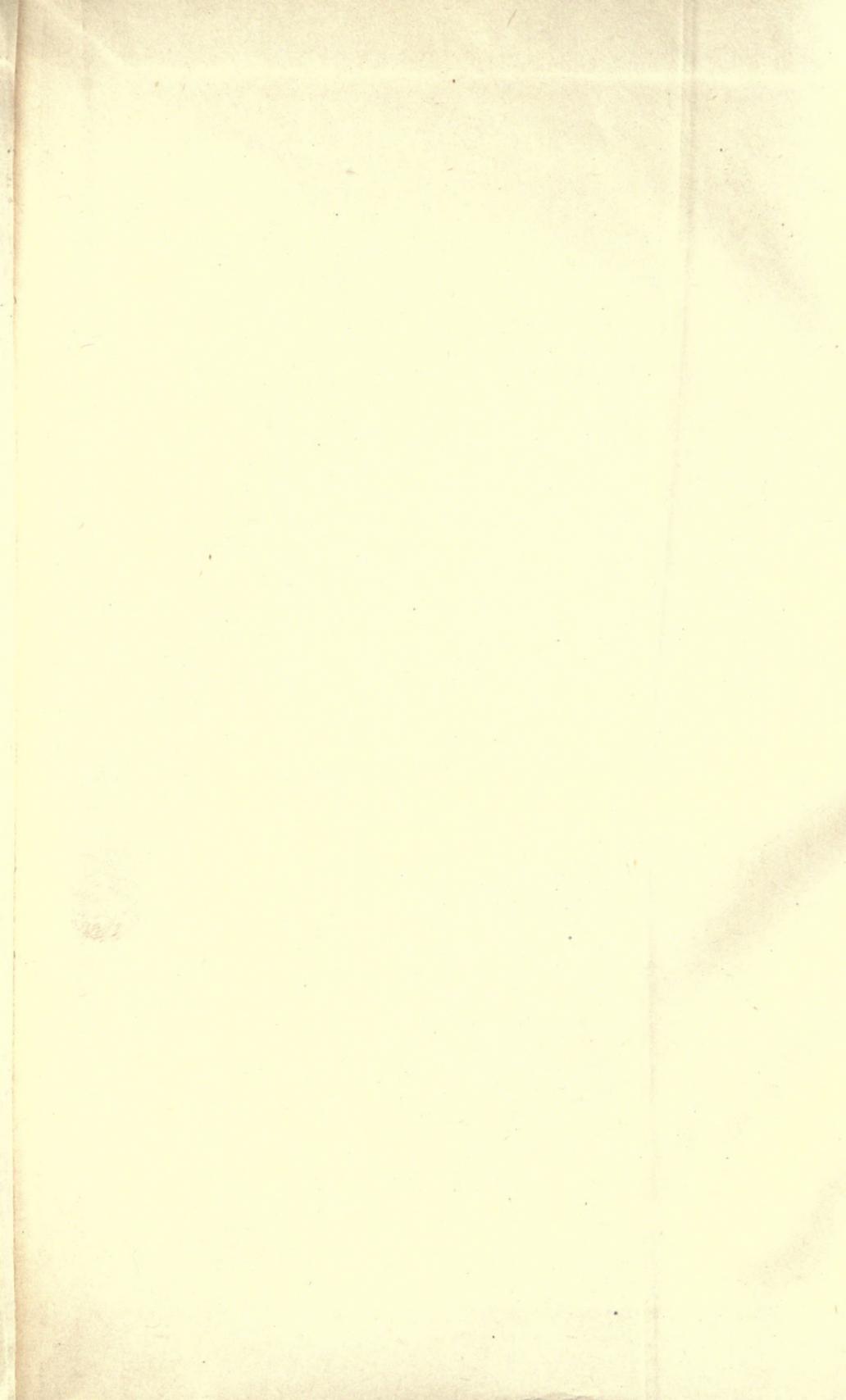
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TO THE

LARVAL HISTORY OF PACIFIC COAST COLEOPTERA.

By

J. J. RIVERS,

*Curator of the Museum, University of California.*



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CONTRIBUTIONS  
TO THE  
LARVAL HISTORY OF PACIFIC COAST COLEOPTERA.

By J. J. RIVERS, Curator of the Museum, University of California.

The study of systematic entomology affords the student but a dim idea of what insects are noxious and what are innocuous. The distinctive characters upon which the systematic entomologist builds classification need not be and generally are not the characters of prime importance to the economic entomologist. The names of many of the groups of Coleoptera afford a slight generalized description which is often misleading. In the present state of entomologic science, where systematic method is given precedence over the biologic, it is dangerous to attempt to make a general statement of the habits of a single genus, and impossible to generalize the habits of a group or family.

The most valuable contribution to the life history of American insects which is generally accessible is Dr. Packard's "Insects Injurious to Forest and Shade Trees."\* In his introduction, the author states that this work is purely tentative, and designed to elicit the results of the observations of students of economic entomology. It is on that account that I feel at liberty to comment upon or question certain of Dr. Packard's statements.

On page 118, *op. cit.*: *Prionus laticollis*, Drury, is noted as injurious to the poplar. If *Prionus* destroys living trees in other parts of America, it has no such destructive habit in California; in fact, the charge against borers that they destroy trees is a very old one, but by no means substantiated by my own observations. *P. Californicus* goes through its transformations in the roots of oaks, but these roots were dead in every case observed by me, and usually belonged to stumps whose trunks had been felled years before. Last year I bred several from the decayed part of an old oaken chopping block. In fact, Dr. Packard himself throws some doubt upon the destructive habit of *P. laticollis*, for in his note he quotes the report for 1872 of Prof. S. J. Smith, Entomologist to the Connecticut Board of Agriculture, as follows: "I have noticed it in logs of poplar, basswood, and oak, and in the trunks of old, decaying apple trees."

On page 137, *op. cit.*, is the following: "We have found Buprestid and Longicorn borers in a dead sweet gum tree." The caption at the head of the page, "Insects Injurious to the Sweet Gum," seems designed to lead to the inference that these borers killed the tree. But my observation is that the larvæ of insects of the two families noted feed only on dead wood.

Again, on the same page (137), *Ptilinus basalis* and *Micracis hirtella* are listed as injurious to the California bay. These species are both found in Berkeley, and I have observed their habits for the last seven years, and as a result of such observation I am in a position to assert that they bore into the twigs of the tree mentioned only when dead, dried, and decaying.

On page 71, *op. cit.*, we find a figure of *Oncideres cingulatus* in the act of girdling a hickory twig. In connection with this insect we meet with

\* U. S. Entomological Commission, Bulletin 7, Washington, 1881.

one of the most interesting and remarkable points in the whole range of insect biology. For, knowing that its larva will have to feed upon dead and sapless wood, this beetle, at the time of depositing its egg in the living and easily penetrated green wood, has instinct or forethought to girdle the twig, and thus assure the future larva the conditions necessary for its metamorphosis.

The question, "Are *Curculio* larva lignivorous?" has been partially discussed in Bulletin of the Brooklyn Entomological Society, vol. vii, p. 150, by Warren Knaus, and in *Entomologica Americana*, vol. i, p. 18, by W. H. Harrington. The question was brought up by the finding of *Wollostonia quercicola* in cottonwood logs in an advanced stage of decay. The *Curculios* are a group of insects in systematic value the equivalent to a sub-order, and known as the *Rynchophora* (Latreille), which bear certain intimate resemblance to one another in the perfect and final forms, while in their larval stage they may, and certainly do, differ in many particulars of habit. *W. quercicola* belongs to the *Calandridæ*, a family abounding in species whose habit in the larval stage is preëminently to feed on dry wood. The metamorphoses of the *Rynchophora* (Latr.) are not at all well known, but I have bred the following, belonging to this sub-order, and have found them to be lignivorous in the larval stage:

PLATYRHINUS LATIROSTRIS Fabr.—Decaying oak stumps highly charged with mycelia of a fungus.

SCOLYTUS DESTRUCTOR Oliv.—Dead sapwood of elm.

MESITIS TARDII Woll.—Decaying beech.

MONARTHURUM HUTTONI Woll.—Various hard woods.

HYLESINUS CRENATUS Fabr.—Dying ash.

ANTHRIBUS ALBINUS Lin.—Old wood.

BRACHYTARSUS SCABROSUS Fabr.—Elm bark.

RYNCOLUS—several species.—Bark of trees.

The foregoing are old world species of *Curculios* that do not affect a herbaceous diet; and the three following species are of similar habits.

#### SCOLYTIDÆ.

MONARTHURUM SCUTELLARE Lec.—Bark of dead *Quercus agrifolia*.

MONARTHURUM DENTIGERUM Lec.—Bark of dead *Quercus agrifolia*.

MICRACIS HIRTELLA Lec.—Dead branches of California laurel, *Umbellularia Californica*.

The *Brenthidæ* are well known to have the general habit of perforating trees and of depositing a single egg in each hole thus made, by this means providing that the larva shall have a full supply of the wood upon which it feeds.

The question, then, should not be: are *Curculio* larvæ lignivorous? but rather, how many have that habit? In a great group like this of *Curculios*, comprising many forms varying greatly from one another, one can easily appreciate the fact that we meet with many different tastes and habits.

Some are known to feed upon all kinds of grain in store; one finds its food in rice, another in barley, and others in maize. Many species of *Balanus* undergo their changes in nuts, the larva feeding upon the kernels; another group is to be found in *Cynips* galls; and one species, geographically distributed from San Diego to Alaska, is to be found beneath seaweed upon the shores. Enough has been instanced to show clearly that we can draw no inference from the fact that two insects are found in the same natural group, that for that reason their habits are similar; and it is evident that a classification by habits would be of little aid to the systematic entomologist.

CHRYSOMELIDÆ.

*DIABROTICA SOROR* Lec.—This is a most destructive insect to our peach orchards, and is not as yet sufficiently studied. If it resembles in habit the eastern species of the genus, and feeds in the larva stage upon the roots of cereals, it may be possible to rid ourselves in some degree of this pest by some rotation of crops. In the meanwhile sprays and washes are beyond a doubt not only useless, but in most cases a positive injury. We shall have to study further before speaking positively of the larval history of this insect pest.

PTINIDÆ.

*PTINUS INTERRUPTUS* Lec.—Black fungus of the laurel, *Umbellularia Californica*.

*PTINUS QUADRIMACULATUS* Melsh.—Decayed *Ceanothus thyrsiflorus*.

*HEDOBIA GRANOSA* Lec.—Dead branches of *Umbellularia Californica*.

*HADOBREGMUS GIBBICOLLIS* Lec.—Decaying wood of *Myrica Californica* and dead willow.

*VRILLETTA CONVEXA* Lec.—Dead *Quercus agrifolia*.

*PTILINUS BASALIS* Lec.—Dead twigs of *Umbellularia Californica*.

*SINOXYLON DECLIVE* Lec.—Any dead tree or unpainted wood, very partial to wine casks and oak barrels. The depredations are done by the beetle while boring for a suitable place to deposit its eggs. Its burrow is straight across the grain of the wood, reaching the interior of the cask, causing waste and deterioration of the contents. Hot solution of alum applied to the outside of the casks will prevent boring.

*POLYCAON STOUTII* Lec.—Dead and dried willow.

*POLYCAON CONFERTUS* Lec.—Found boring into a slab of chestnut oak that had been deposited for years in the museum of the University of California; also bred from the stem of dead apricot trees that had been grafted on a peach root.

There appears strong evidence that these trees were not destroyed by the borer, but through the influence of the "black knot" on the roots, they being diseased with knobs as large as a man's fist on every root; while all the trees killed had the root diseased, only a portion was infested with the larvæ of this beetle.

During July, while on a visit to the Napa Valley, I saw a lot of roots and stems of grapevines that had been grubbed the year before. These were old vines, and had been discarded on account of splitting of the main stem. On examination these were found to contain both the worm and

the beetle forms of *Polycaon confertus*, showing that the metamorphosis takes place in dead wood.

Many similar observations made by myself and others go to show that in the larval stage this insect is xylophagous. On the other hand, there is indisputable proof that the beetle infests living trees by entering the twigs at the axils of the leaves.

*LYCTUS STRIATUS* Melsh.—Devastates furniture made of California laurel, *Umbellularia Californica*. Dr. Packard, *op. cit.* p. 75, quotes Dr. LeConte as saying that it affects the trunks and branches of *Carya tomentosa*. This is not borne out by my observations, as I am well satisfied that the larva lives in dead and dry wood.

#### SCARABÆIDÆ.

*POLYPHYLLA DECEMLINEATA* Say.—Larva that produced this species was found in the earth from one to two feet from the surface, among root fibers of a coarse grass and roots of a California laurel, *Umbellularia Californica*. The earth was sandy loam situated upon the banks of a river, and which is overflowed during the rainy season of the year.

*ODONTAEUS OBESUS* Lec.—This has a light chestnut larva with tufts of bristles surrounding each spiracle. Mandibular and clypeal portions well developed, redder in color, and thicker in texture than any other part. The legs are prominent. Feed upon rootlets of *Umbellularia Californica*. It is much infested with a small, pale-colored mite, which is evidently parasitic on the species.

#### LUCANIDÆ.

*PLATYCERUS OREGONENSIS* (Westwood).—Dead trees of *Photinia arbutifolia*, *Umbellularia Californica*, *Quercus agrifolia*, and *Eucalyptus*.

*PLATYCERUS AGASSII* Lec.—Decayed trees of *Arbutus Menziesii*; also in wood too much decayed to be identified.

*SINODENDRON RUGOSUM* Mann.—Decayed oak, *Quercus agrifolia*.

The five hundred and twenty-two North American species of *Cerambycidæ* are all borers; the insect deposits its egg in a hole perforated in the wood, and the larva penetrates further and further according to a rhythmic order peculiar to the species until its metamorphoses are completed. The following is a list of the Californian species whose habits I have observed:

#### CERAMBYCIDÆ.

*ERGATES SPICULATUS* Lec.—Rotting coniferous trees. Bred from *Sequoia sempervirens*, *Pinus insignis*, *Abies Douglasii*, etc.

*PRIONUS CALIFORNICUS* Mots.—Bred from rotten damp roots of *Quercus agrifolia*.

*ASEMUM NITIDUM* Lec.—Decayed *Pinus insignis*.

*HYLOTRUPES LIGNEUS* Fab.—Dead trees of *Libocedrus decurrens*.

*ELAPHIDION IMBELLE* Lec.—Bred from decayed oak near San Diego, Cal., by F. E. Blaisdell.

*HOLOPLEURA HELENA* Lec.—Dead twigs of *Umbellularia Californica*.

ROSALIA FUNEBRIS Mots.—Decaying Umbellularia Californica among the mycelia of some fungus.

XYLOTRICHUS NAUTICUS Mann.—Dead sapwood of the oak, Quercus agrifolia.

XYLOTRECHUS OBLITERATUS Lec., insignis F.—Dead branches of willow.

NECYDALIS LÆVICOLLIS Lec.—Decayed oak, Quercus agrifolia, and in dead Eucalyptus globulus.

LEPTURA LÆTA Lec.—Dead Quercus agrifolia and Quercus sp.

LEPTURA GRASSIPES Lec.—Decayed wood of Umbellularia Californica.

SYNAPHÆTA GUEXI Lec.—Dead limbs of California buckeye, Æsculus Californica.

POGONOCHERUS CRINITUS Lec.—Dead branches of Quercus agrifolia.

#### TROGOSITIDÆ.

TROGOSITA VIRESCENS Fab.—Dead Libocedrus and several kinds of oak.

#### CLERIDÆ.

THANASIMUS EXIMIUS Mann.—Dead twigs of Umbellularia Californica.

#### MELANDRYIDÆ.

DIRCÆA RIVERSII Lec.—Larva feeds in decaying trees of Madrona, Arbutus Menziesii. In trees in position the insect is found in the primary forks of the roots, and in prostrate logs among the more seasoned fibers of the wood.

#### LAMPYRIDÆ.

Among many entomological enigmas of long standing is one that is about being solved. From time to time in many parts of the United States, large luminous larvæ of some Coleopteron have been found, and it has been conjectured that these larvæ belong to some of the Elateridæ, the general supposition being that they were larvæ of the genus Melanactes. Every attempt at breeding them resulted in failure because their natural food was unknown. I have recently found what their food consists of. Before making this discovery I had arrived, from a careful study of the anatomy of the mouth parts of these larvæ, at the conclusion now confirmed, that they are carnivorous in habit.

Their food consists of the vegetable feeding Myriapoda, particularly of Julus and Polydesmus, with a preference for Julus, because the large area of the rings of this genus affords space for the larva to penetrate the interior of the Myriapod. Its manner of feeding is to seize the hinder part of the Julus, and perforate a segment, reaching the soft inner parts, which it devours at leisure, creeping through many segments without disjoining them, and remaining inside these rings for days at a time, till one can see little else but the slowly wriggling form of the dying Julus.

I have a full fed larva, which I hope will go through its metamorphosis, and solve the problem. And now its mode of life is made known, other persons who are equally anxious with myself that nature shall yield this

long kept secret, can apply themselves with renewed energy to the task of discovering the identity of the perfect insect.

This luminous larva has proved to be the form of the female in a *Lampyrid* beetle, better known as *Zarhipis Riversi* Horn. Or if not a perfectly metamorphosed female, possesses the powers of that sex to produce ova and attract the male. The grub or larva had fed all winter, and in March sloughed its skin and remained motionless, coiled in a cell of earth, for three weeks, and kept a uniform pale-cream color without luminosity, but gradually the center of the dorsal plates became darker, and in the ratio of coloring so was the reappearance of the phosphorescent light; when fully restored in strength it became very active and strongly luminous, but it did not eat. In about a week it disappeared beneath the earth, and remained out of sight for nearly a month, and thinking it had changed into the pupa state I disturbed it, and found no change to have taken place. I returned it to the jar, placing the coiled insect upon the top of the earth, where it lay motionless for two days. On the morning of the third day I found it had sloughed another skin, but this time a very thin covering of uniform pale brown, and the insect itself had disappeared into the earth. This last dormant stage seems to represent its pupa state. I unearthed it again and found it very soon afterwards to assume great activity and bright luminosity, but it would take none of the usual food. Taking the jar which contained this insect into the open air for the purpose of supplying it with fresh earth, and while doing so, several male specimens came flying around the jar, and one example dropped swiftly upon what had been supposed to be the larval form. The male soon attempted copulation. The attraction of the female was perfect, and by it I captured eleven males. The eleven males attracted were not all of the form known as *Z. Riversi* Horn, some represent the *Z. piciventris* Lec., and these facts will cause a revision of the genus, and the four species will be reduced one under the name of *Zarhipis integripennis* Lec.

#### Description of a form of the female:

Apterous, vermiform, segmented, retractile, phosphorescent. Number of joints, exclusive of the head, twelve. Legs, six; two on each of the three anterior segments, or on those portions underneath representing the pro, meso, and metasternum. Length, when extended in walking, two and a quarter inches; and the width, across the widest part, five sixteenths of an inch.

Head, corneous, shining black, and not well defined, and when at rest, hidden beneath the anterior segment. The prominent character of the head consists of a pair of curved, hook-like mandibles, like those of the male. Antennæ, short, straight, four-jointed; the apical joint bristle-like, and growing from the side, at the end of the previous joint, which is the largest, and tubular in form.

Maxillary palpi, five-jointed, four being nearly equal and bead-like.

Labial palpi appear two-jointed. The antennæ and palpi being short, stand stiffly out from their base.

Dorsal surface consists of twelve thin corneous plates, the three anterior being narrowed in front, and all having an impressed line through the longitudinal center. The plates are shining, blackish brown, marginal transversely with transparent olive green, and upon the side margins with opaque pale-yellow, interspersed with olive, which colors intermixed obtain upon the sides and under parts generally.

Spiracles upon the sides of the fourth to the eleventh segments, inclusive, and just below the spiracles on the same segments is a double fold, form-

ing a broken lateral ridge. The other segments bear but a single fold and no spiracles.

The thoracic region bearing the legs exhibits indistinct sutures and folds presenting but a faint resemblance to analogous parts in other Coleoptera, and yet is strongly of the Lampyrid type.

Legs of the Lampyrid type, four-jointed, and, like females of the group, have a short obtuse tarsal claw.

This is a handsome insect when living, and is the most brilliant "glow-worm" known. The light appears most intense on the cross margins of the dorsal plates, but the luminosity is also strong on all the margins, as well as along the lateral edges. Sometimes the insect appears checkered by being banded with phosphorescence.

There are some more facts to learn about this peculiar insect. Why the larva should be luminous, and yet have nothing to attract; and why the adult female should be luminous, while the male is not nocturnal, but roams in the sunlight. The habit of the male is to appear on the wing, in temperate heat, from 9 A. M. to 4 P. M., but during the hottest weather it does not appear until the sun is declining.

Perhaps there is yet to be discovered another form of the female, without luminosity, and perhaps more perfect in its parts, and non-luminous.

Some more questions are: What are the differences in the larval form of the sexes, or, are there any larval differences of the sexes? The answers to these queries will only come after observations; but the answer to the one concerning the luminous character may give way to theory, and it may be suggested that the luminous quality is inherited, and though without use in this species because of the diurnal habit, yet may be a derived character that is only of use when the habit of the insect is nocturnal. But it must be considered that the plumose antennæ of the male would indicate that it seeks its mate by scent.

This species is in no sense an injurious insect, but, on the contrary, may be considered as beneficial to agriculture, having an entirely carnivorous habit.

## A NEW SPECIES OF CALIFORNIAN COLEOPTERA.

By J. J. RIVERS, Curator of Museum, University of California.

### BRADYCINETUS, HORN.

#### *Bradycinetus Hornii*, n. sp.



Male.

Male: Form, robust, elliptical. Color, ferruginous brown, shining; head, tips of armature, margins of prothorax, and a spot near the outer margin of prothorax, either dusky or black. Head: Clypeus transverse and feebly angulate at the sides, the front edge rising increasingly backward, until just before reaching the clypeal suture it ends in a well formed tubercle on either side; behind the sutural line on the vertex is a



Head.

very prominent, stout, conical horn; three fourths of the lower portion of the horn and the whole of the frontal area finely rugose. Antennæ: funicle shining, chestnut; club paler, not shining. Thorax: subtriangular,

deepest longitudinally through the center; noticeably wider than the elytra at their juncture, and rather wider than their greatest breadth; seen from above the front margin appears truncate in the middle, then trends obliquely forward to the angles which are prominent; sides straight for a short distance, posterior angles strongly rounded; posterior margin much extended in the middle with distinct sinuations toward the angles. The front area deeply concave, surmounted with four well formed tubercles; two occupying the center, bold and projecting over the concavity, two others, one on either side of the central two situated near the anterior margin of the thorax at its exterior angles. The area around the two anterior tubercles very rugosely punctate; and transversely across the disc are large distinct punctures nowhere extending to the posterior margin. A well defined margin, reflexed at the sides, surrounds the whole. Elytra: very convex, obtusely rounded behind, having fourteen well defined and regularly punctured striae, the interstices of which are flattened and indistinctly wrinkled. The under side paler than the upper; dense fringes of light chestnut hair line the reflexed portion of the thorax and elytra, while the femora, tibia, and tarsal joints, as well as the lower side generally, are well supplied with rather long chestnut hair. Length .48-.52 inch.



Female.

Female: Form and color as in male. Labrum projecting, rugose, covering the mandibles. Head: clypeal margin raised; a feeble tubercle just in front of the clypeal suture, immediately behind which is a central transverse ridge, undivided, slightly higher in the middle and slightly apiculate at either end. Antennæ less robust than in the male. Thorax: very convex, shining; outline obtusely triangular; anterior margin seen from above, truncate in the center; angles produced; sides rounded; posterior margin much produced to meet the scutellum, sinuate toward the angles which are rounded; the front discal area characterized by a bi-lobed transverse raised line, at either end of which, outward and forward, is a well formed but depressed tubercle; behind which line the disc is dense with coarse corrugated punctures, which become scattered and plain, nowhere reaching the posterior margin, but taking a transverse course, barely reach the side margins, where they become less distinct. Elytra: much the same as in the male, but the interstices of the fourteen punctate striae a trifle more wrinkled and much more convex. Length, smaller than the male.

Habitat: burrowing in the ground near the City of Sonora, Tuolumne County, California; found also in Sacramento County.

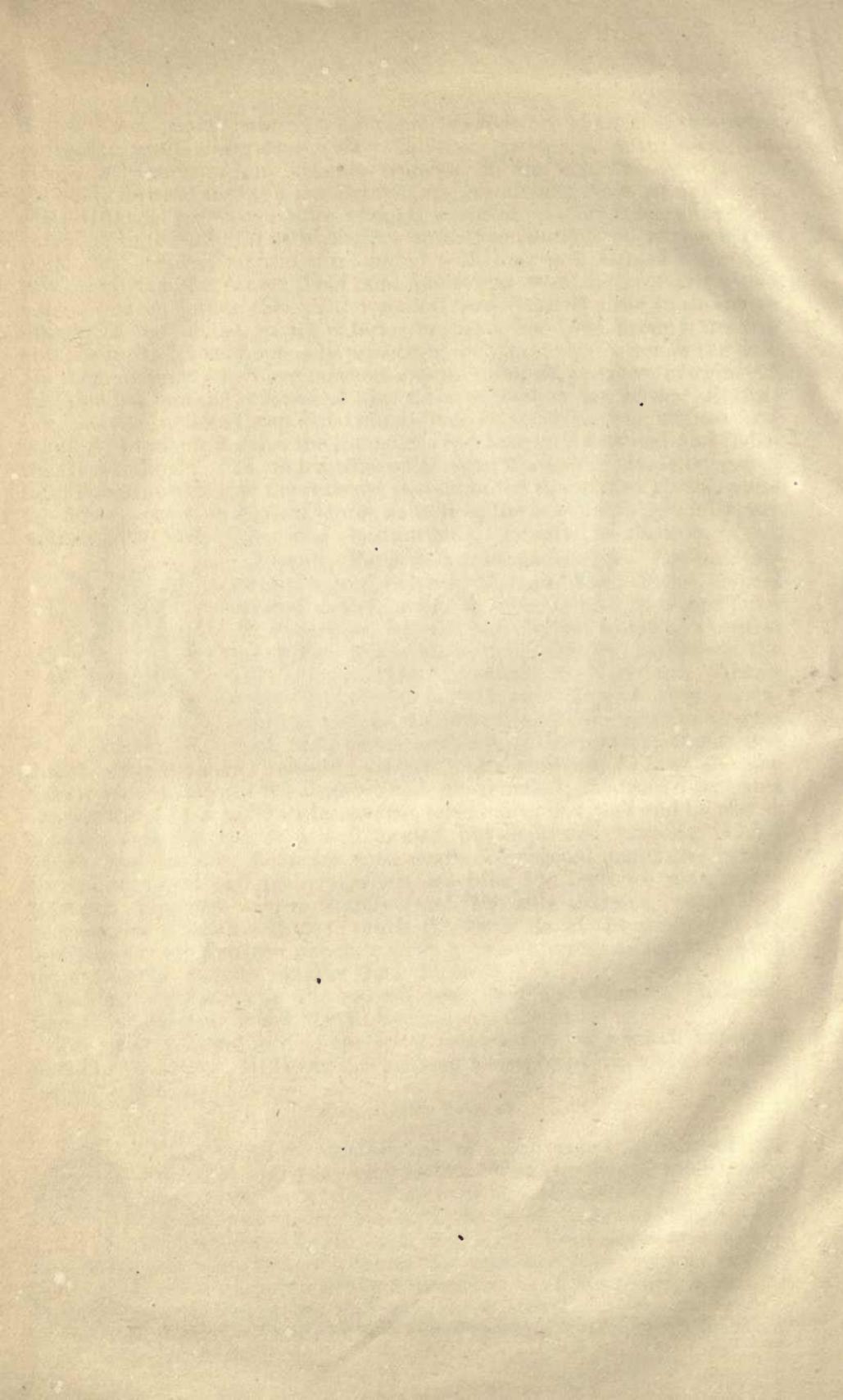
The name selected for this species is intended to be a small tribute of honor to Dr. George H. Horn, the eminent Coleopterist, as a slight return for many favors.

#### STRIDULATING ORGANS.



The sound of stridulating was first heard by Mr. Charles Fuchs, of Alameda, who, having living specimens, made examinations for the source of the sounds, and was rewarded by finding the stridulating apparatus to be three bands situated one each upon the fourth, fifth, and sixth dorsal segments, are well developed, and when magnified show that these bands are set with bristles in diagonal rows, the points of the bristles are bent downward, which, by the quick contraction of the abdomen, these hooked bristles are brought in repeated contact with the edge of the elytra and thus causing the vibrations known as stridulating.











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