FOSSIL ARTHROPODS OF CALIFORNIA
NO. 18. THE TENEBRIONIDÆ – TENTYRIINÆ OF THE ASPHALT DEPOSITS

By W. DWIGHT PIERCE

PLATES 8 AND 9

Among the first insects reported from the Rancho La Brea Pits, a Pleistocene deposit at Los Angeles, California, were the Tenebrionidæ, of which 14 species were reported by Grinnell (1908) and Essig (1931). Their lists included one *Nyctoporis*, one *Eulabis*, seven *Eleodes*, four *Coniontis*, and one *Cratidus*, a total of five genera. Recent studies by the writer have so greatly expanded this list and there is so much of interest to record that I propose to divide the report on the family into four or more papers, treating a subfamily at a time.

The findings from all asphalt deposits will be discussed. At present these are as follows: Rancho La Brea Pits: Academy, 2, 4, 9, 10, 16, 28, 36, 37,. 51, 81, as well as material for which no exact Pit data are available (previously reported as Bliss '29, and Pit X); McKittrick sites 3, 4, 10; and Sulphur Mountain. No Carpinteria specimens have come to hand. "Bliss '29" refers to material collected by Mr. Wesley Bliss in the year 1929, largely from Pit B, but including A and C; "Pit X" is mixed material lacking data and will be referred to as Pit (?).

The Tenebrionidæ were better preserved than the insects of other families, probably because of their thicker chitin, and also because of the cylindrical nature of the head (Pl. 9, fig. 6), prothorax (Pl. 9, figs. 10, 11), and the posterior part of the body. Being wingless the elytra are in many of them connate with the sternites to form a strong cylinder (Pl. 8, fig. 5).

An interesting result of this is that these three body parts acted as capsules, into which the liquid asphalt and its solid contents flowed and packed. Many of the finest tiny mammal, bird, and reptile bones, and plant seeds, have been washed out of the heads, thoraces, and posterior halves of the Tenebrionidæ. Likewise, these capsules contained tiny elytra, heads, etc. of other insects. Each Tenebroinid fragment has to be soaked in xylol, and then, with the aid of fine needles, under a binocular, the contents are removed. It is a delicate task.

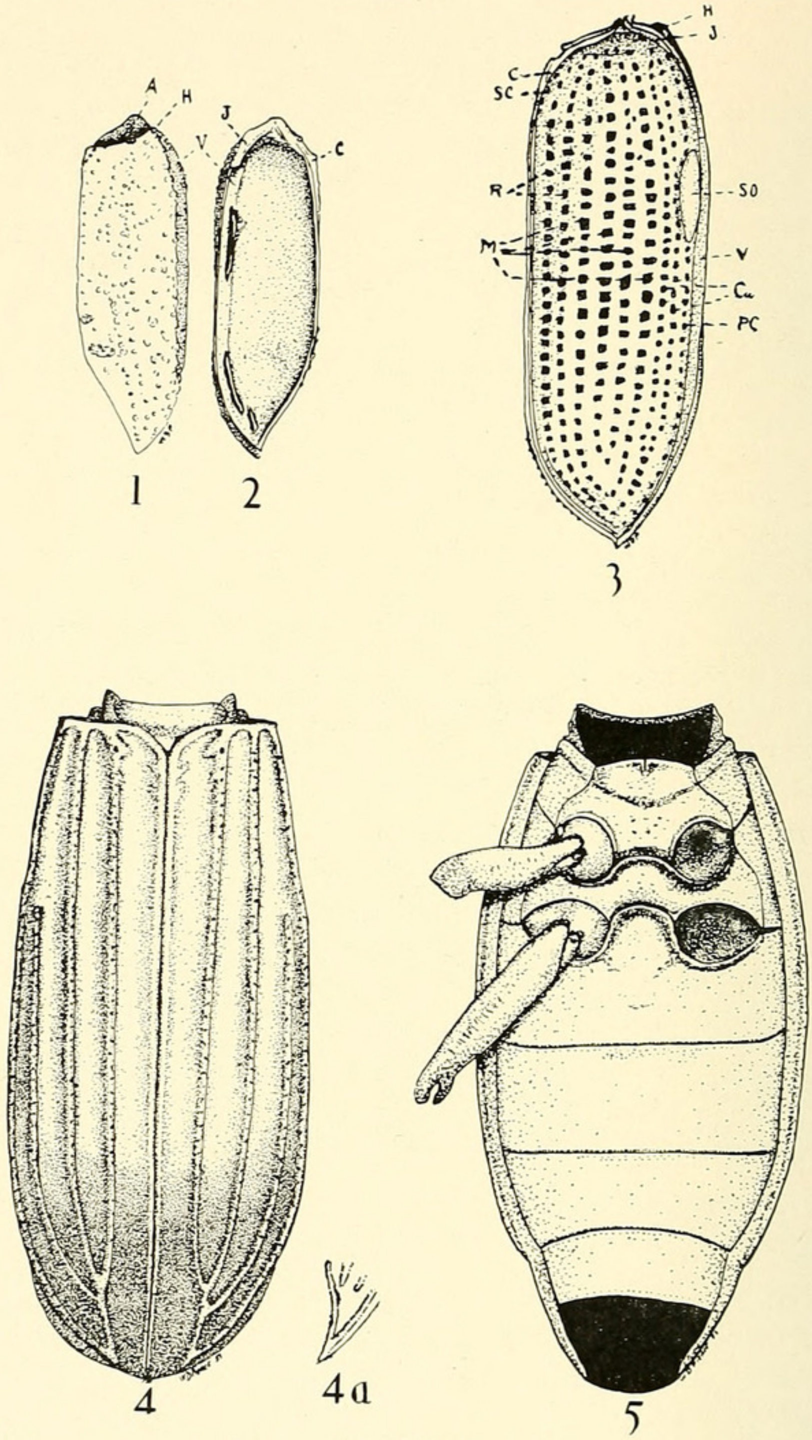


PLATE 8

Fig. 1. *Phloeodes pustulosus,* dorsum of right elytron. Length 12.2 mm. *A*—axillary region, *H*—Humerus, *V*—Vannus.

Fig. 2. *Phloeodes pustulosus,* inside of right elytron, showing scrapers. *C*—Costa, *J*—Jugum.

Fig. 3. *Nyctoporis carinata,* inside of right elytron. Length 9.5 mm.; width 3.2 mm. *C*—Costa, *Cu*—Cubitus, *H*—Humerus, *J*—Jugum, *M*—Media, *PC*—Postcubitus, *R*—Radius, *SC*—Subcosta, *SO*—Sound organ, *V*—Vannus.

Fig. 4. *Parasida mckittricki,* elytral pair with scutellum (McK38al). Length 11.5 mm., width 5.5 mm. 4a. Same, variation in ends of carinae in McK38a2.

Fig. 5. *Parasida mckittricki,* underside of posterior half, except last abdominal segment.

Tenebrionidæ break into fewer fragments than other beetles, because of this welding of the skeletal plates. They are therefore more easily compared with modern insects. The fragments recovered are so close to the modern insects, that I see no reason for erecting new species for most of them. Where there is a reasonable doubt, I have used varietal names to designate the fossil material.

The species found are characteristic inhabitants under stones or bark; in rotten wood; and in dry places; and some of them are associates of ants. Fortunately we have also the fragments of at least one species of host ant.

Strangely, at the present state of my studies, the Tenebrionidæ of the McKittrick asphalt are very scarce, while they are among the commonest of the findings in the La Brea Pits.

MORPHOLOGICAL CONSIDERATIONS

Just as in the other groups of insects previously discussed in this series of articles, one of the most important results of the study of insect fragments is the light thrown upon insect anatomy and morphology.

The early conclusion (Bull. So. Calif. Acad. Sci. 43(1):5-6) that beetle elytra, having migrated from lateral to dorsal attachment, are upside down, so that the Costal margin is sutural (Pl. 8, fig. 3), and the Vannal area forms the epipleuron, with the Jugum a small zone underneath the Humeral area, has been corroborated in this material (Pl. 8, figs. 2, 3). In the Tentyriinæ, the elytron shows no definite striation in *Phloeodes* (Pl. 8, fig. 1), but in *Nyctoporis* and *Parasida* there is a definite strial pattern (Pl. 8, figs. 3, 4). The same case will be demonstrated in the other subfamilies.

When the Tenebrionid head breaks up, all parts in front of the epistomal-pleurostomal-hypostomal suture are dropped, leaving the head as a cylinder, with the basal postoccipital ring, and the heavier occipital-frontal-genal-gular ring, containing eyes and antennæ.

Of the deciduous pieces, mandibles have been recovered. In this paper the mandibles of *Nyctoporis* are described (Pl. 9, figs. 1-4); and in a later paper those of *Coniontis* of the Coniontidinæ will be described. There is very little mention in textbook literature of the fact that in some insects the mandibles have retained the lobe, which Packard calls **lacinia**, and Macgillivray **prostheca.** This corresponds to the lacinia of the mandibles of lower arthropods. In the species studied it is of a different texture from the rest of the mandle, and seems to serve as a soft pad between the mandibles, above the mola.

The form of the gula is very important in the Tenebrionidæ, but in the subfamily Tentyriinæ, under consideration, only that of *Nyctoporis* is here considered (Pl. 9, fig. 6).

A new elytral character has been found in *Phloeodes, Nyctoporis,* and *Coniontis,* which is at least connected with the respiratory system, and I believe has the value of a sound organ, even though it may be ultrasonic to us. When the elytra are raised and lowered, as is the custom of these insects, the natural effect will be opening and closing of the spiracular valves. There are two types of these devices at the edge of the Vannus or epipleuron in the Postcubital area on the under side of the elytra, directly above the marginal edge of the first, or first and second abdominal segments, hence opposite the first, or first and second abdominal spiracles. Type I is a soft pad or elongate inflation, which occurs in *Nyctoporis* (Pl. 8, fig. 3), and *Coniontis* of the Tenebrionidæ; *Donacia flavipes* of Chrysomelidæ; and *Nicobium hirtum* of Anobiidæ. Type II is a sharp ridge, which I have found in *Phloeodes* (Pl. 8, fig. 2) of the Tenebrionidæ, and *Heterocerus* of the Heteroceridæ. The finding of this organ in the fossil fragments, has led to its discovery in living species.

A character of great diagnostic value in the Tenebrionidæ is the presence or absence of a mesothoracic trochantin. This is present in the Tentyriinæ, and is shown in the drawings of *Nyctoporis* (Pl. 9, fig. 12), and *Parasida* (Pl. 8, fig. 5).

The sterno-pleural suture of prothorax is almost entirely erased in *Nyctoporis* (Pl. 9, fig. 10). The meso- and meta-thoracic episternum and epimeron are united in *Nyctoporis* (Pl. 9, fig. 12), and *Parasida* (Pl. 8, fig. 5), the only suture being the separation of mesothorax and metathorax.

Internally, the mesocoxal pocket has two openings in *Nyctoporis* (Pl. 9, fig. 13), but only one in *Coniontis,* to be treated later. The metasternal apodeme is very different in the two genera.

It is because of these interesting findings, and the almost complete absence of descriptions or drawings of the comparative morphology of the Tenebrionidæ, that I have prepared drawings and rather complete morphological descriptions to accompany the recording of species in this report.

RECORD OF SPECIES:
SUBFAMILY TENTYRIINÆ – TRIBE NOSODERMINI

1. **Phloeodes pustulosus Le Conte** (Pl. 8, figs 1, 2)

This interesting beetle is represented by three elytra labelled Spec. C 145, from Rancho La Brea, Pit A (LACMIP 88). The beetles today occur under live oak bark, and in decaying stumps, and the adults feed upon the large fungi on the oak. Since live oaks were present around the pits in the Pleistocene, and many leaves and acorns have been found in the asphalt, the presence of this insect is natural.

The elytra measure 12.2 mm. in length. One elytron has been sketchily drawn to show the essential characters. The three basic or axillary pieces are united in a flat triangular projection, and there is a vertical concave pocket to fit against the pronotum. The elytra taper at both ends, and are very roughly tuberculate. The tubercles do not perfectly define the striæ, because of their irregular size and position, clusters of small tubercles sometimes rising on larger ones. However, the areas of the elytron are definable. On the anterior margin of the vertical basal pocket at the sutural angle, a few small tubercles are arranged triangularly marking off the subcostal area. Near this a small marginal tubercle marks the root of Radius; at two-thirds the distance from suture to Humerus there is a clump of tubercles enclosing a pit, to define the root of Media; and from the Humerus the rows of tubercles represent the Cubitus and Postcubitus. There is no sharp edge to separate Vannus. It is rather a rounded edge from Humerus, outlined irregularly by tubercles. The vertical Vannal or epipleural area has small inconspicuous tubercles arranged in strial formation as a short and a long stria.

On the inside, the Costa forms the sutural edge; the Vannal Fold is clearly defined by a sharp line; the Jugum is a short, raised rib at base, with the Humerus at its middle. The parchment-like smooth inner lining shows the fine strial punctures, but they are not well defined. There is before the middle in the Vannal vertical zone, a short longitudinal ridge making a pocket into which the abdominal sternites fit. This is in the same position as the pad to be described for *Nyctoporis*, opposite the first and second abdominal spiracles. For this reason I assume that it is either for closing the respiratory system, for the locking of the elytra, or for production of sound. Beyond this in the posterior quarter is another sharp ridge, broken into two parts. Rapid raising and closing of the elytra could by means of these ridges produce a vibratory sound.

2. **Noserus corrosus Casey** (Pl. 9, figs. 8, 9)

This species is represented by one prothorax and the tip of an elytron from Pit A (LACMIP 88), Rancho La Brea, labelled Spec. C-160, sorted out by the writer. Modern insects of this genus, like those of Phloeodes, are also found under the bark of trees.

I have illustrated the pronotum from above and beneath. It becomes evident that the prothorax separates into notum and sternum. The length is 5 mm. Although the dorsal tuberculation falls into somewhat of a pattern, there are no visible sutural lines, but internally there is a definite transverse notal ridge to limit presecutum, and posteriorly another scutoscutellar ridge to limit scutellum.

TRIBE NYCTOPORINI

3. **Nyctoporis carinata LeConte** (Pl. 8, fig. 3; Pl. 9, figs. 5-7, 10-13)

This species, first reported by Essig, is a common species from the Rancho La Brea asphalt, being represented from Pits 9 (LACMIP 288), 81 (LACMIP 89), A (LACMIP 88), B (LACMIP 285) and from the "Bliss '29" (LACMIP 277), and other miscellaneous material (Pit ?) (LACMIP 287), as follows (all recorded as Species C 16): Pit 9 – 1 pair of elytra with thoracic and abdominal sterna, 2 prothoraces, 3 elytra; Pit 81 – 2 heads, 1 prothorax, 2 elytra; Pit A – 4 heads, 45 prothoraces, 28 pairs of elytra, 1 thoracic sternite, 9 abdominal sterna, and 106 separate elytra; Pit B – 7 prothoraces, 1 pair of elytra, 4 abdominal sterna; Bliss '29 – 7 prothoraces, 5 pairs of elytra, 19 separate elytra, 5 abdominal sterna; Pit ? – 12 prothoraces, 3 pairs of elytra, 17 separate elytra; making a minimum total insects, 9-2, 81-2, A-81, B-7, Bliss-15, ?-12, total 112 beetles. This species commonly occurs under bark, logs and debris.

A characteristic in the breaking up of this species is that the head capsule, and the prothorax remain as complete units, the pair of elytra often remain locked by the scutellum; but the meso- and meta-thoracic sternites, the first three abdominal sternites, and the last two abdominal sternites, each form separate pieces.

Details of structure. Head (Pl. 9, figs. 5, 6, 7) a cylindrical capsule, without any distinct sutures, but the various areas are defined by sculpture. Frons apically limited by coronal ridge, which longitudinally divides the vertex, and anteriorly, by the epistomal suture. Parietals separated from vertex by somewhat oblique ridges, beginning just at the inner edge of the eyes. Eyes transverse, set in behind the parietal plate, somewhat crescent or kidney-shape, dorsal and lateral. Vertex and frons strongly, coarsely pitted. Occiput fits into prothorax and is more finely, closely punctuate. Laterally, parietal plates and genal lobes form a pocket for antennal attachment. Ventrally, the genal-submental area is completely without sutural marking, but a fine line separating different sculpture sets off the postgenal and gular areas. The broad gula with different sculpture is partially defined by curving gular-postgenal sutures arising from the basic postoccipital ring. These sutures are called postoccipital by Snodgrass (1935. Principles of Insect Morphology, p. 125), but I prefer to call them gular-postgenal sutures. In the other species, considered hereafter, the tentorial pits are on these gular-postgenal sutures, but in this species they are not evident.

The mandibles are of interest (Pl. 9, figs. 1-4), primarily because of the definite presence of a hairy lacinial lobe between the molar plate and dentes. There are few textbooks which define the parts of an insect mandible, but the general opinion is that the mandibles were originally appendages of the same order as the maxillæ, with cardo, stipes, palpus, galea, and lacinia. The basic parts have become amalgamated, and the palpus has been lost, but the galea forms the main cutting portion, terminated by the incisor or incisors. There are two condylar attachments: the anterior at the basal angle of clypeus is called the epicondyle, or preartis; the posterior, or primary attachment is called the hypocondyle, or postartis. The outer or lateral face of the mandible is called the scrobe; the inner or chewing face may be called the molar face. This face has at its base a flattened molar plate, beyond which is the lacinial lobe, in this case a soft hairy lobe, limited by the dentes or inner tooth, beyond which are the incisors, which are the extensions of the two edges of the scrobe. The dorsal face of the mandible is more convex, the inner or ventral face, more or less concave. The hypocondyle is of the ball type on the side of a rounded lobe. In the specimens drawn only the base of the lacinia was present on the left mandible, but it was complete on the right mandible.

Prothorax (Pl. 9, figs. 10, 11) in one piece, although it can separate, dorsum from venter on the lateral margins. The majority of prothoraces found are entire. Dorsum undifferentiated into parts, except that the infolded posterior area may be interpreted as scutellum. In this case it is mainly represented laterally by two triangles. Ventrally, the sternum is all united in the anterior half. Pleural suture only extends a short distance from coxa, but is continued by a smooth punctureless strip, thus defining basisternite. This extends posteriorly between the coxæ as the posterior process, which is raised, lobate in form, but broadened basally. From a posterior view it is apparent that the sternal apodeme arises at the base of this lobe, so we must interpret that there is no sternellum. The coxæ are ventrally enclosed by basisternum and postcoxale. Viewed internally, the postcoxale forms a bridge across the coxa, which is visible between the curve of the sternal apodeme and the inner part of postcoxale. The sternal apodeme is in the form of a furca, with two lateral arms, which contact the pleural apodemes.

Elytra connate, locked by a transverse scutellum. Length of elytral pairs based on 36 specimens ranged from 7.3 to 9.1 mm., mean 8.1 mm.; width 4.1 to 5.2 mm., mean 4.63 mm. Elucidation of the striation would be difficult from the dorsum only, but the strial punctures are represented on the inner side (Pl. 8, fig. 3) by rows of punctures, sometimes surrounded by black dots, which make it possible to completely correlate with the striation in other genera, such as *Apsena* (to be treated in the next paper). There are nine rows of dots in addition to the short subcosta; these are then Radius 1 and 2; Media 1, 2, 3, 4; Cubitus 1, 2; and Postcubitus. Vannus is smooth. On this underside, the margin of Vannus intrudes upon Postcubitus in an elliptical raised area of different texture. In measurement this organ is 1 mm. long, and 0.3 mm. wide, and in most cases is of a different color (reddish brown) from the light tan color of the remainder of the inner lining. This organ is directly above the sharp edge of the sides of base of abdomen. I suspect that it is a sound organ. In examination of a modern specimen it is found that the first abdominal spiracle lies next to this marginal plate, and hence we would expect that when the elytra are lifted the plate could vibrate, or at least the release could effect an expulsion of air from the spiracle. Externally, the elytra are brokenly or nodularly carinate, with three carinæ dorsal and two lateral in addition to the sharper vannal fold, which separates Vannus from Remigium. The true striæ are indicated by rows of small elongate punctures; the interspaces by rows of nodules, which are alternately low and sparse, or high and close. Thus the basal triangular area is Subcostal, set off by a row of low nodules, which continue along the entire Costal or sutural margin. The two Radial striæ are separated by an interspace row of sparsely set nodules; and separated from the Medial area by the first high ridge. Medial area is broken into two longitudinal areas by a high ridge separating Media 2 from 3. Rising from the Humerus is the Mediacubital ridge, the Cubito-Postcubital ridge, and the Vannal Suture. The Cubital area contains two striæ, and the Postcubital one. The Vannal striæ are rather confused. A basal infold probably represents the Jugal area.

The meso-metathoracic sterna separate as a distinct piece (Pl. 9, figs. 12, 13). Mesothorax has a small basic smooth area with median process, which may be interpreted as presternum. The only sutures present are the sterno-pleural sutures extending diagonally from base to the edge of the trochantin. The basisternal intercoxal process is broad, meeting the anterior process of metasternum at the middle of the coxæ. From an external view, the mesocoxæ are open behind, but from Figure 13 it can be seen that the coxæ are enclosed in apodemal pockets with two openings, formed by the infolded postcoxale, the pleural apodeme and the sternal furca. Metasternum is also separated from its pleura by longitudinal sutures, and is medianly divided in its posterior half by a furcal suture. Internally the sternal apodeme arises at base between the coxæ and is two-forked. The metacoxæ fit into a socket formed by the first abdominal.

These are the only parts of this insect so far recovered.

TRIBE ASIDINI

4. **Parasida mckittricki** new species

(Pl. 8, figs. 4, 5)

TYPE. Posterior half of body, with meso- and metathoracic femora and tibiæ of one side, L. A. Co. Mus. No. S9058 from McKittrick Pleistocene, site 4 (LACMIP 260), depth 4 feet, collected August 10, 1947, by Leonard Bessom, labelled McK. 38al.

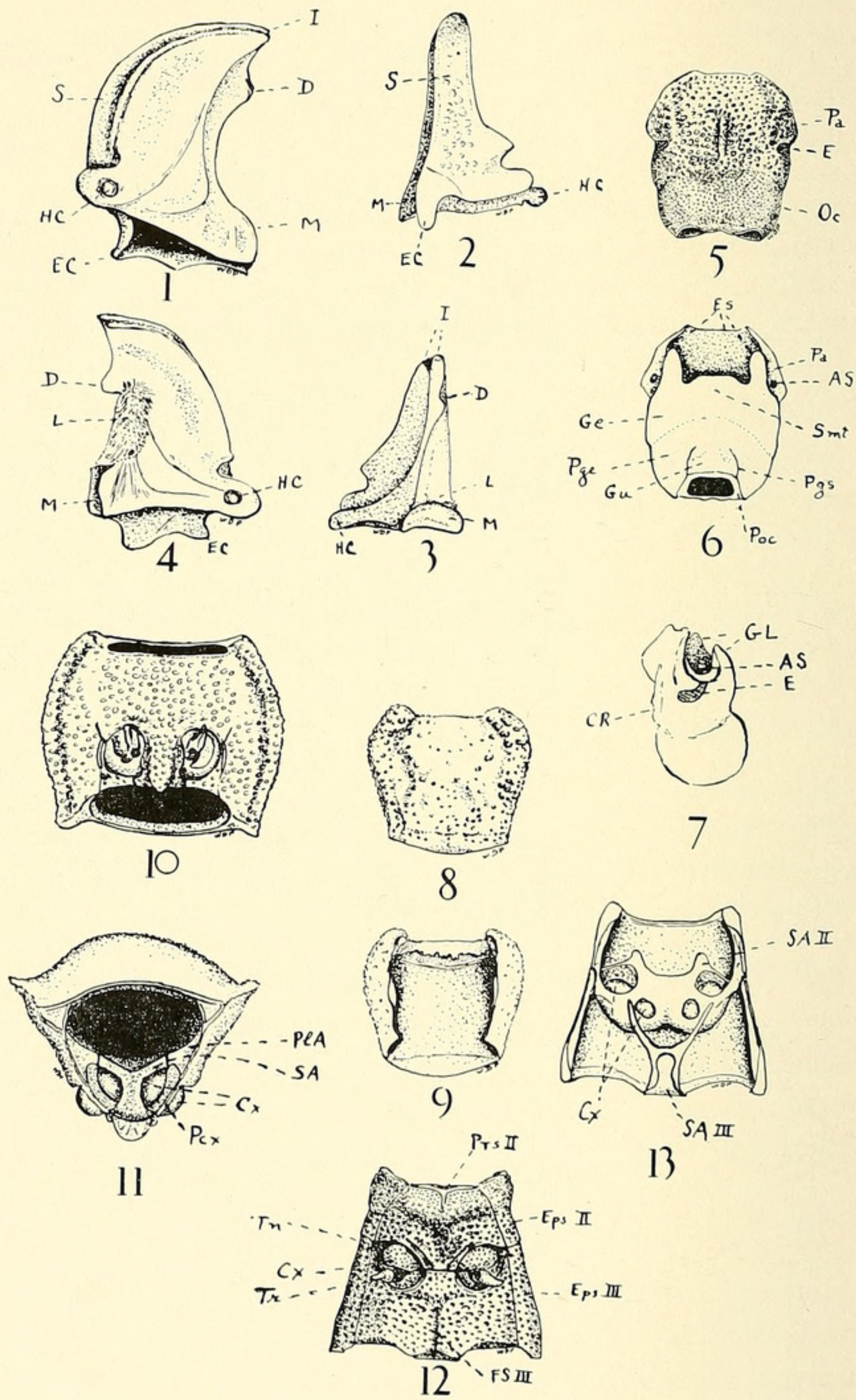
Paratypes. One posterior half (McK 38a2), L. A. Co. Mus. No. S9059, from site 4, McKittrick Pleistocene. Four elytral fragments (McK 38b), L. A. Co. Mus. No. S9060 from McKittrick Pleistocene, site 3 (LACMIP 260), collected September 30, 1945, by Dwight Pierce. Sites 3 and 4 were later found to be only three feet apart.

The species differs not only in being more elongate than any of the described species, but also in the carination, from the two species described from Arizona and New Mexico. The genus has never been recorded from California, although *P. sexcostata* LeConte is described from Baja California, Mexico. In Casey's table it will run next to *P. tolucana* Casey from Toluca, Mexico, and *P. scutellaris* (Champion) from Puebla, Almalonga, Jalepa, and Oaxaca, Mexico.

As previously noted (Pierce, 1946. Bull. So. Cal. Acad. Sci. 45(3):123) the Coprine beetles found in the asphalt have no living representatives in California, and most closely resembled Mexican species.

Length of posterior half 11.5 mm.; width 5.52 mm.

Elytra strongly expanded at base, much wider than mesothorax. Elytral condyles at sides of scutellum. Scutellum broad at base where covered by prothorax, with only a small triangular apex visible normally between the elytra at base. Zones of elytra marked off by rounded ridges, occupying interspaces; Costal-subcostal ridge sutural on each elytron; first discal ridge on Radiomedial interspace; second discal ridge on Intermedial interspace; third discal ridge does not start before the basal fourth, but (by comparison with *P. lirata* from Arizona) appears to originate at the Humerus, and is therefore the Medio-cubital interspace; marginal ridge is the Cubito-vannal ridge, separating the remigial area from the epipleural Vannus, which extends from Humerus to apex; near base Subcostal and Radio-medial ridges have aborted branches directed toward each other; on posterior declivity (at about middle), Radio-medial turns away from a generally parallel direction to Costal, meeting Intermedial and form-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PlA
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9
SA II
Cx
SA III
13
Prs II
Tn
Eps II
Cx
Tr
Eps III
12
FS III

PLATE 9

ing a short common stem joined by Medio-cubital, and then by Cubito-vannal ridges. In the second specimen (McK 38a2) the junctions are not complete on the declivity, as shown by the small side sketch. The elytra are very delicate and thin, likely to break at all ridges and sutures. This is the most fragile of all Tenebrionidæ studied.

Ventrally (Pl. 8, fig. 5) meso- and metathorax, and four abdominal segments are present. Coxæ widely separated and intercoxal processes quite broad. Mesosternum twice as long as metasternum. Mesocoxæ fit in rounded sockets. Sockets for posterior coxæ formed from first abdominal segment. Sterno-pleural suture of mesosternum sinuately curved to anterior edge; base of presternum about half as wide as sternum at trochantins.

EXPLANATION OF FIGURES ON PLATE 9

Fig. 1. *Nyctoporis carinata*, left mandible, inner face without lacinia. *D*—Dentes, *EC*—Epicondyle, *HC*—Hypocondyle, *I*—Incisor, *M*—Mola, S—Scrobe.

Fig. 2. Same, scrobal face.

Fig. 3. Same, molar face with remnant of lacinia.

Fig. 4. Same, right mandible, inner face, with entire lacinia.

Fig. 5. Same, dorsum of head. *E*—Eye, *Oc*—Occiput, *Pa*—Parietal.

Fig. 6. Same, venter of head capsule. *AS*—Antennal socket, *ES*—Epicranial suture, *Ge*—Gena, *Gu*—Gula, *Pa*—Parietal, *Pge*—Postgena, *Pgs*—Postgenal suture, *Poc*—Postocciput, *Smt*—Submentum.

Fig. 7. Same, dorso-lateral view of head. *AS*—Antennal socket, *CR*—Coronal ridge, *E*—Eye, *GL*—Genal lobes.

Fig. 8. *Noserus corrosus*, pronotum.

Fig. 9. Same, ventral view of pronotum without sternites.

Fig. 10. *Nyctoporis carinata*, sternum of prothorax.

Fig. 11. Same, posterior view of prothorax.

Fig. 12. Same, sternum of meso- and metathorax. *Cx*—coxa, *Eps II, III* — Episternum II and III, *FS III, Furcasternal suture*, *Prs*—Presternite, *Tn*—Trochantin, *Tr*—Trochanter.

Fig. 13. Same, inside of sternum of meso- and metathorax. *Cx*—Coxa, SA *II, III*—Sternal apodemes II and III.