

A Monographic Revision of the North American
Species of *Stenelmis* (Dryopidae: Coleoptera)

by

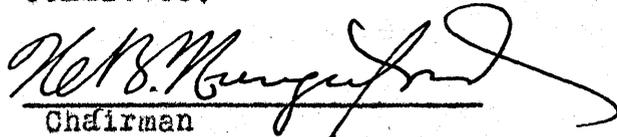
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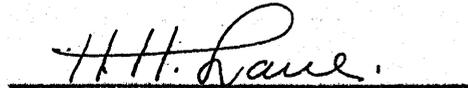
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Introduction

Several years ago when I attempted to determine the material in the Dryopid genus *Stenelmis* in the Francis Huntington Snow Collection at the University of Kansas, it became apparent that practically nothing could be done, with the present literature, toward the identification of our forms. Nearly all of the descriptions are brief, important structural characters were overlooked by early workers, and as a result the specimens of *Stenelmis* in most collections have been misidentified or set aside without names. Added to this difficulty, the specimens are usually clothed with an incrustation of dirt or other debris which has further rendered identification almost impossible. Thus, it became necessary to examine the types of our species in order to approach any accuracy of determination. With the exception of one, *Stenelmis crenata* (Say), the types have been studied.

No monographic studies have been attempted previously although LeConte (1852) and Horn (1870) brought our species together in synoptic arrangement. The purpose of this paper is to redescribe all known North American species of *Stenelmis*, to bring the scanty and scattered literature together, and to make known a number of new and interesting forms. Keys and illustrations are presented which, it is hoped, will aid in the identification of our species. For the sake of completeness, descriptions of *Stenelmis geayi* Grouv. and *Stenelmis nevermanni* Hntn., the only species known in the Western Hemisphere outside of the United States, are appended at the end of this paper.

Acknowledgments

This opportunity is taken to express my deepest appreciation to Doctor H.B. Hungerford for the encouragement and support which have made the writing and publication of this paper possible. His readiness in aiding me to secure materials, to examine various types in the older collections, and to advise me on many problems under consideration has been a constant stimulus. I am also greatly indebted to Doctor Paul N. Musgrave, Fairmont, W.Va. who submitted his large collection of *Stenelmis* for study, and kindly lent me much of the literature from his extensive library on Dryopoidea. His opinions on various questions relative to Dryopidae have been very valuable, and I take this opportunity to express my appreciation. To Doctor R.H. Beamer of the University of Kansas, I owe my thanks for the large numbers of specimens of many interesting species which he has secured on his surveys over the United States.

Through the kindness of Doctor B.S. Cusin of the Zoological Museum of Moscow, U.S.S.R., I have been permitted to examine the types of the species of *Stenelmis* described by Motschulsky (1859) from North America.*

To Mr. Guy Colas of the National Museum at Paris, we are indebted for two specimens from the type series of *Stenelmis geayi* Grouv. And to Mr. Howard E. Hinton of Berkeley, Calif., I am grateful for a paratype of *Stenelmis nevermanni* Hntn.

* *Stenelmis sordida*, *S. elongata*, *S. märkelii*, and *S. humerosa*.

To the following I am indebted for the loan of material: University of Minnesota; Canadian National Museum; Warren Knaus, McPherson, Kansas; Kansas State College; C.A. Frost, Framingham, Mass.; O.L. Cartwright, Clemson College, S.C.; P.W. Fattig, Emory University, Ga.; Cornell University, Ithaca, New York; Doctor H.H. Knight, Iowa State College.

I am grateful for the privilege of studying the collections of Professor W.S. Blatchley, Indianapolis, Ind.; the collections of the Museum of Comparative Zoology, Harvard College; and the Horn Collection at the Philadelphia Academy of Sciences.

To Mr. H.C. Fall, Tyngsboro, Mass.; Mr. Lyman S. Henderson, my fellow student; to Mr. C.W. Sabrosky, East Lansing, Mich.; and to all others who have aided in this project, I wish to give my sincere thanks.

The location of types is indicated after the description of each species.

Historical Review of Stenelmis in North America

The genus *Stenelmis* was first proposed by Leon Dufour in 1835 (Add. des Sci. Nat. Second Serie Tome III p. 158) for the reception of *Elmis canaliculata* Gyll. a species described in 1808 from Europe. Later *Elmis crenata* Say, described in 1824 from Penn. was transferred to this genus. In 1852 LeConte named two more species in the United States, *S. sinuata*, and *S. bicarinata*. In 1859, Motschulsky described *S. humerosa*, *S. märkelii*, *S. sordida*, and *S. elongata*. In 1869, Zimmerman added *S. linearis* and *S. vittipennis*. *S. quadrimaculata* Horn was described in 1870 at which time its author indicated the possible synonymy of *S. linearis* Zimm. with *S. humerosa* Mots. in the following statement: "This may be the species described by Motschulsky under the name of *humerosa*, and, if so, the latter should have priority. The descriptions of this and others is so vague as to leave considerable doubt of their identity." This conclusion, while correct, had not been verified until the present paper. In 1901, *S. nubifera* Fall was described and recorded as the first species of the genus from the Pacific coast. In 1910, Blatchley described *S. sulcata*, and in 1925, *S. fuscata*. In 1933, Musgrave discovered that the name *sulcata* had been used by Grouvelle (Not. Leyd. Mus. XIV, 1892, p. 188) for a species from Sumatra, and proposed the name *blatchleyi* for this species.

History of Classification of Family

The following account is intended to give a brief history of the important changes in the family since the first species was described. Most of the information, until 1852, was taken from Mulsant and Rey (Hist. nat. col. Fr. 1872), and Zaitzev's account of the Dryopidae (Colleopterorum Catalogus, Vol. 14). The family was unknown to Linnaeus.

1785. Geoffroy (Foure. Ent. Paris, I, p. 20) was the first to describe a species of Dryopidae, Dermestes auriculatus, which he placed with the Dermestids.
1787. Fabricius (Mantissa Insectorum) described a species which he called Elater dermestoides.
1791. Olivier (Encycl. méthod. VI, p. 298) proposed the generic name of Dryops for the species which Geoffroy had placed with the Dermestidae.
1792. Fabricius (Ent. Syst. I, p. 245) removed the species which he had described as an Elaterid and made it type of the genus Parnus. At the same time he described Parnus prolifericornis.
1793. Panzer (Fn. Germ. 7, p. 4) described a species which he called Dytiscus volckmari.
1798. Latreille (Bull. Soc. Philom. I-II) described the genus Elmis.
1802. Marsham (Entom. Brit. I, p. 192) placed the same insect in the genus Chrysomela.

1804. deBrives (Hist. Nat. IX, p. 227) associated Elmids and Dryops with the Byrrhidae, and also placed the Heteroceridae with the same family. Altogether they formed the group Ripicoles. He stated that Dryops and Gyrinids made up the family Otiophores.
1806. Müller (Illig. Mag. V, p. 184) adopted the name Limnius.
1807. de Brives (Gen Crust. II, p. 48) preserved the family Otiophores.
1811. Germar (N. Schriften Nat. Ges. Halle 1, VI, p, 41) established the genus Potamophilus for Parnus acuminatus Fab.
1817. Leach (Cuv. Règne Anim. III, p. 268) changed the name Potamophilus to Hydera. This genus, Dryops and Heterocerus form the second section of the family of Clavicornes.
1817. Leach (Zool. Misc. III, p. 88) placed Dryops with the Parnidea, and in addition Parnus and Potamophilus are placed in the same group.
1825. MacLeay (Annul. Javan. ed. I, p. 34) recognized the family Parnidae.
1828. Stephens (Ill. Brit. Ent. II, p. 102) divided the second section of the Clavicornes of Latreille into three families: Heteroceridae, Parnidae and Limnidae.
1839. Westwood (Intro. to the Modern Classification of Insects, Vol. I and II) adopted the divisions of MacLeay. He called the Limnidae of Stephens a subfamily of Parnidae, but preferred the subfamily name of Elmidae.

1845. Redtenbacher (Die Gattungen der deutschen Käferf., Wien.) placed the Parnidae, Elmidae and Heteroceridae after the Hydrophilidae. He placed the Georyssidae between the Dermestids and Byrrhids.
1847. Erichson (Naturg. Ins. Deutschl. III, p. 509) reunited all described Dryopids into a single family, the Parnidae. This was divided into two tribes, Unciferes and Diversicornes.
1852. LeConte divided the family into three groups: Eurypalpini which included the genus Eurypalpus (Psephenus); Dryopini which included Lara, Lutrochus, Pelonomus and Helichus; and the Elmini which included Limnius, Elmis, Stenelmis, Macronychus and Ancyronyx.
1861. LeConte, in his Classification of the Coleoptera of North America (Smith. Miscell. Coll. 1861) considered the family Parnidae as containing three distinct subfamilies: Psephenidae, Parnidae (genuini) which contained the tribes Larini and Parnini, and the Elmidae.
1872. Mulsant and Rey (Hist. nat. col. Fr. XXII) retained the tribes Unciferes and Diversicornes of Erichson.
1870. Horn (Trans. Amer. Ent. Soc. III) recognized the three subfamilies of LeConte.
1883. LeConte and Horn (Smith. Miscell. Coll. 507), in their Classification of Coleoptera, recognized the subfamilies Psepheninae, Parninae, and Elminae.
1900. Lameere (Ann. Soc. Ent. Belg. XLIV, 363) proposed to unite Psephenus and also the Heteroceridae and Georyssidae with the Dryopidae. The family then was divid-

ed into the following subfamilies: Psepheninae, Parninae (including Heteroceridae), and Elmidinae (including Georyssidae).

1904. Ganglbauer (Die Kafer von Mitteleuropa) has used the subfamilies, Dryopinae and Helminthinae.
1908. Zaitzev recognized the subfamilies Psephenini, Dryopini, and Helminthini.
1910. Zaitzev places the species in the Psepheninae, Dryopinae, and Helminae.
1910. Blatchley (Coleoptera of Indiana, p. 677) follows LeConte and Horn recognizing the subfamilies Psepheninae, Parninae and Elminae of the family Parnidae.
1920. Leng (Catalogue of Coleoptera) considered that Psephenus should constitute the family Psephenidae. The subfamily Parninae, or Parnidae of some authors, is raised to the family rank of Dryopidae, and the Elminae is raised to family rank but is designated Helmidae.
1926. Forbes (Jr. N.Y. Ent. Soc. XXXIV, pp. 107-108) on a basis of wing folding patterns of Coleoptera recognizes the superfamily Dryopoidea as constituting the Ptilodactylidae, Dryopidae (with Psephenus and Elmis), Chelonariidae, Heteroceridae, Byrrhidae (except Nosodendron) and the Mycetophagidae.
1927. Barthe (Miscellanea Entomologica, XXX, p. 4) follows Ganglbauer in the naming of subfamilies.
1927. West (Ann. Ent. Soc. Amer., XXII, p. 691), although acknowledging the usage of Psephenidae, Dryopidae and Elmidae by Leng, preserves Psepheninae, Dryopinae

and Elminae as subfamilies of Dryopidae. His assumptions were based upon a study of the larvae.

1929. Carter and Zeck (Australian Zoologist, VI, p. 51), in their Monograph of Australian Dryopidae, recognize the Psepheninae, Dryopinae, and Helminae.

1929. Böving (Bull. Brook. Ent. Soc., 24, p. 55) studied the larva of Lara and as a result concluded that it should constitute a separate family from the Dryopidae. This he named the Larridae. The genus Eubrianax, formerly included in the Dascyllidae, is placed with the Psephenidae. Other families, in addition to the Dryopidae, which he considered as belonging to the Dryopidae were Chelonariidae, Ptilodactylidae and Psephenidae.

1930. Böving and Craighead (Entomologica Americana, XI, pp. 1-351) gave us our more recent general classification of the larvae of Coleoptera. Based upon a study of larval characters they recognized the series Dryopoidea under which were included the following families: Ptilodactylidae, Eurypogonidae, Psephenidae, Chelonariidae and Dryopidae. In this proposed classification the Heteroceridae is removed to the series Dascilloidea. The genus Eurypogon is removed from the Ptilodactylidae and given the rank of family. The Psephenidae is divided into the Psepheninae and the Eubrianacinae, the latter formerly being included in the Dascyllidae. The Dryopidae included the subfamilies Larinae, Pelonominae (containing Pelonomus, Helichus and Psepheno-

- ides), and Helminae (containing Dryops, Helmis, Limnius, Ancyronyx, etc.). The Ptilodaetylidae, Eurypogonidae and Chelonariidae were formerly included in the Dascilloidea.
1930. Blackwelder (Pan. Pac. Ent., VI) also favors the placing of Eubrianax with the Psephenidae.
1930. Bradley (Manual of the Genera of Beetles of America North of Mexico) included the Psephenidae, Laridae, Dryopidae, Georyssidae, Chelonariidae, and Ptilodaetylidae in the superfamily Dryopoidea. He mentioned that the family name Laridae is preoccupied by the family of sea-gulls, though based on a differently spelled generic name.
1935. Hinton (Stylops, Vol. 4, p. 173) recognizes three subfamilies, Larinae, Dryopinae, and Elminae. He also considers the Psephenidae as a separate family.
1936. Darlington (Psyche, XLIII, pp. 65-83), in a paper on West Indian Dryopidae, recognized the subfamilies Psepheninae, Dryopinae and Helminae.
1936. Hinton (Annals and Magazine of Natural History, Ser. 10, Vol. XVIII, p. 89) considers the same subfamilies as in his paper of 1935.

The generic names Elmis and Helmis have been used interchangeably since Helmis first was designated. Bedel (Ann. Soc. Ent. Fr., V, 1878, p. LXXV) added the "h" to Elmis claiming that Latreille, being French, did not use the aspirate. Since the original transliteration was Elmis, there

is no reason why the name *Helmis* should be used.

Musgrave (Proc. Ent. Soc. Wash., 37, 1935, pp. 137-138) in a discussion of *Helichus*, gives a brief review of the usage of *Parnus* and *Dryops*, and indicates why the name *Parnus* never should have been used. According to this author, "The genus (*Helichus*) was established by Erichson (Naturg. Ins. Deutschl. III, 1847, p. 510) in a general description in a footnote. The only pertinent statement in the description is contained in the sentence: "Die Fühler wie bei *Parnus* gebildet....., der ohrförmige Fortsatz daher nur Kurz, dreieckig." *Helichus* being very close to *Dryops* Olivier (*Parnus* Fabricius) was confused with the latter genus for more than a hundred years; and Erichson in his key to the Dryopini, which accompanied his original description, made the mistake of separating the two genera on approximate or distant hind coxae. The hind coxae are distant in both genera. This error was noted by Sharp (Biol. Centr. Amer. I, Pt. 2, 1882, p. 120) who placed species in the genus *Dryops* Leach, making *Helichus* a synonym. Much of the confusion was caused by the fact that both Olivier (Encycl. method. VI, 1791, p. 297) and Leach (Zool. Misc. III, 1817, p. 88) described genera, applying the name *Dryops*. *Dryops* Oliv. (*Parnus* F.) is the correct name and is the true *Dryops*. The *Dryops* of Leach is the *Helichus* of Erichson and can not be used because the name was previously used by Olivier. This fact validates *Helichus* Erichson, although the name did not appear until 1847. *Parnus* Fabricius (Ent. syst. I, l. 1792, p. 245) is a synonym of *Dryops* Oliv.; and, therefore, species placed in *Parnus* belong to *Dryops* Oliv."

Family Characteristics

Dryopidae are usually characterized by being small aquatic or subaquatic beetles, rarely over eight to ten millimeters in length, and having the following characters: head usually in part retractile and nearly always protected beneath by the prosternal lobe. In most species this lobe, while the head is in repose, meets the labrum and completely conceals the mouthparts. Antennae 7-11 segmented, the great majority of the species having the latter number. Prosternum with a posterior median process which fits into or against a groove on the mesosternum. Coxae generally widely separated, the anterior ones widely open behind. Hind coxae transverse and usually partly protecting the hind femora. Abdomen distinctly 5-segmented, the first few segments firmly united. Legs usually long and slender, tarsi 5-segmented and with the last segment often as long as the four preceding combined. Claws very long and generally robust.

BIOLOGY AND MORPHOLOGY

Need for Research

An examination of the literature on the biology and morphology of Dryopidae indicates that much remains to be discovered. To my knowledge the complete life cycle of none of the species has been worked out although we have considerable information on the development of the closely related family, Psephenidae. The larvae of but few of our species are known, the pupae of but one or two, and the eggs of one or two. Nothing has been done on the embryology. Only recently has anything been discovered regarding the tracheation of the larva, and information on the digestive and other systems is entirely lacking.

In 1835, at the time the genus *Stenelmis* was described, some information was given on the morphology of the adult, but nothing was known of the biology. Brocher (1912) has added some data on adult respiration, and suggests that this subject needs to be more fully developed.

The larvae and adults can be found in abundance in their natural habitat, so quantities of material may be had for study. The eggs have been seen in the field once or twice, but I have obtained them only by the dissection of adult females.

Life History

Matheson (1914) was the first to record data on the immature stages of any of our species of *Stenelmis*. He found the full grown larvae and pupae of *Stenelmis bicarinata* Lec. (latitude of Truro, Nova Scotia) under stones along the banks of the Salmon River. The larvae left the water about the last of July or the first of August. They constructed their pupal chambers in damp places under stones. Matheson found many pupae and larvae in such situations about August 7, and succeeded in rearing one adult from these pupae. It emerged on August 10. From this information it seems probable that the pupal state may last two weeks or less. In July and August I have found adults and larvae of all stages in lakes and streams. Larvae kept under laboratory conditions for a period of four to six weeks have not been seen to moult. The data is insufficient to warrant a guess as to the probable length of the life cycle, but it suggests that the complete development may occupy a period of more than one year.

Recently Hinton (1936) has made some observations on the biology of *Dryops luridus* Er., a European species. Eggs were deposited from May to July. Some of the eggs were found inserted in fresh and partly decayed stems and leaves of the water mint, *Mentha*, and still others were found at the bottom of the rearing jar. Hinton considered that oviposition normally occurs in plant tissue but that the overcrowded conditions forced some females to lay their eggs free in the water. The eggs required about 15 days to hatch. Rupturing of the chorion

took place by body movements. According to Hinton (p. 72), "Two or more days before eclosion the larva may be seen frequently to shift to a slight extent its position inside the egg. It often actively moves its legs and mouth-parts. No special apparatus exists for breaking the chorion as has been observed for other beetles such as *Dytiscus*. Probably no fluid is secreted, for if the egg be marked it is found to break open at places where the head of the larva has not been. On emerging, the larva usually begins to tunnel in the partly decayed stem or leaf in which the egg was laid. The larvae, both in nature and in captivity, seem to prefer partly decayed plant tissue. The duration of the life-cycle and the number of instars has not been determined, nor have I been able to obtain pupae. I believe a complete life-cycle probably requires two years. West (1929, p. 18) points out that in all probability the life-cycle of *Psephenus lecontei* Lec. requires two years in northern latitudes."

In a related species (*Dryops auriculatus* Geoffr.), Brocher (1913, p. 227) has noticed the females depositing their eggs in damp places out of the water, though this may not be the usual habitat for the species.

Respiration and Habits of the Larva

The larvae of the various species of *Stenelmis* which I have examined are entirely aquatic and breathe by means of caudal filaments. The respiratory organ consists of three tufts of filaments which, in later instars, arises from a common stalk and which may be protruded from the caudal opening of the abdomen. The most important contribution to this subject is by Susskind (1936). This author treated the morphology and function of the respiratory system of several instars of *Stenelmis quadrimaculata* Horn. She observed that the larvae expand and contract the filaments rhythmically when they are subjected to abnormal conditions such as rapid increase in temperature of water, exposure to light, high carbon dioxide tension, or low oxygen tension. The rhythm of expansion might be slow or rapid depending upon the various conditions to which the larvae were subjected. The larvae often gathered themselves in a mass and remained quiet in this position for long periods. At such times the filaments usually were retracted, and she suggested that under these circumstances, respiration might go on without their use.

Adaptation of the larva to gradually changed conditions is generally effected without unusual disturbance to itself. If, however, the larva is suddenly subjected to warm water, the body is rapidly contorted in much the same manner as a mosquito larva.

The paper by Miss Susskind presented the various methods by which the tracheae of the larvae were prepared and studied. Furthermore she has traced the various branches to the different parts of the body. The average number of filaments given for the middle tuft of caudal filaments is 55, and for the lateral tufts, 35. Two tracheoles, twisted about each other, are in each of the filaments. According to this author the spiracles do not appear until the last larval instar. There are ten pairs, two in the thorax, and eight in the abdomen. The position of the spiracles is ventro-lateral with one pair each in the meso- and meta-thorax, and one pair in each of the first eight abdominal segments. The aperture of the spiracle is described as being closed by two lightly sclerotized membranes which meet in a straight line parallel to the long axis of the body. The internal edges of the membranes are fused. She thought that the membranes prevent the entrance of water into the tubes and probably act as diffusion membranes.

By way of summarizing her paper, Miss Susskind has given the following tabular arrangement:

"1. Both larvae and adults of Stenelmis sulcatus [quadrimaculata Horn] occur in marl concretions and are permanently submerged, never coming to the surface for air.

2. The larval tracheal system has fewer branches in the first instar than in all older larvae.

3. In the first larval instar neither spiracles nor spiracular tracheae are present.

4. The intermediate instar studied has spiracular tracheae, which are about half developed.

5. Last instar larvae have completely developed spiracular tracheae and ten pairs of spiracles. The spiracular apertures are permanently closed by weakly chitinized membranes.

6. Larvae of all instars possess three tufts of caudal filaments at the posterior end of the main tracheal trunks. These tufts are protrusible through the tip of the last abdominal segment.

7. Intermediate and last instar larvae possess a caudal chamber associated with the caudal filaments.

8. The tracheal system of all larval instars is a closed one."

Hinton (1936) has figured a ventral view of the tracheal system of the larva of Dryops luridus Er. which, however, belongs to a different subfamily from Stenelmis. This constitutes practically all that is known regarding respiration and respiratory systems of the larvae of this family.

I have observed in the field and laboratory the larvae of Stenelmis quadrimaculata Horn in marl concretions. They occur in immense numbers in Black Lake (Cheboygan Co. Mich.) where they may be taken from their burrows in the concretions. Sometimes at the ends of these burrows a mass of larvae, often of various stages, are found. The larvae of the stream-dwelling species of Stenelmis crawl about beneath stones, in sand and in debris lodged in the stream. Hinton (1936) records the larvae of Dryops

luridus Er. as having been taken, on one occasion, from damp places some distance from water. He suggested that since the larvae were in their last instar, the entire life-cycle might take place out of water. I have collected larvae from running waters of all types, and also from the waters of lakes. Hinton's records are, therefore, interesting, and unusual if we consider the preferences of the great bulk of our Dryopidae.

Respiration and Habits of the Adults

Texts, and other papers, which discuss the respiration of aquatic insects rarely mention that it is unnecessary for adult Dryopids to come to the surface of the water to breathe. Except for the genus *Haemonia* (Chrysomelidae), other Coleoptera, although they may descend beneath the surface of the water to deposit their eggs (ex. Psephenidae), or may use this medium as a natural habitat (ex. Dytiscidae), are not known to remain there for indefinite periods without returning to the surface for air.

The body of a submerged Dryopid is surrounded by a film of air which is held to it by the hydrofuge hairs. This silvery region is termed the "plastron" by Brocher, Muttkowski and others. This arrangement is not alone responsible, however, for the insect's ability to remain under water indefinitely for other aquatic Coleoptera have similar air carrying capacities, yet they can remain under water only temporarily.

The researches of Brocher (1912) have contributed much regarding the respiration of adult Dryopidae. I shall make no attempt to cover his extensive paper on this subject, but hope to present some of his interesting experiments and conclusions, especially regarding *Stenelmis canaliculatus* (Gyll.).

Brocher, at first, studied certain European species, including the above *Stenelmis*, under laboratory conditions. The jars in which they were placed contained sand, stones

with calcareous incrustations, and some aquatic plants such as Hynnum. They were kept in a cool, well lighted place but out of the direct rays of the sun. Under these conditions, the plants liberated a great deal of oxygen, the water temperature did not rise, and there was an abundance of food. The beetles behaved as they did in their natural habitat and remained in perfect health. Some of the adults were placed in a small jar, the mouth of the jar was closed with muslin and submerged in a larger jar of water. They remained thus for 140 days, when the experiment was interrupted, at which time they were still in perfect health. During this time the adults were not always observed with a bubble of air at the tip of the body, nor were the beetles found floating inactive at the surface of the water. When the conditions of existence became unfavorable such as too few plants in the jar, or too feeble illumination, the beetles were disturbed. Some moved about with a bubble at the tip of the abdomen; they were often seen rising to the surface supported here by the bubble. If the bubble burst, the insect immediately fell to the bottom of the aquarium. Brocher concluded, after this observation, that the beetle did not come to the surface for air. He mentions that these insects are the first to die when the water of the aquarium is insufficiently aerated.

Proof that Dryopidae obtain some of the oxygen, necessary for respiration, from plants presented itself to Brocher on two occasions. Adults were observed, upon encountering a bubble of air adhering to the plant, "to eat with frenzy

at this spot." The silvery region of the head absorbed some of the oxygen gradually relaying it to other parts of the body. He did not observe air in the mouth of *Stenelmis* which led him to suppose that the absorption of oxygen must have taken place in other regions of the body.

He further observed that the Dryopidae were able, while feeding on plants, to gather quantities of oxygen which oozed out of the tissues. The oxygen, apparently, was absorbed by the silvery surface of the body. The fact was mentioned that it was important to the insect not to take up too large a quantity of gas at one time since the specific weight of its body would be lowered. In this event the beetle might float to the surface of the water once it lost its hold upon a support.

After having studied the habits of healthy Dryopids, Brocher thought it worthwhile to study certain beetles in which the functions of respiration had been disturbed. One experiment was to force the beetles to stay in a poor oxygen medium, such as boiled water, or in water charged with carbonic acid. When the bubble of air appeared at the end of the body, it was removed. In addition the silvery region of the body was mechanically removed or the end of an elytron was cut off. When they were transferred back to the proper conditions of the aquarium, the insects appeared to be more active than those that were kept in the normal state.

It was found that when the hairs which support the silvery region of the pro-, meso-, and metasterna were

completely removed by scraping with the point of a needle, the beetle died within one or two days. When only the silvery region of the prosternum was destroyed, the beetle was able to survive for a longer time and apparently in good condition. The facts, according to Brocher, appear to demonstrate that the silvery regions fulfill an important physiological function which can only be respiratory.

The respiratory system is described by Brocher as being composed of the silvery hydrofuge surface, the dorsal space under the elytra, and the tracheal system. In *Stenelmis* the silvery region was described as occupying the dorsal surface of the head and prothorax and all of the ventral face of the body including the femora. I have also observed this region covering the tibiae. When these surfaces were examined under the microscope, many granules were found, each provided with a long hair. Brocher regarded these granules as organs destined to capture the minute bubbles of gas which by chance come into contact with the silvery regions. The bubbles came to rest collectively on the granules and little by little were absorbed.

Brocher described nine pairs of spiracles in the adult. The first pair was situated in the membrane between the prothorax and the mesothorax. These were termed the "mesothoracic spiracles." The "metathoracic spiracles" were situated in the lateral membrane of the metathorax opposite the coxal cavity. They are much less prominent than the

mesothoracic ones. Raising of the elytra and wings revealed seven pairs on the dorsal face of the abdomen.

The hydrofuge hairs are continuous, from the ventral surface of the abdomen, along the groove under the edge of the elytra, and to the spiracles. By this route the oxygen may pass directly to the spiracles where it can be used for respiration or to the sub-elytral space for storage. It is thought that the oxygen which comes to the silvery regions of the prothorax, by way of the mouthparts, arrives at the mesothoracic spiracles which may act as inspiring spiracles. Frequently however, they may serve for expiration, for bubbles have been observed to issue from them. The metathoracic spiracles have a direct relationship with the hydrofuge regions or the ventral surface of the body as has been pointed out for the abdominal ones.

Frequently Brocher noticed that when a Dryopid was placed on its back and further disturbed by teasing, a bubble of air appeared on each side of the posterior coxae. He was led to believe, from this observation, that expiration also took place in the abdominal spiracles. By pressing lightly on the abdomen, I have noticed that a bubble of air appeared at the tip of the body. Another specimen, when turned on its back, released two bubbles of air from the region of the left hind coxa, and another from the left middle one.

I have observed the adults of Stenelmis quadrimaculata Horn feeding upon algae in marl incrustations. Specimens taken from a stream and brought into the laboratory with

dead leaves were found to "graze" over both surfaces. They were, apparently, feeding upon an algae-like growth. When no leaves or stones containing their food were placed with them, they proceeded to feed upon the debris on one another.

The tarsi of the adult *Stenelmis* are terminated by two long claws which enable them to cling to stones in the swiftest of streams. They seldom come to the surface during the day, but at night the winged species often leave the stream, pond, lake or other natural habitat and take wing. They have been taken at lights by hundreds in various localities. Frequently several species may be observed in these flights. This indicates a positive phototropism though during the day they generally prefer the dark recesses of their habitat. In at least one instance, however, I have found adults of a Dryopid, *Heterlimnius corpulentus* (Lec.), during a bright day, resting on stones jutting out of the stream.

Internal Anatomy of Adult

Some discussion was given in a foregoing section on certain features of the tracheal system of the adult. The intention here is to point out what is known concerning the internal anatomy exclusive of the respiratory system. External features have been discussed in the section on specific characters of *Stenelmis*.

Apparently the only contribution that we have on the anatomy of *Stenelmis* is that of Leon Dufour (1835) at which time the genus was erected. Dufour considered chiefly the digestive systems and the male and female reproductive organs of *Macronychus quadrituberculatus* Mull., *Lathelmis* (Elms) *volckmari* (Panz.), and *Stenelmis canaliculatus* (Gyll.).

The alimentary tract was described as being essentially the same in the three species except that *Macronychus* possessed a proventriculus (gizzard), and gastric pouches. Plate VIII, figures 17 and 19, demonstrates these differences. Reference to the explanation of plates will designate the parts of the systems. The tract of *Macronychus* was described as being not more than one and one-half times the entire length of the body. Dufour remarks that this comparative length of the digestive canal is particularly observed in insects which feed upon animal matter. I have never seen our species feeding upon anything except material of vegetable origin. This, then, is another problem which needs solution.

The figures and illustrations , Plate IX, show the features of the reproductive organs so that little explanation is necessary. Certain differences in the females should, however, be pointed out in Stenelmis canaliculatus and Stenelmis consobrinus Duf. There are many more coils in the sebific glands and there is a different shape to the sebific reservoir in S. consobrinus than in S. canaliculatus. Comparison of the figures will demonstrate these differences as well as others. Dufour has called to our attention that these two species appeared at first to differ only in size. He suggests that a study of the internal anatomy may help to confirm the validity of species that were described upon external characters.

Description of the Larva

Matheson (1914) briefly characterized the larva of Stenelmis bicarinata Lec. The full grown larva is described as having the head and terminal segment of the abdomen nearly black. The antennae are briefly described and measurements are given for each segment. Following Matheson, we have the next important contribution, on larvae of Dryopids, by West (1929). This author discusses eight types of larvae and, in addition, the larva of Psephenus herricki (DeKay) (Psephenidae). His description of an unidentified Stenelmis follows:

"Larva elongate, of the form of an attenuated hemicylinder, i.e., with ventral surface nearly flat, but with dorsum arched, so as to appear in cross-section semi-circular. Median dorsal line but faintly indicated; not elevated into a carina of any sort. Prothorax one and one-half times the length of the succeeding segment. Seen in dorsal view, margins of all body segments except the last appear bisymmetrically rounded, the margin of the prothorax alone being very slightly sinuate. Posterior abdominal segment sub-conical; the dorsal sclerite rather abruptly narrowed posteriorly and terminating in two sharp points. Ventral sclerite occupying posterior half of segment, of the form of a quadrangle with an equilateral triangle attached posteriorly; with two elongate, slender appendages, bearing numerous spines, and recurved at the tips. Entire dorsal surface of the larva, except the head, covered with a

close sprinkling of fine tubercles, each of which tends to give rise to a minute, backward directed spine. These tubercles tend to be replaced by spines on posterior segments. Those spines along the posterior margin of each segment are more stout and elongate, forming a ciliate border to the segment. Larva slightly broadest in the region of the first two or three abdominal segments; diminishing slightly in size both anteriorly and posteriorly from this point.

"Head large, exserted, rather conspicuous, being nearly three-fourths as broad as prothorax; with conspicuous Y-shaped epicranial suture visible dorsally. Antennae short, composed of three segments; the first rather deeply inserted and but slightly longer than broad, the second much more slender, fully twice the length of the first and, seen laterally, more expanded at distal end than at the base; the third duplicate, being composed of two small, transparent articles arranged side by side, the one gradually tapering, the other more robust and of the same diameter throughout. No terminal spine has been demonstrated on either of these articles. Ocelli situated behind the antennae, each group composed of apparently five units. Labrum simple, with lateral margins evenly rounded; slightly emarginate anteriorly. Anterior and lateral margins, as well as entire upper surface, beset with rather stout spines. Mandibles sub-triangular, distinctly tri-dentate, and bearing a large "taste-brush" [prostheca] on the inner

surface at about one-third the distance from base to tip. Outer surface bearing at least two branching spines. Maxillae small, with four-segmented palpi. Stipes, near base of palpus, bearing at least one stout branching spine. Small area on distal portion of last palpal segment provided with papillae, evidently tactile in function. Lacinia lying close upon galea and of the usual form, i.e., resembling a truncate sleeve, or cylinder, open along the exposed surface and adorned distally with a variable number of stout spines. Galea without characteristic form, bearing distally several stout curving spines. Labium membraneous, nearly twice as long as broad, and bearing three-segmented palpi, of which the third segment is much the smallest and bears distally a small sensory area, where are located usually four tactile papillae. Outside of, and opposite to first palpal segment may be found, on each side, a short, studded spine. Mentum rather clearly bounded by a suture at the base of the palpi. Distal portion of labium evenly convex and adorned with a great number of fine, tactile hairs.

"Legs composed of the usual parts and adorned with a rather scanty covering of spines. Coxae somewhat excavated anteriorly, and thus adapted for reception of femora. Distal portion of excavation cushion-like in appearance, with a mass of small closely ranged tubercles. Claw bearing on its inner surface a slender, and sometimes curving spine. Gills caudal, arranged in three principal tufts and capable of extrusion between the sclerites of the posterior abdom-

inal segment. Spiracles situated laterally, one pair on the meso-thorax and one pair on each of the first eight abdominal segments. Length of mature larva, 6.5 mm. Greatest width (at first abdominal segment), .91 mm.

"Description drawn from several specimens taken at Walnut Creek, Michigan, and assigned to *Stenelmis* since several adults of that genus were associated with them. Also the larva of *Stenelmis bicarinatus* Lec. as figured by Matheson ('14) comes closer to this type than to any other studied so far."

Plate I, fig. 8 and 9 ? and Plate IV in West's paper illustrate larvae and certain morphological characters. In west's discussion of the larvae, a comparison is made of the larval types and he attempts to correlate structures of the larvae with their habitats. Comparisons are made chiefly with *Psephenus*, *Helichus*, *Elmis* (European) and *Stenelmis*.

The lateral lobes of the body segments of *Psephenus* are developed to a high degree, but, when one proceeds through the series of *Stenelmis*, the lobes are found to be entirely lacking. Comparison of the respiratory apparatus, especially position, is of some significance in the series. In *Psephenus* the respiratory gills are ventral; in all others they are caudal. The structure of the caudal abdominal segment is described by West as being strikingly similar in most of the larvae having caudal gills. Position of the head in *Psephenus* and *Helichus* is beneath

the expansion of the prothorax, but in others the head is visible from the dorsum.

Following this discussion West attempts to show natural groupings within the family on the basis of larval characters. An interpretation is given from an evolutionary point of view. A key, including several European forms, is presented for the few larval types.

Böving and Craighead (1930), in their extensive paper on the principal larval forms of Coleoptera, figure a mandible, head and antenna, maxilla, and a lateral view of the ninth tergite and tenth sternite of Stenelmis grenata (Say). Descriptions of the parts are not included.

Finally Bertrand (1935) briefly describes some characters of four larvae, thought to belong to Stenelmis, from Java. Only the antenna and mandibles are figured.

Comparative studies of the larva, within a genus of Dryopidae, have not been made. The larvae of some genera still are unknown, but, when most of the larval types have been discovered and studied, we may have a better understanding of the phylogeny of the entire family.

Description of the Pupa

Matheson (1914) gave us our only figure and description of the pupa of *Stenelmis*. According to this author: "The pupa [*Stenelmis bicarinata*] Lec. is soft, white in colour, the thoracic segments, wing-pads and legs being slightly dark in colour. This darkness deepens with the age of the pupa. Length 3.4 mm.; width at base of wing pads, 1.2 mm.

"The head lies incurved under the prothorax, the developing mouth-parts showing very distinctly. The eyes are small and almost black. The antennae lie in front of the eyes and extend under the pronotum, thus being concealed from the dorsal view. The wing-pads are prominent.

"The pronotum is large and rather densely covered with fine colourless setae. The outer angles of the anterior margin each bear a long, curving spine, measuring .32 mm. The posterior outer angles also, each bear a spine measuring .28 mm. These spines are yellowish brown in colour. They support the pupa in its chamber, preventing it from coming in contact with the coarse grains of sand.

"The abdomen is composed of nine segments, the posterior margins on the dorsal side being strongly elevated into narrow ridges. These ridges are clothed with numerous short setae. The ninth segment bears on its dorsal side two curving stout cerci, measuring .4 mm. in length. The cerci almost completely conceal the segment from which they arise. The pupa rests on its back in the pupal chamber.

By the aid of the prothoracic spines and cerci together with the numerous short setae arising from the raised ridges of the abdomen, injury from the roughened walls of the pupal chamber is avoided. The posterior margins of the wing pads and the legs are also provided with many short setae."

Geographical Distribution

The family Dryopidae is not a large one, there being some 600 species representing approximately 80 genera known from the entire world. Their distribution extends to all of the continents, and nearly every locality, through the tropical and temperate zones, is productive of from one to many species. The greater number of the known species appear to come from the Oriental region, and from the East Indian group of islands. In a number of instances, a genus may be confined to a definite region. The genera *Pachelmis* Fairm., *Helminthocharis* Grouv., *Lophelmis* Fairm. and a number of others are recorded only from Africa and Madagascar. *Phanocerus* Sharp is known only from North and South America and the West Indies. However, other genera are more widely distributed and not confined to a limited region. *Dryops* Oliv. is found in Europe, Asia, North and South America, and Africa. Thus, it might be said to be found on all continents with the possible exception of Australia.

The genus *Stenelmis* Duf. is one of the larger genera of the family, sixty-eight species having been described. Nearly one-half of the species are from the Oriental region and the East Indian Archipelago. Sumatra, alone, has ten species. The United States is second in importance to the Orient with one-third of the species. The rest occur over wide areas, three recorded from Europe, ten from Africa, and one each from Damascus, French Guiana, and Costa Rica.

It is of interest to note that one species, S. minuta Grouv., has been recorded both from Sumatra and Java.

Although there are no doubt many more new species to be discovered from one region or another, this distribution suggests that the genus may have arisen in the Orient.

In the United States, the species of *Stenelmis*, with one exception, are distributed east of the 100th meridian from Canada south to Florida and Texas. S. crenata (Say) is distributed over the whole of the eastern United States from Quebec to Texas. On the other hand, S. sexlineata Sand. is, apparently, a middle western form having been found only in Kansas and Texas. Some of the species occur in large numbers in small areas with an occasional specimen found in other localities. This is especially true of S. lateralis Sand. which is abundant in the streams of the Ozark Mountain chain. A few specimens have been taken in Pennsylvania; Virginia; Tennessee; and Ireland and Lucedale, Mississippi.

Until more is known of the biology of this genus, it would be out of place to generalize regarding the habitat preferences of the various species. However, some of the species seem to prefer clear and cold streams; others muddy and warm ones. Other species are found in both. Two species, S. quadrimaculata Horn and S. douglasensis Sand., have been found in lake water and, from available information, they seem to be confined to this habitat.

In the great expanse between the 100th meridian and California, no species of this genus has been recorded,

although considerable collecting has been done. However, S. nubifera Fall, our only western species, is distributed along the Pacific coast from Southern California to Oregon.

Geological Distribution

A very few fossil Dryopidae or Psephenidae have thus far been recorded. Apparently the first fossil Dryopid to be made known was Dryops (Parnus) prolifericornis Fab. from the Pleistocene of Galicia. This species, identified in 1894, was associated with the recent species D. prolifericornis Fab. of Europe, which is now recognized as a synonym of D. auriculatus Geoffr. In 1911, Wickham recorded Dryops eruptus (now assigned to the genus Helichus) from the Florissant. The following year, he named Dryops tenuior (also placed with Helichus), and named and described the genus and species, Lutrochites lecontei, both species of which came from the Florissant. The first Psephenid, made known in 1911, was Psephenus lutulentus Scudder, described from the Florissant of Colorado. Concerning this species, Scudder says, "The species described below, from the Oligocene of Colorado, is the only extinct form of this family yet known." The Florissant of the Miocene is the correct horizon, no doubt, rather than the Oligocene. This constitutes virtually all that has been made known of fossil Dryopidae and Psephenidae.

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Original Description of Stenelmis

"J'ai cru devoir établir pour quelques espèces d'Elmis à corps étroit et à pattes allongées un genre propre sous la dénomination de Stenelmis. Ce genre est intermédiaire aux Macroniques et aux Elmis. Il se rapproche des premiers par la longueur et la structure des pattes, ainsi que par le genre de vie, mais il en diffère essentiellement par la forme et la composition des antennes. Par ces derniers caractères, il appartient aux véritables Elmis, dont il s'éloigne par la forme du corps, la longueur des pattes et quelques habitudes.

"Caractères génériques.--Antennes insérées à nu au-devant des yeux, de la longueur du corselet, filiformes, grêles, étalées, composées de onze articles courts, cylindrico-conoïdes; le premier plus long, le dernier à peine un peu plus gros et ovalaire.

"Labre coriacé, entier, presque tronqué.

"Mandibules cachées, petites, courtes, robustes, arquées, plus surbaissées que dans le Macronique, brièvement tridentées à leur extrémité, garnies au côté interne d'une lame membraneuse pellucide, en tout semblable à celle du genre précédent.

"Machoières coriacéo-membraneuses, bifides, à lobes oblongs. Lobe extérieur ou palpifère plus étroit, velu à son extrémité. Lobe intérieur bordé de poils courbes et de

quatre dents principales, membraneuses, acérées. (Obs. Je ferai, relativement à la composition et à la structure des mâchoires du Stenelmis des observations qui, vraisemblablement, sont applicables à la plupart des Leptodactyles et peut-être aussi à beaucoup d'autres insectes. Des deux lobes qui constituent la mâchoire, celui qui reçoit à sa base l'insertion du palpe se termine à son extrémité par des poils simples assez longs plus ou moins courbés d'avant en arrière. L'autre lobe ou l'intérieur est légèrement coriacé dans une grande partie de son étendue, mais son bord libre ou interne est purement membraneux, et indépendamment des poils assez long dont il est garni il y a des lanières dentiformes très acérées et inclinées d'avant en arrière. Ces lanières, dont il y a quatre principales dans le Stenelmis, ne sont que des prolongemens du bord membraneux de la mâchoire, de véritables lames incisives. Les entomologistes, trompés par la villosité que les avoisine et les recouvre, se sont contentés de les désigner sous le nom de soies. Des observations microscopiques attentives et renouvelées m'ont démontré l'existence de ces dents membraneuses, de ces lames incisives dont les fonctions dans l'acte masticatoire sont bien faciles à déterminer.)

"Palpes courts. Les maxillaires de quatre articles dont le premier fort petit, les deux suivans conoïdes, le dernier ovale-oblong, de la longueur des trois précédens pris ensemble. Les labiaux insérés non sur les côtes, mais

sur le disque de la base de la languette labiale, composés de trois articles dont le dernier plus grand, ovale-oblong.

"Lèvre a languette largement dilatée en avant et tronquée, velue, ayant un espace coriacé en arrière. Menton transversal.

"Pattes longues, mais moins que dans le Macronique, inermes, grêles. Tarses allongés, de cinq articles, dont le dernier, aussi long que les quatre précédents pris ensemble, se termine par deux ongles longs et robustes.

"Caractères habituels.--Le corps des Stenelmis est allongé, légèrement déprime comme celui de Lyctus, d'une texture coriacée, glabre, mais revêtu en dessous d'une sorte de duvet imperceptible. Sa tête presque de la largeur du corselet est à demi emboîtée dans celui-ci, et la table sternale du prothorax s'avance sur les parties de la bouche absolument comme dans le Macronique. Les antennes grêles, droites et étalées, c'est-à-dire débordant le corselet, ont leur article basilaire un peu plus gros que les cinq qui suivent. Le huitième, le neuvième, et le dixième, un peu plus larges que les précédents ont leurs angles antérieurs un peu détachés, saillans. Le onzième ou dernier, est ovale-oblong un peu plus développée que les autres. Les yeux sont ovales-obtus médiocrement saillans; les palpes sont habituellement cachés. Le corselet de la largeur des élytres et d'une circonscription à-peu-près carée à sa région dorsale, inégale, guillochée, et un fin rebord sur les côtés; l'écusson est ovale-arrondi; les élytres sont moins embrassantes sur les

côtés que celles du Macronique. Il ya à des ailes toujours propres au vol. Les pattes, à un peu moins de longueur près, ont la conformation et la structure de celle du Macronique.

"Genre de vie.--Il a été expose a l'article du genre précédent."

Writer's Description of *Stenelmis*

Elongate, convex or subdepressed species. Head retractile and protected beneath by the prosternal lobe. Antennae 11-segmented, the segments gradually broader toward the distal one, the basal one or two wider and more rounded than succeeding ones. Maxillary palpi 4-segmented, the labial palpi 3-segmented. Mandibles bidentate at apex. Eyes denuded. Pronotum usually quadrate or longer than broad, convex, with a median longitudinal sulcus, and on either side a rounded or elongate basal tubercle. A tubercle in front of the basal one generally rounded or elongate, though occasionally indistinct anteriorly from the general surface of pronotum. Apical angles of pronotum prominent. Elytra punctate-striate with the third interval usually elevated at base, the sixth elevated and usually carinate for nearly its entire length. Front coxae rounded, without trochantin, widely separated by posterior lobe of prosternum which fits against a groove in the mesosternum. Middle coxae rounded, more widely separated than the prosternal coxae. Posterior coxae transverse, dilated internally, with their separation less than that of the middle coxae. Ventral abdominal segments five, the apical one with its apex more or less emarginate. Legs slender, the hind legs longer than either the middle or anterior ones. Tarsi 5-segmented, the last segment generally longer but never more than slightly shorter than the four preceding segments combined. In our species, tibiae without brush

of tomentum on inside of apical half.

Secondary Sexual Characters of *Stenelmis*

In all of our species the males have been found to possess a spinous ridge or a row of spinules on the inside of the middle tibia. The spines are variable in number within the species. They usually extend posteriorly for a short distance from near the middle of the tibia. The females have the inside of the middle tibia smooth. Both middle and hind tibiae of *Stenelmis nubifera* Fall have been found to possess the same type of spination. Another character, of sexual importance, which has been found in at least one species, *Stenelmis quadrimaculata* Horn, is a white labro-clypeal band. This membranous band is entirely absent in the males of the species, but very distinct in the females.

Specific Characters of *Stenelmis*

In this genus in which most of the species are closely related, the search for characters by which to segregate species has been a rather difficult task. Since no key has been published to include all of the known members of our fauna, a means was first sought to separate the species into groups. In-as-much as all of our species, with one exception, are confined to the eastern half of the United States, a study was made of the Pacific Coast *Stenelmis nubifera* Fall to see if it presented any marked differences from those of the East. Examination shows that the first elytral stria of *Stenelmis nubifera* Fall is incomplete, and does not extend to the apex of the elytron. Furthermore, the granulations of the head, pronotum, and legs are conspicuously elongate contrasted with the rounded granules of the other species. Other characters were also noted such as the type of maculation, etc. One species was thereby eliminated, and study was then made of the remaining ones to see if they presented any group characters. An examination showed that they could be differentiated into two groups based upon the comparative length of the last tarsal segment with the four preceding segments combined.

The groups are accordingly designated as Nubifera Group with one species; Crenata Group with eleven species; and the Sinuata-humerosa Group with fifteen species. The members of the Crenata Group have the last tarsal segment no longer than the four preceding segments combined. Those

of the Sinuata-humerosa Group have the last segment distinctly longer than the combined length of the preceding four. The longer last segment invariably has the claws more robust.

Descriptions of the different species have been arranged, in this paper, in a logical manner and the scheme has been consistently followed throughout. After a species has been traced to its position in the key, it should be carefully compared with its description.

The following arrangement has been used in all descriptions:

Size. The total length of the species, indicated under size, may fall short of the total length of the pronotum plus the elytra. This is explained by the fact that the pronotum is not in the same plane with the elytra, but is slightly deflexed. Measurements of the width are from the greatest width across the elytra.

Form and Color. The form of *Stenelmis* may vary somewhat from one species to the next but in degrees that make description difficult. In general, however, the range is from nearly sub-depressed to convex. The body is usually slender, and with the sides of the elytra nearly or quite parallel.

Head. All of our species, except *S. nubifera* Fall, have a dark median longitudinal band on the head with two lighter bands, nearly of equal width, on the inside of the eyes. The bands may be indistinct if the specimens have the head covered with earthy matter. In several cases the

color of the antennae and palpi aid in segregating certain species. The length of the antenna is helpful in certain groups. Several of the last antennal segments in many specimens are clothed with very fine yellow hairs and a few stiff ones near the apices of these segments. This character has not been found of specific value for the hairs may be present or absent within a series of a single species from one locality.

Pronotum. There is every gradation in the pronotum from one in which the median longitudinal sulcus or groove is very deep, with the sides nearly straight, to one in which the groove is barely evident. There is, likewise, much variation in the size and shape of the tubercle at base of pronotum between posterior angles and sulcus. In some species this tubercle is carinate posteriorly; in others the carina is obsolete. The tubercle immediately preceding the basal one is designated as the anterior tubercle and is variable to some degree. It is rounded and may be very prominent to inconspicuous. The oblique transverse impression separates the lateral tubercles in a varying degree and is occasionally deep immediately on the inside of the basal tubercle. Behind the anterior angle of the pronotum is a small transverse ridge, continuous with the lateral margin of pronotum, and variable in its distinctness. In two species, S. tarsalis n. sp. and S. concinna n. sp. the anterior tubercle barely unites with this transverse elevation. In some species the crenation of the lateral margin of pronotum is better marked than in others, although

this character seldom aids in the separation of closely related species. The pronotum, as well as the elytra, is covered with fine, usually close, and decumbent hairs. These appear to be more distinct on the margins of the median sulcus and the base of the third elytral interval. The pronotum is nearly always longer than wide, and especially so in the Sinuata-humerosa Group. In S. tarsalis n. sp., however, the width is slightly greater than the length.

Elytra. The keys, to a great extent, are based upon the maculation of the elytra. Therefore it is necessary to start with a specimen in clean condition or nearly so. However two species are known in which the elytra are entirely without spots or vittae. One species is known by the presence of six longitudinal vittae on the elytra. Other divisions within the two major groups have the humeral spot covering the umbone of the elytron, or the spot may be confined to the inside of the sixth elytral interval. When the vitta is divided into two spots, the basal one is termed the basal spot, the other is the apical spot. Rarely do individuals of the same species show every gradation between an entire vitta and one in which the spots are separate.

The first interval is designated, in this paper, as the one between the elytral suture and the first stria. In Stenelmis nubifera Fall the first stria is short with the fourth interval elevated at base. The seventh inter-

val is also elevated in this species. In all others of the genus in our fauna the first stria continues to the apex of the elytron. The third interval is elevated at base in all but one or two of the remainder of our species. The sixth interval is always more or less carinate from the base for about five-sixths of its length.

Venter. The apex of the last abdominal segment is always emarginate although the emargination may be partially covered above by a thinner part of the segment. In S. nubifera Fall the width of this emargination is about twice that of the greatest width of the last tarsal segment. In all others the width may be less than, to but little more than, that of the tarsal segments. The value of this character is especially significant in such closely related species as S. tarsalis n. sp. and S. concinna n. sp. The color of the venter is variable and is of little importance. In perfectly clean specimens the venter is a beautiful iridescent blue.

Legs. The character of the last tarsal segment is of fundamental importance in the separation of our groups of Stenelmis. The Sinuata-humerosa Group, in which the last segment is longer than the preceding four combined, has this segment more suddenly enlarged distally than in the Crenata Group. The claws in the latter group are slender and much less robust than in the other group. In two species the lower margin of the last tarsal segment is triangularly produced. This margin in all other species is straight or but little produced. The color of the tibiae and tarsi are useful in separating some species. With exception of S.

douglasensis n. sp. and S. grossa n. sp., all of the species in our fauna have the pronotum, venter, and legs granulate. The granulation of the femora refers to the larger ones on the outer surface. These are frequently intermixed with many fine granules. The hind tibiae are always longer than the middle and anterior ones. The anterior tibiae are longer or equal to the middle tibiae.

The Male Genitalia of *Stenelmis*

The genitalia of the males of *Dryops*, *Helichus*, *Elmis*, and a few other genera have been used to some extent in classification, but to the writer's knowledge, the genital structures of but one *Stenelmis* (*nevermanni* Hntn. 1935) have been figured and described for this purpose. Since some of the species of *Stenelmis* are difficult to segregate by external characters, a study of the male genitalia shows that this organ is of some importance. The genitalia are quite simple, consisting primarily of a large cylindrical basal piece, a median and two lateral lobes. The bases of the lobes are inserted for a short distance inside the posterior opening of the basal piece. The median lobe is longer than the lateral ones.

In our species of *Stenelmis* four general types of genitalia are represented: (1) lateral lobes of aedeagus without internal sinuation, (2) lateral lobes sinuate internally, median lobe without lateral processes, (3) lateral lobes sinuate, median lobe with lateral processes evenly rounded, and (4) lateral lobes sinuate, median lobe with lateral processes subangulate anteriorly. The first type is found in *S. nubifera* Fall and the remaining types are found among the species in the Eastern United States. It must be pointed out that the genitalia are not to be depended upon entirely for the identification of species, but should be used in conjunction with the keys and descriptions. For example, one type might be exhibited in each

of our chief groups of Stenelmis and the resemblance between the genitalia of two species, each in a separate group, may seem close.

Technique for Dissecting Male Genitalia

The technique for extracting the genitalia is simple and is as follows: The male is determined by the presence of the small spines on middle tibiae, all labels are removed from the pin, and the specimen is immersed for several minutes, or as long as necessary, in a 5-10% hot alcohol solution. After the beetle is sufficiently relaxed, it is held between the thumb and forefinger; a small, curved dissection needle is inserted between the last dorsal and ventral abdominal segments; and the genitalia and associated parts are removed. A few minutes boiling in a weak solution (5-10%) of caustic potash, then washing in distilled water will clear the structures sufficiently for study. It has been found very convenient to mount the genitalia below the dissected specimen upon a small celluloid slip with the genital parts immersed in a drop of commercial diaphane (euparal). Thus the genitalia is always with the specimen and is easily removed by dissolving the diaphane in 95% alcohol. The genitalia may also be mounted on glass slides in Canada balsam and covered with a coverslip.

SYSTEMATIC TREATMENT

Key to Genera of Dryopidae of the United States

At the time of this writing, the world genera are in the process of being revised by Mr. Howard E. Hinton, Berkeley, Calif., after which this key may be subject to modification. No attempt is made to extend it beyond the limits of the United States, and for that reason it is applicable only to the forms within this region. It is given simply to show the relationship of Stenelmis to the other genera.

At present it is considered that the Dryopidae are divided into three subfamilies as follows:

Subfamilies of Dryopidae

- 1. Head not entirely retractile; anterior lobe of prosternum ill defined or absent; mouthparts exposed; posterior coxae dilated and partly protecting femora.....Larinae
 Head usually retractile, usually protected beneath by prosternal lobe; mouthparts generally concealed.....(2)
 - 2. Anterior coxae transverse, with trochantin.....Dryopinae
 Anterior coxae globular, without trochantin.....Elminae
- Larinae
- Antennae clavate.....Phanocerus
 - Antennae not clavate.....Lara

Dryopinae*

- 1. Body rounded; last segment of maxillary palpi hatchet-shaped.....Lutrochus
 Body elongate, oval; last segment of maxillary palpi slender.....(2)
- 2. Second segment of antennae produced into an ear-like process.....(3)
 Second antennal segment not thus produced.....(4)
- 3. Antennae approximate; thorax with a deep-cut, sharp-edged longitudinal line on each side.....Dryops
 Antennae widely separated; thorax not as above...Helichus
- 4. Antennae distant.....Pelonomus
 Antennae approximate.....Throscinus

Elminae

- 1. Anterior tibiae without a patch of tomentum.....Stenelmis
 Anterior tibiae with tomentum.....(2)
- 2. Antennae of less than 10 segments.....(3)
 Antennae of 10 or 11 segments.....(4)
- 3. Antennae 7-segmented.....Macronychus
 Antennae 8-segmented.....Zaitzevia

*The genus *Oberonus* Csy. has been omitted from the key to the Dryopinae. At the present time I am not of the opinion that it should be made distinct from *Pelonomus* until additional specimens are examined to verify the characters set forth by Casey. I have examined the type, and it is true that the structure of the intermediate coxae is radically different from *Pelonomus*. However this may be no more than an imperfectly developed structure. The type of *Oberonus* is a male and the genitalia are exactly the same type as *Pelonomus*.

- 4. Maxillary palpi 3-segmented.....(5)
Maxillary palpi 4-segmented.....(6)
- 5. Sub-lateral carinae present.....Elmis
Sub-lateral carinae absent.....Narpus**
- 6. Head free, prosternum not lobed in front.....Ancyronyx
Head protected by prosternal lobe.....(7)
- 7. Second elytral stria terminating at about basal one-
third of elytra.....Elsianus
Second elytral stria complete or nearly so.....(8)
- 8. Prothorax with a sublateral carina extending from base
of apex.....(9)
Prothorax without a sublateral carina or with a very
short one.....(13)
- 9. Median longitudinal groove or impression present.....(10)
Median longitudinal groove or impression absent.....(11)
- 10. Transverse impression on apical one-third; two oblique
sub-basal impressions.....Microcylloepus
Transverse impression absent; no oblique sub-basal
impressions.....Cylloepus
- 11. No transverse or other impressions between sub-lateral
carinae.....Limnius
Transverse impression present.....(12)
- 12. Impression a little anterior of middle.....Neoelmis
Impression median.....Heterelmis
- 13. Sublateral carinae very short, from one-third to one-
half the length of thorax.....Heterlimnius
Sublateral carinae absent.....Simsonia

**This genus was incorrectly placed with the Dryopinae until its correct position was established by Hinton (Ent. Mo. Mag. Vol. 72, 1936, p. 57). I have examined the imperfect type of this species, and in addition, several perfect specimens. The type of antennae, as well as the globular anterior coxae, unmistakably place it in the Elmidae.

Groups of Stenelmis

An examination of our species shows that they may be separated into three fairly well defined groups as follows:

- 1. First elytral stria incomplete, terminating shortly behind scutellum; granules of head and legs elongate.

Nubifera Group

(see page 62)

First elytral stria complete from base to apex; granules of head and legs rounded.....(2)

- 2. Last tarsal segment distinctly longer than the four preceding combined, the last segment usually suddenly dilated beyond the middle; tarsal claws comparatively robust.....Humerosa-sinuata Group

(see page 109)

Last tarsal segment never distinctly longer than the preceding segments combined, the last segment not as noticeably dilated; tarsal claws comparatively slender.....Grenata Group

(see page 67)

NUBIFERA Group

Stenelmis nubifera Fall

(Pl. I, Fig. 1; Pl. II, Fig. 7; Pl. VI, Fig. 2)

1901. Stenelmis nubifer Fall, Occ. Papers Cal. Ac.

Sci. VIII, p. 238.

Original Description

"Elongate, parallel, finely pubescent. Head and prothorax black without lustre, the apices of the front angles rufescent; elytra dull yellow with a broad diffuse median cloud; beneath fuscous or fuscoferruginous, antennae and legs testaceous, the femora sometimes darker. Head rather coarsely punctate; antennae reaching almost to the hind angles of the prothorax. Prothorax about as long as wide, a little narrowed in front, sides moderately rounded just behind the middle, and also slightly so before the hind angles, which are a little acute; surface moderately closely granulate-punctate, disk with two small impressions at the middle of the base, a deeper longitudinal one each side extending to the middle, and an elongate median fovea. The base is slightly longitudinally channeled before the scutellum and between the small basal impressions, the channel is smooth at the bottom posteriorly. There is also in some examples an oblique impression extending from the lateral impressions inward and forward toward the median fovea. Elytra but little wider than the prothorax, nearly parallel, sides slightly sinuate; the rows of punctures feebly

impressed; intervals nearly flat, the fourth a little prominent at the base, the sixth finely carinate nearly to the tip. Beneath coarsely, rather densely scabrous-punctate, except the abdomen, which is less roughly sculptured, especially posteriorly.

"Length, 2-2.4 mm.

"Described from nine examples taken in a small mountain stream near Pasadena (Calif.).

"This is the first species of the genus to be reported from the Pacific Coast; it is not closely related to any of the eastern species."

Writer's Description

Size. Length, 2.15-2.7 mm.; width, .87-1 mm.

Form and Color. Body elongate, nearly parallel, and only slightly wider behind middle, moderately subdepressed. Color deep reddish-brown with a broad basal testaceous area on elytra and another before the apex.

Head. Frontal band absent; head granulate with the granules rather large, longitudinally elongate, and separated laterally by their own transverse diameters. Antennae and palpi testaceous; the antennae distinctly longer than the pronotum.

Pronotum. Length, .62-.8 mm.; width, .73-.9 mm. Widest just behind middle, then gradually tapering to base; slightly narrowed before the rounded sides and sinuate before apex. Base of pronotum distinctly wider than apex. Entire surface moderately, closely, and evenly granulate,

the granules rounded or elongate and separated by less than their diameters. Median sulcus moderately deep, rather suddenly narrowed to the two posterior carinae before the scutellum. On each side of sulcus, two elongate tubercles, the posterior one of which is distinctly carinate before and extending to the base, the anterior one slightly prominent posteriorly and gradually reduced anteriorly to the surface of the disc. A slight depression on each side of the sulcus at base.

Elytra. Length, 1.6-2 mm.; width, .87-1 mm. Basal band occupying from one-third to one-fourth of the elytral length; the apical one about one-fourth; suture darker to the apex. Elytral punctures very broad and deep basally becoming reduced in size and depth toward the apex, on the apical band of which the punctures are nearly obsolete. First elytral stria incomplete, irregularly punctured and extending to about one-fifth of elytral length. Intervals nearly flat except the fourth which is slightly elevated and broadened at base.

Venter. Brown to dull grey. Granules of abdomen a little more elongate than on pronotum, becoming smaller and fewer towards apex. Apex of last abdominal segment with a very broad, shallow emargination which is usually equal to twice the greatest width of the last tarsal segment.

Legs. Hind tibiae, .65-.8 mm.; middle tibiae, .5-.65 mm.; anterior tibiae, .5-.65 mm. The last tarsal segment perceptibly shorter than the four preceding combined. All femora with granules rather close and longitudinally elong-

ate. Middle tibia of male with a row of about ten evenly spaced small spines on the inside. Posterior tibiae with a similar set of spines nearly equally spaced and about fifteen in number. Femora, tibiae, and tarsi uniformly colored as the venter.

Notes on Types. This species was described from a small series of specimens taken at Pasadena, Calif., Oct. 31, 1892. I have examined the type and two paratypes.

Remarks and Comparative Notes. In the series of specimens examined, some variation has been noted in pronotal sculpturing; the widths of the elytral bands are slightly variable, and there is some deviation in the ratio of the elytral length to the combined width. The demarkation between the bands is usually indistinct. In some specimens there is a tendency for the antennae to become darker toward the distal segment.

Notes on Distribution. In addition to the types from Pasadena, Calif., the species has been examined from the following localities:

Calif.: Siekiyou Nat. Forest, 7-14-35, R.H. Beamer.

Oregon: Bonneville, 7-3-35, R.H. Beamer.

Wash.: Kalama, 7-4-35, R.H. Beamer.

Location of Types. Type and paratypes in the collection of Mr. H.C. Fall, Tyngsboro, Mass.; one male paratype in the Francis, Huntington Snow Entomological Collection,

University of Kansas.

The distribution of this species has been extended for nearly 900 miles from the type locality.

CRENATA Group

Key to the Species of the Crenata Group

1. Each elytron with three longitudinal vittae

sexlineata n.sp.

Each elytron with more than one vitta or elytron

bi-maculate.....(2)

2. Humeral spot or vitta on inside of sixth interval.....(3)

Humeral spot or vitta embracing umbone of elytra.....(5)

3. Body very robust, and with the elytral spots or stripe wider, covering considerably more than the fifth interval; third elytral interval sharply elevated at base.....crenata (Say)

Body very elongate, with the elytral spots or stripe narrower, covering but little more than the fifth interval; third interval but slightly elevated at base and very short.....(4)

4. Length 2.85-2.9 mm.; median lobe of aedeagus distinctly constricted at middle.....exigua n.sp.

Length 3.2-3.4 mm.; median lobe of aedeagus more nearly parallel.....beameri n.sp.

5. Vitta very broad and covering nearly all of the inner space between the first and sixth intervals; vitta extending cephalad outside elevated apex of sixth interval.....lateralis n.sp.

Vitta narrower and never extending internally beyond the second or third intervals.....(6)

6. Lower margin of last tarsal segment with a conspicuous angular process; species generally larger, 3.2-3.6 mm. (7)
- Lower margin of last tarsal segment without such a process, size usually smaller, 2.6-3.25 mm.....(8)
7. Apical abdominal emargination equal to width of last tarsal segment; tibiae testaceous only at base; pronotum generally rounded at sides.....concinna n.sp.
- Apical emargination very inconspicuous and much less than width of last tarsal segment; tibiae and apices of femora testaceous; pronotum generally more rounded tarsalis n.sp.
8. Basal tubercle of pronotum elongate and carinate.....(10)
- Basal tubercle just perceptibly elongate and never carinate.....(9)
9. Each elytron distinctly bimaculate.....knobeli n.sp.
- Each elytron with an entire vitta.....bicarinata Lec.
10. Elytra twice longer than its width, the legs entirely testaceous.....exilis n.sp.
- Elytra less than twice its width, the legs wholly or in some part dark.....meta n.sp.

CRENATA Group

Stenelmis sexlineata n. sp.

(Pl. I, Fig. 2; Pl. VI, Fig. 6)

Size. Length, 3.2-3.6 mm.; width, 1.25-1.4 mm.

Form and Color. Body elongate, parallel, moderately subdepressed. Color of elytra dark brown to black and with three longitudinal brownish testaceous vittae on each elytron. The vitta of the fourth and fifth intervals not extending laterad of the sixth interval to embrace the umbone.

Head. Granulations between eye and band rounded and generally separated from two to four times their own diameters. Antennae and palpi brownish-testaceous. Antennae distinctly shorter than pronotal length.

Pronotum. Length, 1-1.15 mm.; width, .95-1.12 mm. Disc of pronotum deep brown but with posterior four-fifths of sulcus and surface caudad of lateral oblique impression, grey. Widest behind middle then tapering to base but not suddenly. Rather sharply sinuate before rounded sides, then straight and nearly parallel to apex. Base of pronotum distinctly and conspicuously wider than apex. Granules between the median sulcus and the lateral tubercles; fine granules separated by nearly twice their own diameters. Median sulcus deep and extending from apical one-fifth to base, sides parallel. An oblique impression on either side of median sulcus deep and clearly separating lateral tubercles; basal tubercle prominent, elongate, rounded anteriorly distinctly narrowed and carinate posteriorly to base

of pronotum. Anterior tubercle prominent, rounded, scarcely wider in any one diameter. Anterior angles of pronotum dull rufous.

Elytra. Length, 2.3-2.75 mm.; width, 1.25-1.4 mm.

Each elytron with three longitudinal brownish-testaceous vittae. Vitta on inside of the sixth interval entire, not at all interrupted at middle, and occupying all of fourth and fifth intervals from base of elytron to apex; this vitta wider at base, narrowed toward middle, and again wider near the apex in conformity with combined widths of the intervals covered. First interval dark brown from behind scutellum to near apex; the second, including striae on either side, testaceous from near its base for three-fourths the length of interval. A third vitta extending from the humerus on the outside of the sixth interval to the apex. First elytral stria continuous from elytral base to apex. Third interval distinctly raised at base and very convex.

Venter. General color grey with the lateral and posterior margins of abdominal segments and median portion of metasternum brownish. Emargination of last abdominal segment just less than greatest width of last tarsal segment.

Legs. Hind tibiae, .9-1.12 mm.; middle tibiae, .75-.9 mm.; anterior tibiae, .85-.95 mm. Last tarsal segment distinctly shorter than the four preceding combined. Granules of hind femora separated from two to four times their own diameters. All femora darker above and below, the apices of femora, tibiae, and tarsi brownish-testaceous.

Notes on Types. Holotype male, 7-19-33; allotype female, 7-22-32; and numerous paratypes, Lawrence, Kansas, collected at light from July 11 to August 5, 1930-1935, Milton W. Sanderson. Additional paratypes, Douglas Co., Ka., 9-24-1923, R.H. Beamer; August, E.S. Tucker; Olathe, Kansas, 5-6-34, S. Clare; Manhattan, Kans., Apr. 16, 1933, and 1934, C.W. Sabrosky; 3 mi. n. Onaga, Kansas, 8-15-01, French Creek; Belvidere, Ks., 7/2/04; Riley Co., Kan., Sept. 29, C.D. Adams; Kans., (Coll. Hubbard and Schwarz); Texas, Belfrage; Canyon, Tex., 7-9-33, W. Benedict. Types and paratypes deposited in the Francis Huntington Snow Entomological Collection, University of Kansas. Paratypes in the Harvard College Collection; in the collections of Doctor Paul N. Musgrave, Fairmont, W. Va.; and Mr. C.W. Sabrosky, East Lansing, Mich.

Remarks and Comparative Notes. The present species is the only known one in this group which is six vittate, and is to be associated with S. crenata (Say). It is easily separated from this, and other related species, by the type of its maculation. The median lobe of the aedeagus is without lateral processes as in S. crenata. An occasional specimen shows very clearly the grey area between the basal pronotal tubercles as in some specimens of S. crenata and S. beameri n. sp.

Stenelmis crenata (Say)

(Pl. I, Fig. 3; Pl. VI, Fig. 3)

1824. E. crenatus Say, App. vol. II. Keating's Exp. to source of St. Peters Riv. under Maj. Long, Plila. p. 275.
1859. Stenelmis sordida Motschulsky, Etudes Entomologiques 8 me année 1859 Helsingfors, p. 51.
1869. E. crenatus Say. A description of the insects of North America, by Thomas Say, edited by John L. LeConte. Vol. I, p. 181 (contains original description).

Original Description

"Thorax with four elevated lines; each elytrum with two dull rufous spots.

"Inhabits Pennsylvania.

"Parnus crenatus? Knoch in Melsh. Catal.

"Body blackish-brown; front with two dilated, cinereous, longitudinal lines; antennae and mandibles rufous; thorax with four obtuse, elevated, longitudinal lines; two intermediate ones nearly confluent at each end; lateral ones more distant, slightly interrupted behind the middle; elytra with striae of dilated impressed punctures; an elevated line from the humerus terminates rather before the tip; another elevated line nearer the margin also originates at the humerus and becomes obsolete before the middle; a third elevated line originates at the middle of the base and also becomes obsolete before the middle of the elytrum;

an oblong rufous spot on the humerus and another near the tip; tarsi dull rufous.

"Length less than three-twentieths of an inch."

Writer's Description

Size. Length, 3-3.35 mm.; width, 1.2-1.37 mm.

Form and Color. Body generally very broad and robust, subdepressed, distinctly wider behind. Color of elytra dark brown to black, each elytron with two testaceous spots or with an entire vitta which is on the inside of the sixth interval.

Head. Granulations between eye and band rounded, separated from one to several times their own diameters. Antennae and palpi brownish-testaceous. Antennae distinctly shorter than pronotum.

Pronotum. Length, .87-1.1 mm.; width, .87-1.12 mm. Anterior angles and margin rufescent. Base of pronotum from posterior angles to anterior end of basal tubercle and all of disc between tubercles a light grey in color. Margins and posterior half of median sulcus generally of same color. Remainder of pronotum dark brown to black. Pronotum widest just behind middle then distinctly rounded and narrowed to posterior angles; in some specimens, slightly sinuate before hind angles. Base of pronotum narrower than behind middle. Margins in front of rounded sides sinuate then faintly inwardly curved to apex. Base of pronotum distinctly conspicuously wider than at apex. Granules

between lateral tubercles and sulcus very fine and sparse, separated by several times their diameters. Median sulcus very deep, widest before middle then narrowed behind. Sulcus extending posteriorly from apical one-fourth or one-fifth to base. Oblique impression on either side of median sulcus distinct and clearly separating lateral tubercles. Basal tubercle elongate, narrowed posteriorly, and distinctly carinate to base of pronotum; anterior tubercle prominent, a little longer than wide.

Elytra. Length, 2.12-2.37 mm.; width, 1.2-1.37 mm.

Each elytron with a humeral and subapical spot or with spots very distinctly united into a vitta but which is always on the inside of sixth interval. Vitta or spots usually covering fourth and fifth intervals with apex of vitta or sub-apical spot usually reaching to about one-half the distance between end of carina of sixth interval and apex of elytron. First elytral stria complete from base to apex. Third interval distinctly raised and rounded at base, the elevation extending a little beyond basal declivity. Elytral punctures deep on disc then smaller toward apex but never obsolete in apical region.

Venter. Grey to brownish with apical margins of abdominal segments usually lighter. Abdominal emargination very inconspicuous and considerably less than the greatest width of last tarsal segment.

Legs. Hind tibiae, .67-1 mm.; middle tibiae, .67-.85 mm.; anterior tibiae, .75-.9 mm. Last tarsal segment equal to the

combined length of the four preceding. Granules of femora rounded, separated from once to twice their own diameters. Femora dark except apex which is testaceous. Tibiae and tarsi testaceous, the tarsi slightly darker.

Notes on Types. Since the original types of this species are lost, new types are hereby designated.

Neoholotype, neocallotype, and neoparatypes, Guthrie, Tenn., 7-26-34, M.W. Sanderson, collected in Red River. Additional neoparatypes from the following localities: Hull, Que. 27. VIII 1931, W.J. Brown (Can. Nat. Coll.); Knowlton, Que. 12. VI., 8. VIII, 21. VIII, 1930, L.J. Milne (Can. Nat. Coll.); Wakefield, Que. 7-VIII '31 (Can. Nat. Coll.); Winchester, Va. 7-21-34, M.W. Sanderson, Hogue Creek; Buffalo, N.Y.; "Mass."; Romney, N.H. VII. 18. '30, Darlington; Plymouth, VIII. 20. 1925, Darlington; Freeville, N.Y. 6. V. 1915 (H.H. Knight Coll.); "Pa" (H.H. Knight Coll.); Biol. Field Sta., Ithaca, N.Y. X. 2, -13 (H.H. Knight Coll.); The Cove, Ithaca, N.Y. X 2, 1913 (H.H. Knight Coll.); Inlet Valley, Ithaca, N.Y. X-2 1913 (H.H. Knight Coll.); Ithaca, N.Y. (H.H. Knight Coll.) Concordville, Md. 7-18-34, M.W. Sanderson; Alpena, Mich. Oct. 5 '08, Nason (C.A. Frost Coll.); the following neoparatypes from the collection of P.N. Musgrave: Greenbrier, Tenn., June 12, '31, Little Pigeon River; Fairmont, W. Va., Aug. 3, at light; Btn. Va.; Head and Marlinton, W. Va., July 13, Elk River; Mineral Jo., W. Va., July 20, Johnny Cake Run; Mt. Storm, W. Va., Aug. 19, 1930, Johnny Cake Run; Wardens-

ville, W. Va., July 19 and Aug. 22; at light, and in Moore's Run; Huntsville, Ala. 6-17, Dry Fork; Pocahontas Co., W. Va., Jun. 29, Minehaha Springs.

Remarks and Comparative Notes. In his original description, Say states, "Inhabits Penn." LeConte (1852) subsequently mentions Niagara River and again Pennsylvania as localities from which specimens were taken. Horn (1870), in regard to this species states, "Our common eastern species easily known by its broader thorax with more strongly rounded sides. Disc is channeled and on each side three obtuse tubercles. Entire surface is opaque and its general aspect more depressed. Abundant in waters of Pennsylvania."

Since Say's types of S. crenata are apparently lost, the author has redescribed what he regards as this species, and has designated new types. An examination of specimens determined by LeConte and Horn as S. crenata, examination of material from the Niagara and Pennsylvania, and many additional specimens from a wide range of localities over the eastern United States, shows that we have one very common species which might easily have been that of Say.

An examination of the type female of S. sordida Mots. shows that it is the same species as S. crenata. Since the later has priority by thirty-five years, S. sordida is to be dropped from our lists. The elytral spots are not evident in the type due to a thin incrustation of debris. The sordid aspect of the specimen no doubt suggested its name to Motschulsky. As indicated in the original description,

his specimen was from Pennsylvania.

Hundreds of individuals of the present species have been examined from localities, as already indicated, and there is considerable variation within the series. There is some variation in size, relative proportions of length and width of pronotum, although the two measurements are generally the same, and in the character of the elytral maculae. Without exception, the macula is confined to the inside of the sixth interval although the variation from an entire to a broken vitta is notable. In some specimens, there is no indication of a separation of the humeral from the sub-apical spot.

Of the many specimens that have been examined, a single example has been found in which the lower margin of the last tarsal segment is prolonged nearly as in S. tarsalis n. sp. and S. concinna n. sp. The latter species, however, have the humeral spot covering the umbones. The present species may be separated from its closest ally, S. beameri n. sp., by its less elongate and more depressed form, the wider vittae, which in S. beameri usually cover no more than the fifth interval, and by its peculiar type of genitalia. The median lobe possesses two rounded lateral processes on the apical half, a character which is found in no other member of the Grenata Group

Notes on Distribution. In addition to the specimens from various places designated on types, specimens from the following localities have been examined:

United States

Conn.: Cornwall

Mass.: Tyngsboro; Wellesley; Walpole; Plymouth

Maine: Monmouth; Paris

N.Y.: Batavia; Staten Island

Tenn.: "Tenn."

Md.: "Md."

Penn.: "Penn."; "Pen."; Lancaster

Texas: Columbus

D.C.: Washington

Va.: Fredrkgb.; Pennington Gap

Mich.: Gd. Ledge; Cheboygan Co.

Kans.: Manhattan; Lawrence; Olathe

Canada

Que.: Hull, Knowlton, Knowlton's Landing, Wakefield,
Otter Lake, Fairy Lk., South Bottom, MacDonald,
Covey Hill, Kazubazua.

Ontario: Bothwell; Normandale; Miner's Bay; Dundas;
Walsh; Ronteau Pk.; Rideau R.; Ottawa.

N.B.: Boiestown.

Location of Types. Neoholotype, neocallotype and neoparatypes deposited in the Francis Huntington Snow Entomological Collection, University of Kansas. Additional neoparatypes deposited in nearly all the collections given under acknowledgements.

Stenelmis exigua n. sp.

(Pl. I, Fig. 4)

Size. Length, 2.85-2.9 mm.; width, 1-1.1 mm.

Form and Color. Body elongate, nearly parallel, scarcely wider behind, moderately subdepressed. Color deep brown to black. Each elytron with a narrow testaceous humeral spot and a sub-apical one. Humeral spot on inside of sixth interval.

Head. Granulations between frontal band and eye minute, rounded, and generally separated from two to four times their own diameters. Antennae and palpi testaceous. Antennae just perceptibly longer than pronotum.

Pronotum. Length, .87-.9 mm.; width, .75-.85 mm. Wider behind the middle, then a little narrowed to base. But faintly sinuate before hind angles. Margin convergent from rounded sides to apex before which there is a double sinuation, the one immediately before the anterior angles smaller and less distinct. A little wider at base than at apex. Granules on either side of median sulcus at base fine and separated by two or three times their diameters. Median sulcus deep and extending from apical one fourth to base, the sides of sulcus slightly narrowed behind. Oblique impression on either side of median sulcus rather deeply separating lateral tubercles. Basal tubercle rounded anteriorly and elongate but scarcely distinctly carinate. Anterior tubercle rounded, scarcely prominent. Anterior

angles and margin faintly to distinctly refescent; remainder of pronotum dull black and in some individuals with a dull greenish cast.

Elytra. Length, 2.05-2.15 mm. Humeral spot narrow, occupying fifth interval, extending from behind humerus to about one-fifth of elytral length. Sub-apical spot extending but little beyond apex of carina of sixth interval, covering all of fifth and a part of fourth intervals. First stria complete from base to apex. Third interval faintly elevated at base. Strial punctures moderate, never obsolete near apex.

Venter. Dark through a light brown to dull grey or green with posterior and lateral margins of segments lighter. Apical emargination nearly equal to width of last tarsal segment.

Legs. Hind tibiae, .87-.9 mm.; middle tibiae, .7-.8 mm.; anterior tibiae, .75-.85 mm. Last tarsal segment a little shorter than the four preceding combined. Granules of femora (outer side) separated by no more than their own diameters, frequently less than. Femora uniformly dark except apex which is testaceous. Tibiae and tarsi testaceous.

Notes on Types. Holotype male, and allotype female, Polk, Arkansas, July 21, 1928, L.D. Beamer, collected at light. Paratype male, same data; paratype female, "Mo.", Otto Lugger Collection.

Remarks and Comparative Notes. This species is very closely related to S. beameri n. sp. and may be separated

as follows: By actual measurement the pronotum and elytra are shorter in S. exigua, and the legs comparatively shorter. In the few specimens of the present species at hand, there is a fairly distinct double sinuation of side of pronotum in front of rounded side, while S. beameri has only the sinuation immediately in front of rounded sides. The sinuation before the posterior angle of pronotum is also more distinct in S. exigua. Reference to the male genitalia shows a much greater constriction of the median lobe in S. exigua than in S. beameri. This species is about the size of S. exilis n. sp. and S. knobeli n. sp., but differs from either by having the presence of humeral spot of elytra on the inside of sixth interval.

Location of Types. Holotype and allotype in the Francis Huntington Snow Entomological Collection, Univ. of Kans. One paratype in collection of Dr. Paul N. Musgrave. The second paratype deposited in the collection of the University of Minnesota, from which it was borrowed for study.

Stenelmis beameri n. sp.

(Pl. I, Fig. 5)

Size. Length, 3.2-3.4 mm.; width, 1.2-1.25 mm.

Form and Color. Body elongate, nearly parallel, scarcely wider at all behind, moderately subdepressed. Color, black, each elytron with a narrow testaceous vitta broadly interrupted at middle. Vitta not extending beyond the sixth interval.

Head. Granulations between frontal band and eye rounded and generally separated by a little more than their diameters. Antennae and palpi testaceous; antennae as long as pronotum.

Pronotum. Length, .95-1.05 mm.; width, .9-1 mm. Color brown to dull black. Distinctly wider behind middle then gradually tapering to base. Sinuate before the rounded sides then convergently straight to apex. Base of pronotum distinctly wider than apex. Granules on either side of sulcus at base separated from slightly less to a little more than their own diameters. Median sulcus deep and extending from apical one-fourth to base; sides parallel. An oblique impression on either side of the median sulcus clearly separating the lateral tubercles; the basal tubercle prominent, elongate, narrowed toward base of pronotum, and distinctly carinate; the anterior one prominent, rounded though very slightly longer in its longitudinal diameter. Anterior angles and margin and posterior angles, dull rufous.

Elytra. Length 2.3-2.5 mm.; width, 1.2-1.25 mm.

Humeral spot narrow, occupying no more than fifth interval, and extending from just behind the humerus to about one-fourth or one-third of remainder of fifth interval. First elytral stria complete. Elytral punctures moderately impressed, a little larger on disc, punctures becoming smaller toward apex, but never obsolete before reaching it. Third interval but slightly raised and rounded on basal declivity.

Venter. General color grey with lateral margins of metasternum and lateral and apical margins of abdominal segments testaceous. Emargination of last abdominal segment equal to the greatest width of last tarsal segment.

Legs. Posterior tibiae, 1-1.1 mm.; middle tibiae, .8-.87 mm.; anterior tibiae, .87-1 mm. Last tarsal segment shorter than the four preceding combined. Granules of femora rounded and separated by no more than their own diameters. Femora darker above and below; the apices and margins, tibiae and tarsi brownish-testaceous.

Notes on Types. Holotype male, allotype female, and numerous paratypes, Berryville, Arkansas, 7-4-34, R.H. Beamer, and M.E. Griffith, collected at light. Additional material from Noel, Missouri, 7-19-34, Beamer and Lawson, at light; Hollister, Missouri, 7-28-34, M.W. Sanderson, Long Creek.

Remarks and Comparative Notes. In S. beameri n. sp. there is some variation in the length of the elytral spots, there being a tendency for union in the middle of elytron

in some specimens, though there is always some clouding medially. The female allotype shows a greyish band at base of pronotum which extends from hind angles to anterior end of basal tubercles, then gradually curves to the opposite end basal angle of pronotum. This also occurs in some other specimens of this species. This coloration is quite characteristic of S. crenata (Say).

The present species keys out with S. crenata by its type of maculation, but is readily separated by its much more slender and elongate form. The maculation of S. beameri scarcely covers more than the fifth interval, the raised third interval at base is slight compared with S. crenata, and the median lobe of the aedeagus of S. beameri is without lateral processes.

Location of Types. Holotype, allotype, and paratypes deposited in the Francis Huntington Snow Entomological Collection, University of Kansas. Additional paratypes in the collections of Dr. Paul N. Musgrave, Fairmont, W. Va.; and Harvard College.

Stenelmis lateralis n. sp.

(Pl. I, Fig. 6; Pl. V, Fig. 8; Pl. VI, Fig. 4; Pl. VII)

Size. Length, 2.65-3 mm.; width, .95-1.1 mm.

Form and Color. Body elongate, sides parallel, scarcely, if at all, wider behind than across humeri; moderately subdepressed. Color, black; each elytron with a very broad yellow-testaceous vitta which embraces umbone and extends on inside of sixth interval nearly to apex. Vitta also extending cephalad on lateral side of sixth interval.

Head. Granulations between eye and band separated by about twice their diameters. Antennae and palpi yellow, testaceous; the antennae slightly longer than pronotum.

Pronotum. Length, .83-.87 mm; width, .75-.8 mm. Widest behind middle, then gradually tapering to base before which there is a slight sinuation; lateral margin sinuate in front of rounded sides, then narrowed and straight to apex. Base slightly wider than apex. Granulations on either side of median sulcus at base separated by two to three times their own diameters. Sulcus moderately deep and extending from apical one-third to near the base, perceptibly narrowed behind. Oblique impression on either side of sulcus, distinct and clearly separating lateral tubercles. Basal tubercle elongate, narrowed toward base of pronotum, but not distinctly carinate; the anterior one rounded; entire anterior margin of pronotum rufescent.

Elytra. Length, 1.95-2.15 mm.; width, .95-1.1 mm. Vitta occupying all of inner space between first stria and

sixth interval. Basal margin of elytra darker. Sutural stripe often a little broader toward apex. First elytral stria complete from base to apex. Third interval perceptibly raised and rounded basally. Elytral punctures large and deep, becoming smaller and shallower toward apex; punctures obsolete behind end of carina of sixth interval.

Venter. General color brownish to grey, the abdominal segments with posterior border testaceous. Apical emargination about equal to width of last tarsal segment.

Legs. Hind tibiae, .8-.85 mm.; middle tibiae, .65-.7 mm.; anterior tibiae, .65-.7 mm. Last tarsal segment distinctly shorter than four preceding combined. Granules of femora closely placed and usually separated by less than their own diameters. All femora darker above and below, the tibiae and tarsi testaceous.

Notes on Types. Holotype male, allotype female, and numerous paratypes from Berryville, Arkansas, 7-4-34, R.H. Beamer and M.E. Griffith, collected at light. One paratype from Schellburg, Pa., VIII 16. Additional material from Hollister, Mo., 7-28-34, M.W. Sanderson, Long Creek; Noel, Missouri, 7-19-24, Beamer and Lawson, at light; Ireland, Miss., 7-7-34, M.E. Griffith, at light; Lucedale, Miss., June 22, P.N. Musgrave, White's Creek; Winchester, Va., 7-21-34, M.W. Sanderson, Hogue Creek; Clarksville, Tenn.; 1915, at light.

Remarks and Comparative Notes. The present species is of particular interest since it appears to be very abundant.

in several localities of the Ozark Mountain region in Arkansas and Missouri. The elytral vitta is always entire and is much broader than in any other known species of our fauna. The extension of the vitta cephalad on the outside of the carina of the sixth interval is very characteristic of this species. This character is found in an occasional specimen of S. mera n. sp., but the broader stripe with no indication of bimaculation will readily distinguish the two.

Location of Types. Holotype, allotype, and paratypes in the Francis Huntington Snow Entomological Collection, University of Kansas. Additional paratypes in the collections of Dr. Paul N. Musgrave, Canadian National Collection, Harvard College Collection, C.A. Frost collection, and the collection of Harry H. Knight, Iowa State College.

Stenelmis concinna n. sp.

(Pl. II, Fig. 1)

Size. Length, 3.3-3.6 mm.; width, 1.3-1.5 mm.

Form and Color. Body generally broad and robust, moderately convex, nearly parallel behind. Color dark brown to dull black; each elytron with a testaceous spot on humerus which extends on inside of sixth interval, and an elongate sub-apical one.

Head. Granulations between eye and band rounded and separated by about twice their own diameters. Antennae and palpi brownish-testaceous. Antennae equal in length to pronotum.

Pronotum. Length, 1-1.1 mm.; width, .9-1 mm. Widest just behind the middle then rounded to posterior angles. In some specimens slightly sinuate before hind angles. Margins in front of rounded sides narrowed and subparallel to apex. Before the middle of sides, a slight sinuation. Base of pronotum distinctly wider than apex. Granules between lateral tubercles and sulcus separated by about twice their own diameters. Median sulcus very deep, margin behind middle conspicuously raised and prominent. Inner sides of sulcus perpendicular in some specimens just before base; sulcus extending posteriorly from apical one-fourth and slightly narrowed toward base. Oblique impression on either side of sulcus distinct and rather deeply separating lateral tubercles. Basal tubercle elongate, narrowed toward base and distinctly carinate to base, in some

individuals acutely so; anterior tubercle elongate, about three times longer than its greatest width; anterior angles and margin rufescent.

Elytra. Length, 2.35-2.65 mm.; width, 1.3-1.5 mm.

Small humeral spot embracing umbone, extending to and covering fourth interval at base and occupying only about one-fifth of elytral length. Sub-apical spot extending from a point considerably behind the middle to a little beyond the apex of carina of sixth interval and occupying fifth and a part of fourth and sixth intervals. First elytral stria complete from base to apex. Third interval distinctly elevated and rounded at base, the elevation extending to near the posterior border of humeral spot. Elytral punctures deep at base and on disc and becoming shallow and smaller toward apex, never obsolete in apical region.

Venter. General color deep brown to grey with apical margins of abdominal segments lighter. Last ventral abdominal segment almost wholly dark. Apical emargination conspicuous, equal to width of last tarsal segment.

Legs. Hind tibiae, 1-1.12 mm.; middle tibiae, .87-.95 mm.; anterior tibiae, .9-1 mm. Last tarsal segment shorter than the four preceding. Lower margin of apex of this segment prolonged into a conspicuous angulate process. Granules of hind femora rounded, very closely placed. Femora and tibiae dark in color except base of tibia which is brownish-testaceous. Tarsi brownish-testaceous.

Notes on Types. Holotype male, allotype female and a number of paratypes, North River, N.Y., 7-7-34, M.W. Sanderson, collected in Hudson River. Additional paratypes, Wakefield, Que., May 29-Aug. 7, 1930-1932, W.J. Brown, (Can. Nat. Coll.); Knowlton, Que., June 29-Aug. 8, 1928-1930, L.J. Milne, (Can. Nat. Coll.); Bedford, Mass., VII-15-11, (C.A. Frost Coll.); Mouth of Williams River, W. Va., July 10, 1933, (P.N. Musgrave Coll.); Marlin, W. Va., July 29, 1930, Greenbrier River, (P.N. Musgrave Coll.); "N.C."

Remarks and Comparative Notes. In the large series of this species which the author has examined, all of the specimens show a distinct and wide separation of the humeral from the sub-apical spot, there being no indication of a union. A single specimen of this species from Marlin, W. Va., does not have the process of the tarsal segment prominent. However, the humeral spot covers the humerus, and the median lobe of aedeagus is without processes--characters which exclude it from being placed with S. crenata (Say).

This species is very closely related to S. tarsalis n. sp. by the presence of the angulate process on the lower margin of last tarsal segment, and by its type of elytral maculation. It may be distinguished from S. tarsalis by having the tibiae nearly completely dark; the apical abdominal emargination is equal to the tarsal width, and the humeral spot is much shorter than in S. tarsalis. The sides of the median lobe are nearly parallel in the present species.

Location of Types. Holotype, allotype, and paratypes in the Francis Huntington Snow Entomological Collection, University of Kansas. Additional paratypes in the Canadian National Collection, C.A. Frost Collection and the collection of Doctor Paul N. Musgrave.

Stenelmis tarsalis n. sp.

(Pl. II, Fig. 2; Pl. V, Fig. 6, Pl. VI, Fig. 1)

Size. Length, 3.2-3.5 mm.; width, 1.25-1.5 mm.

Form and Color. Very broad and robust, moderately convex, wider behind than across the humeri. Elytra black; each elytron with a small entire spot which covers humerus and an elongate sub-apical one.

Head. Granulations between eye and band rounded, and generally separated by two to three times their own diameters. Antennae and palpi brownish-testaceous, antennae slightly shorter than pronotal length.

Pronotum. Length, .95-1.12 mm.; width, 1-1.2 mm. Widest considerably behind the middle, then rounded to posterior angles before which there is a vague sinuation. Lateral margins narrower in front of rounded sides and nearly straight to apex; a very feeble sinuation about half way between rounded sides and the anterior angles. Base of pronotum distinctly wider than apex. Granules on each side of sulcus separated by from once to twice their own diameters. Median sulcus very deep and with lateral margins perpendicularly produced internally for nearly the entire length. Sulcus extending posteriorly from about the apical one-fifth to near posterior margin of pronotum, nearly parallel-sided throughout its length. A distinct oblique impression on either side of median sulcus clearly separating lateral tubercles. Basal tubercle elongate, narrowed

posteriorly, and distinctly carinate almost to basal margin of pronotum, anterior one elongate, nearly three times longer than its own width. Anterior margin of pronotum rufescent, more distinctly so at angles. A light greyish area between the basal tubercles.

Elytra. Length, 2.25-2.6 mm.; width, 1.25-1.5 mm.

Small humeral spot embracing umbone, extending posteriorly on inside of sixth interval for about one-fourth of elytral length. Spot usually not extending beyond fifth interval internally. Sub-apical spot extending from behind middle to a point slightly beyond end of carina of sixth interval. This spot embracing fifth and part of fourth intervals in this region. First elytral stria complete from base to apex. Third interval distinctly elevated and rounded on basal declivity. Elytral punctures very broad and deep on either side of third interval at base. Remaining punctures deep but becoming shallow and smaller toward apex of elytron, never obsolete in apical region.

Venter. General color grey to nearly light blue, sometimes iridescent, and with apical margins of abdominal segments and nearly the entire apical segment brownish-testaceous. Apical emargination of last segment inconspicuous, not more than one-half the greatest width of last tarsal segment.

Legs. Hind tibiae, .87-1.12 mm.; middle tibiae, .75-.9 mm.; anterior tibiae, .82-.95 mm. Last tarsal segment shorter than the four preceding combined. Granules of

hind femora separated by little more than their own diameters. All femora entirely grey in color except apices which are lighter. Tibiae brownish-testaceous but with tarsi just slightly darker. Lower margin of last tarsal segment prolonged into a prominent process.

Notes on Types. Holotype male, allotype female, and a number of paratypes, Winchester, Va., 7-21-34, M.W. Sanderson, Hogue Creek. Additional paratypes: Berryville, Ark., 7-4-34, R.H. Beamer, at light; Ottawa Co., Okla., June 4, 1930, 7-30-34, M.W. Sanderson; Guthrie, Tenn., 7-26-34, M.W. Sanderson; Annadale, Va., 7-21-34, M.W. Sanderson; Lynchburg, Va., July 12, P.W. Musgrave, Flat Creek; Burlington, W. Va., August 22, 1930, Patterson Creek; Wardensville, W. Va., August 22, 1933, Moore's Run; July 19, Moore's Run, and at light; Romney, W. Va., Aug. 22, 1930, South Br. Potomac; Maysville, W. Va., Aug. 19, 1933, Lunice Creek; Pocahontas Co., W. Va., July 31, 1930, Minnehaha Springs; Franklin, W. Va., Aug. 9, 1933, Thorn Creek; Clifton Forge, Va., July 13, Duplap Creek, P.W. Musgrave, at light; Batavia, N.Y., 7 Sept., 1915, Sept., 1915 and 8 Sept., 1915, H.H. Knight; Ottawa, Ont., 14, VIII, 1912, G. Beaulieu; Ottawa, Can., 15, VIII, 1912, G. Beaulieu.

Remarks and Comparative Notes. In the type there is a prominent post-coxal elevation on the first abdominal segment, but which is less conspicuous in other specimens. This character is also found in other species but usually to a less marked degree. The anterior and the posterior lobes of the prosternum are brownish-testaceous, a

variable characteristic of this species.

This species and S. cincinna n. sp. are our largest forms of *Stenelmis* in which the umbone is covered by the humeral spot. They might easily be confused with each other, both species possessing the same type of elytral maculation. In addition, they have the lower margin of the last tarsal segment prolonged into a prominent process. The present species is to be separated from S. concinna by its less conspicuous abdominal emargination, by its entirely testaceous tibiae, and by the shape of its aedeagus. The sides of the median lobe are distinctly sinuate, and not straight and nearly parallel as in S. concinna.

Location of Types. Holotype, allotype, and paratypes in the Francis Huntington Snow Entomological Collection, University of Kansas. Additional paratypes in the collection of Dr. Paul N. Musgrave, H.H. Knight Collection, and Canadian National Collection.

Stenelmis knobeli n. sp.

(Pl. II, Fig. 3)

Size. Length, 2.75-3 mm.; width, 1-1.05 mm.

Form and Color. Body elongate, moderately subdepressed, but little wider behind. Color of elytra deep brown approaching black. Each elytron with a humeral spot which embraces the umbone, and a sub-apical spot.

Head. Granules between eye and band separated by a little more than their own diameters. Antennae and palpi testaceous, the palpi lighter. Antennae equal to pronotal length.

Pronotum. Length, .85-.87 mm.; width .8 mm. Wider behind the middle, then conspicuously narrowed but scarcely sinuate before hind angles. Convergent from rounded sides to apex, the sides distinctly emarginate at middle. A little wider at base than apex. Granules on either side of median sulcus at base fine, rather conspicuous and separated by their own diameters. Median sulcus shallow, sides nearly parallel, extending from apical one-third to apex of basal declivity. Oblique impression on either side of median sulcus rather shallowly separating lateral tubercles. Basal tubercle broadly rounded, perceptibly elongate, and not at all carinate behind. Anterior tubercle rounded, not at all prominent. Anterior angles and margin of pronotum rufescent, the remainder of pronotum dull black.

Elytra. Length, 2-2.25 mm. Humeral spot covering umbone and most of fourth and fifth intervals at basal

one-fifth. Sub-apical spot elongate, covering most of third, fourth and fifth intervals, extending obliquely inside to the first stria which it follows nearly to elytral apex. Sub-apical spot extends cephalad on the outside of carina of sixth interval, becoming fainter near the middle of side of elytra. First elytral stria complete from base to apex. Third interval not at all elevated at base. Strial punctures moderately large, less so apically but never obsolete near apex.

Venter. Light brown to dull grey, posterior margins and last abdominal segments lighter. Apical emargination nearly equal in width to last tarsal segment.

Legs. Hind tibiae, .85-.9 mm.; middle tibiae, .7-.75 mm.; anterior tibiae, .75-.8 mm. Last tarsal segment equal to the four preceding combined. Granules of femora (outer side) prominent and separated by much less than their own diameters. Femora nearly uniformly dark except at apex. Tibiae and tarsi testaceous.

Notes on Types. Holotype male and allotype female, Hope, Arkansas, July 28, 1932, L. Knobel.

Remarks and Comparative Notes. According to the key this species is associated with S. bicarinata Lec. by the character of the basal tubercle of pronotum. Reference to my description of S. bicarinata will show that S. knobeli is considerably smaller, and each elytron is bimaculate. It bears its closest resemblance, however, to S. exilis n. sp. both in size and general appearance. From S. exilis

it may easily be distinguished by the absence of basal elevation of third elytral interval, the absence of posterior carination of basal tubercle of pronotum, by its darker femora, and by differences in the median sulcus of pronotum. S. exilis lacks the extension of the posterior elytral spot on outside of sixth interval found in the present species. The pronotum is a little narrower in proportion to its length than in S. exilis.

Location of Types. Types located in the collection of Dr. Paul N. Musgrave, Fairmont, West Virginia.

Stenelmis bicarinata Lec.

(Pl. II, Figs. 4 & 6; Pl. V, Fig. 10)

1852. S. bicarinatus LeConte, Proc. Ac. N. S. Phila.
VI. p. 44

Original Description

"Elongatus, ater, thorace elongato, vix inaequali, antrosum angustato, lateribus rectis, elytris profunde punctato-striatis, interstitio 5^{to} carinato, vitta angusta lutea ornatis, antennis tarsisque ferrugineis. Long '12.

"Ohio, Haldeman: the impressions of the thorax as in the preceding [S. orenata] (Say), but very faint."

Writer's Description

Size. Length, 2.8-3.25 mm.; width, 1.1-1.25 mm.

Form and Color. Body elongate, side of elytra nearly parallel, convex. Color of elytra dark brown to black, each elytron with an entire vitta covering humerus and extending inside of sixth interval to near the apex.

Head. Granulations between eye and band rounded, generally separated from two to four times own diameters. Antennae and palpi light brownish-testaceous; antennae as long as or slightly longer than pronotum.

Pronotum. Length, .85-1 mm.; width, .8-.9 mm. Disc of pronotum grey and usually with blue or greenish reflections. Widest behind the middle then convergent to base, only a faint indication of a sinuation before the angle. Usually slightly sinuate before rounded sides then convergent and straight to apex. Base of pronotum wider than apex. Granules between basal tubercle and sulcus separated from one to three times their own diameters. Median sulcus moderately deep, inner sides only occasionally perpendicular and usually gradually sloping from margins of sulcus. Sulcus extending posteriorly from about apical one-fourth to near the base, somewhat convergent on basal pronotal declivity. A moderately distinct oblique impression on either side of median sulcus shallowly separating

lateral tubercles. Basal tubercle rounded, perceptibly elongate, and never carinate; a rather deep impression on the inside of basal tubercle about one-third from base of pronotum. Anterior tubercle rounded, not at all prominent. Anterior angles and margin rufescent.

Elytra. Length, 2.15-2.45 mm.; width, 1.1-1.25 mm. Vitta embracing umbone, extending on the inside of sixth interval, covering all of the fourth and fifth, and terminating about half way between end of carina of sixth interval and apex of elytron. First elytral stria complete from base to apex. Third interval very faintly to distinctly raised and rounded on basal declivity. Strial punctures prominent on disc but becoming shallower and smaller toward apex, never obsolete.

Venter. General color bluish-grey with posterior margins of abdominal segments brownish-testaceous. Last abdominal segment in great part testaceous with the emargination barely less than greatest width of last tarsal segment.

Legs. Hind tibiae, .88-1 mm.; middle tibiae, .75-.85 mm.; anterior tibiae, .8-.9 mm. Last tarsal segment shorter than the four preceding combined. Granules of femora usually separated by less than their diameters. Femora and tibiae grey except bases and apices which are brownish-testaceous. Tarsi testaceous.

Notes on Type. The type of this species from Ohio has been examined.

Remarks and Comparative Notes. This species is close-

ly related to S. mera n. sp. from which it may be easily separated by its greater length, and by having no posterior elevation of the basal tubercles of pronotum. In addition there is no tendency toward quadrimaculation which is often found complete in S. mera. The median lobe of the aedeagus is more acute and parallel in S. bicarinata Lec. than in S. mera.

Notes on Distribution.

- Kansas: Lawrence, June 4-Aug. 7, 1930-1935, M.W. Sanderson and L.S. Henderson; Saline Co., July 7, 1925, R.H. Beamer; Woodson Co., July 31, 1923, Beamer and Lawson; Riley Co., Marlott and J.B. Norton (Kans. State College Collection).
- Texas: "Tex." Belfrage (Harvard College Collection); several additional specimens labeled "Tex." (Harvard College Collection); "Tex.", May, (W. Knaus Collection); "Tex." (Univ. of Minn. Collection); Camp San Saba, 5-28-04, (W. Knaus Collection).
- New Jersey: "N.J." (W. Knaus Collection); "N.J. (C.A. Frost Collection).
- New York: Ithaca, July 10, 1901 (H.H.Knight Collection).
- Vermont: Bengtn. Co. July, 1894 (H.H.Knight Collection).
- Penn.: "Penn." (Harvard College Collection).
- Location of Types. Type in the LeConte Collection,

Harvard College.

Stenelmis exilis n. sp.

Size. Length, 2.8-3 mm., width, 1-1.1 mm

Form and Color. Body elongate, moderately subdepressed, a little wider behind. Color of elytra deep brown. Each elytron with a humeral spot which embraces the umbone, and a sub-apical spot.

Head. Granules between eye and band separated by their own diameters. Antennae and palpi yellow-testaceous. Antennae equal to the pronotal length.

Pronotum. Length, .85-.87 mm.; width, .82-.87 mm. Wider behind middle, then conspicuously narrowed and slightly sinuate before hind angles. Convergent and nearly straight from rounded sides of apex, distinctly sinuate at middle. Wider at base than apex. Granules on either side of median sulcus at base very fine and inconspicuous. Median sulcus deep, the sides nearly parallel, extending from apical one-fourth to base. A rather deep oblique impression on either side of median sulcus, clearly separating lateral tubercles. Basal tubercle rounded, prominent, elongate, and distinctly carinate behind; anterior tubercle rounded, prominent. Anterior angles and margin of pronotum rufescent.

Elytra. Length, 2.05-2.12 mm.; width, 1-1.1 mm. Humeral spot covering umbone and most of fourth and fifth intervals at basal one-fifth; sub-apical spot elongate and terminating a little beyond the carina of sixth inter-

val, and also covering most of fourth and fifth intervals. First elytral stria complete from base to apex. Third interval elevated only on basal declivity. Elytral punctures large and deep, never obsolete apically.

Venter. Light brown to dull grey and usually with posterior half of abdominal segments lighter. Apical emargination equal in width to last tarsal segment.

Legs. Hind tibiae, .77-.87 mm.; middle tibiae, .62-.7 mm.; anterior tibiae, .65-.77 mm. Last tarsal segment equal to four preceding combined. Granules of femora separated by no more than their own diameters. Femora and tibiae uniformly testaceous, the tarsi but little darker.

Notes on Types. Holotype female and two paratype females, Berryville, Ark., 7-4-34, R.H. Beamer, collected at light.

Remarks and Comparative Notes. This species shows a striking resemblance to some of the smaller specimens of S. beameri n. sp. but is at once separated by having the humeral spot covering the umbone, and by the legs, which are entirely testaceous. In S. beameri the apical one-fourth only of the femur is testaceous, the tibia of the same color.

Location of Types. Types deposited in the Francis Huntington Snow Entomological Collection, University of Kansas.

Stenelmis nera n. sp.

(Pl. II, Fig. 5; Pl. VI, Fig. 5)

Size. Length, 2.6-2.85 mm.; width, 1-1.2 mm.

Form and Color. Body elongate, moderately convex.

Sides of elytra parallel and scarcely wider behind. Color of elytra dark brown to black; each elytron with an entire vitta which embraces the umbone and extends on the inside of sixth interval nearly to apex; or vittae interrupted at middle to appear or nearly to appear quadrimaculate.

Head. Granulations between eye and band rounded, generally separated from one to three times their own diameters. Antennae and palpi light brownish-testaceous; antennae longer than pronotum.

Pronotum. Length, .8-.85 mm.; width, .8-.9 mm. Disc of pronotum dark brown to grey and usually with a darker fuscous area between basal tubercles; this frequently extending cephalad on either side of median sulcus. Widest behind middle then convergent and straight to base. Slightly sinuate before rounded sides, then convergent and nearly straight to apex. Granules on inside of basal tubercles separated from once to twice their diameters. Median longitudinal sulcus deep; the inner sides, especially near base, perpendicular. Sulcus extending posteriorly from apical one-fourth to base, somewhat narrowed before basal declivity. A distinct oblique impression on either side of median sulcus distinctly separating lateral tubercles. Basal tubercle rounded anteriorly, narrowed and elongate

toward base of pronotum and distinctly carinate; anterior tubercle rounded, scarcely prominent. Anterior angles and margin rufescent.

Elytra. Length, 1.9-2.1 mm.; width, 1-1.3 mm. Vitta embracing umbone and extending on inside of sixth interval, usually covering all of fourth and fifth intervals and terminating shortly before apex. Vitta always with a more or less distinct band or clouding medially. First elytral stria complete from base to apex. Third interval usually very distinctly raised at base. Elytral punctures large and prominent and becoming smaller toward apex, never obsolete.

Venter. General color grey or brownish with posterior margins of abdominal segments light brownish-testaceous. Emargination of last abdominal segment slightly more than greatest width of last tarsal segment.

Legs. Hind tibiae, .75-.88 mm.; middle tibiae, .62-.75 mm.; anterior tibiae, .65-.8 mm. Last tarsal segment shorter than the four preceding combined. Granules on lower side of femora rounded, separated by less than their diameters. Femora, except apex, grey; tibiae variable in coloration though usually brownish-testaceous.

Notes on Types. Holotype male, allotype female, and eight paratypes, Guthrie, Tenn., 7-26-34, M.W. Sanderson, collected in Red River. Additional paratypes from East Homer, N.Y., 7-5-34, M.W. Sanderson, East River; Ithaca, N.Y., July 10, '01; North River, N.Y., 7-7-34, M.W. Sand-

erson, Hudson River; Eureka Springs, Ark., 7-4-34, R.H. Beamer; Schellburg, Pa., VIII, 16; "Penn.", (Otto Lugger Coll.); "N.C.", (H.H.Knight Coll.), (Otto Lugger Coll.); N.C., Mass.; Greenbrier, Tenn., June 13, '31, P.N.Musgrave, Little Pigeon River; South Bottom, Quebec, 16.6.1928, G.H. Fisk, (Can. Nat. Coll.); Knowlton, Quebec, 19.6.1928, G.H. Fisk, (Can. Nat. Coll.); Keyser, W. Va., 7-22-34, M.W. Sanderson, New Creek.

From West Virginia, material has been collected by P.N. Musgrave from the following localities: Wardensville, July 19, at light; Great Cacpon, July 24, 1933, Cacpon River; Meadow Branch of Sleepy Creek, July 23, 1933; Richmond, July 11, 1933, North Fork Cherry; Mouth of Williams River, July 10, 1933; Franklin, August 9, 1933, Thorn Creek; Maysville, August 19, 1933, Lunice Creek; Romney, August 22, 1930, South Br. Potomac; Burlington, August 22, 1930, Patterson Creek; Stony River, August 21, 1930; Pocahontas Co., July 31, 1930, Minnehaha Springs; Big Spring Creek, June 3; Fairmont, August 3; New Creek, August 20, 1930.

Remarks and Comparative Notes. Very often specimens of S. mera n. sp. are found in which there is a testaceous spot on the outside of carina of sixth interval near its apex, but which is always short and continuous with the distal stripe. This character approaches that of S. lateralis n. sp. from which this species is easily separated by its much narrower elytral vitta; the vitta of S. lat-

eralis occupies all intervals inside of the sixth except the first. The present species is more nearly related to S. bicarinata Lec. but is separated by its shorter form, the elongated and carinate basal tubercle, and the median clouding of elytral vitta which in some instances clearly separates the humeral from the sub-apical spot. In S. bicarinata Lec. the vitta is always entire with no indication of a median cloud. S. mera has been identified as S. linearis Zimm. in some collections. As indicated elsewhere in this paper, this species is a synonym of S. humerosa Mots. It is properly placed in the Sinuata-humerosa Group and not in the Orenata Group to which S. mera belongs.

Location of Types. Holotype, allotype, and paratypes deposited in the Francis Huntington Snow Entomological Collection, University of Kansas. Additional paratypes in the Canadian National Collection, collections of Dr. Paul N. Musgrave; University of Minnesota; and Dr. Harry H. Knight, Ames, Iowa.

SINUATA-HUMEROSA Group

Key to the Species of the Sinuata-humerosa Group

1. Femora punctulate and not at all granulate.....(2)
Femora distinctly granulate.....(3)
2. Longitudinal vitta of elytra complete from base to
apex; processes on median lobe of aedeagus evenly
rounded.....douglasensis n. sp.
Each elytron distinctly bimaculate; process on median
lobe of aedeagus subangulate anteriorly...grossa n. sp.
3. Elytra immaculate.....(4)
Elytra maculate or vittate.....(6)
4. Median band of head as wide as two lateral ones combin-
ed; length of body, 2.5 mm.; width, .87 mm..parva n, sp.
Median band but little wider than either lateral one;
length of body over 3.7 mm.; width over 1 mm.....(5)
5. Length, 3.25-3.4 mm.; processes of median lobe of aede-
gus present and distinct.....fuscata Blatch.
Length, 2.7-2.8 mm.; processes of median lobe nearly
absent and very inconspicuous.....hungerfordi n, sp.
6. Humeral spot distinctly covering umbone.....(7)
Humeral spot on inside of sixth interval.....(8)
7. Femora and tibiae entirely grey.....humerosa Mots.
Femora grey, tibiae testaceous.....mirabilis n.sp.
8. Antennae or palpi or both dark brown to black.....(9)
Antennae and palpi testaceous.....(11)

9. Last six or seven antennal segments nearly always shining black, the palpi testaceous.....antennalis n. sp.
Palpi usually dark brown to piceous, the antennae nearly always lighter.....(10)
10. Length, 2.7-3.2 mm. Lateral processes about two-thirds the width of median lobe of aedeagus
quadrimaculata Horn.
Length, 2.4-2.65 mm., processes about one-third the width of median lobe.....musgravei n. sp.
11. Sides of pronotum in anterior third sharply divergent
sinuata Lec.
Sides of pronotum in anterior third parallel or convergent.....(12)
12. Process of median lobe of aedeagus absent or very inconspicuous.....(13)
Process of median lobe present and conspicuous.....(14)
13. Elytral stripe present and entire; processes absent
decorata n. sp.
Faint humeral and sub-apical spots; processes very narrow and inconspicuous.....hungerfordi n. sp.
14. Processes of median lobe evenly rounded.....(15)
Processes subangulate anteriorly.....vittipennis Zimm.
15. Lateral processes of median lobe as wide as lateral lobes near apex; body more convex, the vittae less distinctly marked.....convexula n. sp.
Lateral processes about one-half the width of lateral lobe near apex; body less convex, vittae more distinctly marked.....märkelii Mots.

Stenelmis douglasensis n. sp.

(Pl. III, Fig. 1)

Size. Length, 3.35-3.6 mm.; width, 1.2-1.5 mm.

Form and Color. Body elongate, convex, nearly parallel. Elytra black; each elytron with a distinct longitudinal vitta on inside of sixth interval.

Head. Granulations of head obsolete. Antennae and palpi light brownish-testaceous. Antennae distinctly shorter than pronotum.

Pronotum. Length, 1-1.1 mm.; width, .9-1 mm. Pronotum grey to dull black; the prominences lighter. Apical margin of pronotum not rufescent. Sides nearly parallel in basal half and with a distinct sinuation before the hind angles; the hind angles very prominent. Narrowed anteriorly then nearly parallel or divergent in front. Pronotum as wide at base as width behind middle. Frequently distinctly wider. Width at apex shorter than at base. Surface of pronotum indistinctly punctulate. Median longitudinal sulcus deeply channeled from apical one-fifth to base, but little narrowed posteriorly. Oblique impression on either side of median sulcus very distinct, clearly separating lateral tubercles. Basal tubercle is rounded anteriorly and carinate behind. Anterior tubercle prominent and rounded.

Elytra. Length, 2.4-2.5 mm. Each elytron with an entire longitudinal vitta extending to a point about one-third of the distance between apex of carina of sixth interval and apex of elytra; vitta occupying nearly all of fourth and fifth intervals. Occasionally the second and

eighth intervals faintly longitudinally vittate. First elytral stria complete. Third interval moderately elevated at base, the elevation extending only about one-sixth of the elytral length. Elytral punctures moderately deep on disc and not entirely obsolete on apical declivity.

Venter. Dull green to grey or dull black. Apical abdominal emargination a little less than width of last tarsal segment.

Legs. Hind tibiae, 1.1 mm.; middle tibiae, .87-.9 mm.; anterior tibiae, .9-.95 mm. Last tarsal segment distinctly longer than preceding four combined. Granules of femora and tibiae replaced by minute punctures. Femora and tibiae of same color as venter. The tarsi, brownish.

Notes on Types. Holotype male, allotype female, and six paratypes, Cheboygan County, Michigan, July 10, 1936, T.C. Lawrence. Collected on submerged chunks of wood in edge of water along east shore of Douglas Lake. Additional paratypes from Nottawa, Michigan, Sept. 1, 1933, C.W. Sabrosky. Collected on old pieces of wood in 1 to 1½ feet of water in Sand Lake. According to notes of the collector: "this lake has no inlet or outlet, being fed entirely by underground springs."

Remarks and Comparative Notes. S. douglasensis n. sp. is closely related only to S. grossa n. sp. by the complete absence of distinct granules over the surface of the body. As in S. grossa the granules are replaced by distinct punctures. It is distinguished from S. grossa by its entire longitudinal vittae and the evenly rounded lateral processes

of the median lobe of aedeagus. This is one of the few species which, apparently, confines itself to the lakes of the North. In some examples the second and eighth elytral intervals are faintly testaceous for a part of their length.

Location of Types. Holotype, allotype, and paratypes in the Francis Huntington Snow Entomological Collection, University of Kansas. Additional paratypes in the collections of Dr. Paul N. Musgrave, Harvard College, and University of Michigan.

Stenelmis grossa n. sp.

(Pl. III, Fig. 3)

Size. Length, 3.25-3.8 mm.; width, 1.25-1.4 mm.

Form and Color. Body elongate, convex, nearly parallel. Elytra reddish-brown to dark grey; each elytron usually with a faint humeral and sub-apical testaceous spot. Humeral spot on inside of sixth interval.

Head. Granulation nearly absent between eye and band but a small group of granules near posterior end of band. Antennae and palpi light brownish testaceous, the antennae considerable shorter than pronotum.

Pronotum. Length, 1-1.12 mm.; width, .9-1.05 mm. Disc of pronotum dull grey to deep blackish-grey, the anterior part of sulcus light fuscous. Apical margin of pronotum rufescent. Sides of pronotum parallel or divergent on basal half and without a sinuation before basal angles. Narrowed anteriorly about the middle, distinctly sinuate, then sides nearly parallel or usually distinctly divergent to apices. Pronotum as wide at the base as width behind the middle, often distinctly wider. Width at apex shorter than at base. Granules not evident on either side of base of median sulcus. Median longitudinal sulcus deeply channelled from about the apical one-fourth to base, narrowed posteriorly. Oblique impression on either side of sulcus distinct, and clearly separating lateral tubercles. Basal tubercle rounded anteriorly, narrowed and elongate posteriorly and usually distinctly carinate to near the pronotal

base. Anterior tubercle prominent and rounded.

Elytra. Length, 2.37-2.75 mm.; width, 1.25-1.4 mm. Each elytron usually faintly bimaculate. Humeral spot on inside of sixth interval, usually occupying no more than the fifth interval at base, and extending along the interval only for about one-fifth of its length. Sub-apical spot extending from about one-third behind the middle of elytron to barely beyond end of carina of sixth interval. First elytral stria complete from base to apex. Third interval conspicuously elevated at base, the elevation ending posteriorly to about the end of humeral spot. Elytral punctures deep on disc and becoming finer posteriorly, never obsolete on apical declivity of elytra.

Venter. Light brown to grey, usually lighter posteriorly. Apical abdominal emargination less than width of last tarsal segment.

Legs. Hind tibiae, 1-1.15 mm.; middle tibiae, .8-.9 mm.; anterior tibiae, .87-1 mm. Last tarsal segment distinctly longer than preceding four combined. Granules of femora usually not evident. Femora and tibiae of same general color as venter, the tarsi light brownish.

Notes on Types. Holotype male, allotype female and two paratypes, Ireland, Miss., 7-8-34, R.H. Beamer. Additional paratypes from Tallulah, La., VII-12-30, VII-13-30, and VIII-15-30, P.A. Glick; Beaugard Par., La., 8-18-28, J.G. Shaw; Green Co., Miss., 3-3-1932, H. Dietrich, Gaines Cr.; Leaf, Miss., Mar. 3, 1932, H. Dietrich; Lucedale, Miss., 6-22, P.N. Musgrave; Hope, Ark., VII-1-32, L. Knobel, at light (C.A. Frost Coll.). The specimens

from Tallulah, La. are from the Harvard College Collection, that of C.A. Frost, and the Canadian National Collection.

Remarks and Comparative Notes. This species, with S. douglasensis n. sp., occupies a unique position in the Sinuata-humerosa Group by the complete absence of granules on the pronotum, legs, and remainder of the body. The granules in this species and its ally, apparently are replaced by distinct punctures. S. grossa is distinguished from S. douglasensis by the bimaculate instead of vittate elytra, and by the shape of the processes on the median lobe of the aedeagus. In S. grossa the processes are subangulate anteriorly; in S. douglasensis the processes are evenly rounded. These are two of our largest species of Stenelmis.

Location of Types. Holotype, allotype, and paratypes in the Francis Huntington Snow Entomological Collection, University of Kansas. Additional paratypes in the Harvard College Collection; Canadian National Collection; collection of Dr. Paul N. Musgrave, Fairmont West Virginia; and C.A. Frost, Framingham, Mass.

Stenelmis parva n. sp.

(Pl. III, Fig. 3)

Size. Length, 2.5 mm.; width, .87 mm.

Form and Color. Body elongate, parallel, convex. Elytra entirely immaculate above, color black.

Head. Median longitudinal band as wide as the two lateral ones combined, the granulation between median band and eye irregular and indistinct. Antennae and palpi yellow testaceous. Antennae longer than pronotum.

Pronotum. Length, .75 mm.; width, .65 mm. Base of sulcus and on either side of basal tubercles, light grey; remainder of pronotum a dull dark brown. Sides of pronotum very slightly rounded behind middle, a little convergent posteriorly and anteriorly to basal and apical angles. Width at apex equal to width at base. Granules on either side of sulcus very fine and separated by twice their diameters. Median longitudinal sulcus distinct though not deep, the anterior limits indistinct; sulcus extending posteriorly from about the apical one-third to near the base, the sides nearly parallel. Oblique impression on either side of median sulcus distinct and clearly separating lateral tubercles. Basal tubercle a little elongate, the anterior one fairly prominent and rounded.

Elytra. Length, 1.85 mm.; width, .87 mm. Elytra entirely immaculate, there being no trace of pale spots. First stria complete. Third interval but slightly elevated at base. Elytral punctures moderately large and deep on disc,

never obsolete on declivity.

Venter. Blue-grey, the posterior margin of abdominal segments and an entire narrow stripe on the last segment, lighter. Apical emargination less than width of the last tarsal segment.

Legs. Hind tibiae, .75 mm.; middle tibiae, .62 mm.; anterior tibiae, .65 mm. Last tarsal segment longer than preceding four combined. Granules of femora separated by their own diameters. Femora and tibiae darker grey than venter. Tarsi and extreme apex of tibiae reddish-brown.

Notes on Types. Holotype male and one paratype, Latimer Co., Okla., 12-VII-1931, W. Fisher. Allotype female, Edna, Texas, 8-9-28, R.H. Beamer.

Remarks and Comparative Notes. S. parva n. sp. has a wider median frontal band on the head than in any other species examined. This species is associated with S. antennalis n. sp. and S. musgravei n. sp. by its small size but is readily distinguished by the total absence of elytral spots. By this characteristic it would be placed with S. fuscata Blatch. from which it is separated by its much smaller size.

Location of Types. Holotype and paratype in the collection of Dr. Paul N. Musgrave. Allotype located in the Francis Huntington Snow Entomological Collection, University of Kansas.

Stenelmis fuscata Blatchley

(Pl. III, Fig. 4)

1925. Stenelmis fuscatus Blatchley Can. Ent. 57,
p. 164.

Original Description

"Elongate, convex. Body a uniform dark fuscous-brown without trace of pale spots or stripes; legs a paler brown; antennae and tarsi a reddish brown. Head with a broad shallow longitudinal interocular groove. Thorax one-half longer than wide; sides parallel on basal two-thirds, sinuate at apical third, disk minutely densely punctate and with a rather deep median groove extending from apical fourth to base and a vague oblique one each side on basal half. Elytra with second interval elevated at base, fifth carinate its full length, striae rather coarsely deeply punctate, the punctures separated by an interval equal to their diameters. Length, 3.2 mm."

"Two specimens taken from a mass of decaying pond weeds beneath a bridge at Royal Palm Park (Fla.). Uniform dark color and parallel sides of basal portion of thorax distinguish this from S. vittipennis Zimm., its nearest ally."

Writer's Description

Size. Length, 3.25-3.4 mm., width, 1.15-1.25 mm.

Form and Color. Body elongate, convex, parallel.

Color of entire upper surface a uniform dark brown without indication of spots on vittae.

Head. Granulations between eye and frontal band rather

coarse and uneven. Antennae and palpi yellow-testaceous. Antennae usually conspicuously shorter than pronotum.

Pronotum. Length, 1-1.1 mm.; width, .9-.95 mm. Anterior angles and margin of pronotum rufescent. Sides parallel on basal half, sinuate before middle then a little convergent and rounded to apex. A slight sinuation between hind angles and rounded sides of pronotum. Width at base of pronotum equal to that at middle. Narrower at apex than at base. Granules of either side of median sulcus moderately deep, distinct to just before the base, and extending posteriorly from about the apical one-fourth. Oblique impression on each side of sulcus distinct and clearly separating lateral tubercles. Basal tubercle a little elongate, anterior one more rounded and conspicuous.

Elytra. Length, 2.37-2.5 mm.; width, 1.15-1.25 mm. Entirely immaculate above with no trace of spots. First elytral stria complete from base to apex. Third interval elevated at base. Elytral punctures moderate on disc, then smaller toward apex, never obsolete.

Venter. Very dull grey to light brown, the abdominal segments nearly uniform in color. Apical emargination about equal to width of last tarsal segment.

Legs. Hind tibiae, 1mm.; middle tibiae, .85 mm.; anterior tibiae, .9 mm. Last tarsal segment longer than preceding four combined. Granules of femora rounded, separated by their own diameters or less. Femora and tibiae of the same general color as venter. Tarsi light brown.

Notes on Types. The type and paratype, from Royal Palm Park, Fla., 3-18-24, W.S. Blatchley, have been studied.

Remarks and Comparative Notes. The specimens of this species before me are remarkably uniform in size. Stenelmis fuscata Blatch. was the first truly immaculate species to be named from our fauna. It is closely related to Stenelmis hungerfordi n. sp. from which it may be separated by its comparatively large size, and by the very distinct lateral processes on the median lobe of the aedeagus. In S. hungerfordi these processes are only about one-fourth the width of the lateral lobes.

Notes on Distribution. In addition to the types, the following localities are represented in the material at hand: Ft. Pierce, Fla., 8-7-30, R.H. Beamer, P.W. Oman; Laccochee, Fla., 8-18-30, J.O. Nottingham; Hillard, Fla., 8-19-30, P.W. Oman; and Hillard, Fla., 8-31-30, J.O. Nottingham.

Location of Types. Type in the collection of Prof. W.S. Blatchley. Paratype in the Francis Huntington Snow Entomological Collection, University of Kansas.

Stenelmis hungerfordi n. sp.

(Pl. III, Fig. 5)

Size. Length, 2.7-2.8 mm.; width, 1-1.1 mm.

Form and Color. Body elongate, convex, parallel.

Color of elytra black, each elytron usually with pale humeral and sub-apical spots; the humeral spot, if present, always on inside of sixth interval.

Head. Granulations between eye and band generally separated by twice their diameters. Antennae and palpi yellow-testaceous. Antennae slightly longer than pronotum.

Pronotum. Length, .85-.9 mm.; width, .75-.8 mm.

Color of pronotum dull grey to brown; the anterior angles and margin rufescent. Occasionally a little lighter between basal tubercles. Sides nearly parallel though a little convergent to base; sinuate before the middle, then sides parallel, or slightly divergent at apices, never convergent. Sides before the basal angles perceptibly sinuate. Width at base of pronotum nearly equal to width behind middle, narrower at apex than at base. Granules on either side of median sulcus separated by about twice their diameters. Median longitudinal sulcus moderately deep, convergent posteriorly, indistinct at extreme base. Oblique impression on either side of median sulcus distinct, clearly separating lateral tubercles. Basal tubercle a little elongate, never carinate; anterior one a little less distinct and rounded.

Elytra. Length, 1.95-2.1 mm.; width, 1-1.1 mm. Usually entirely immaculate above though occasionally a small

indistinct humeral spot on inside of sixth interval, and a faint sub-apical one. Spot, when present, covering no more than fifth interval. First elytral stria complete from base to apex. Third interval elevated at base. Elytral punctures large on disc, becoming rapidly smaller at apex, never obsolete on apical declivity.

Venter. Dull grey to light brown, the abdominal segments generally lighter on posterior borders. Abdominal emargination less than width of last tarsal segment.

Legs. Hind tibiae, .82-.87 mm.; middle tibiae, .7-.72 mm.; anterior tibiae, .75 mm. Last tarsal segment longer than preceding four combined. Granules of femora rounded and usually separated by a little less than their own diameters. Upper surfaces of femora and tibiae grey with lower surfaces light brown; tarsi a lighter testaceous.

Notes on Types. Holotype male, allotype female and numerous paratypes, Lacoche, Fla., 8-18-30, J.O. Nottingham, collected at light. Additional paratypes from Ocala, Fla., 8-17-30, Paul W. Oman; Plant City, Fla., 8-15-30, J.O. Nottingham.

Remarks and Comparative Notes. This species is named after Doctor H.B. Hungerford, University of Kansas, who has aided me in many ways in my study of Stenelmis. S. hungerfordi n. sp. is closely related to S. fuscata Blatch. but is readily separated by its smaller size, the antennae are longer than the pronotum, and an occasional specimen shows a faint humeral and apical spot on each elytron. The processes on the median lobe of aedeagus are evenly

rounded and no more than one-fourth the width of the lateral lobe. In S. fuscata, the processes are fully one-half the width of lateral lobe. Reference to the plate of genitalia will show other minor differences.

Location of Types. Holotype, allotype, and paratypes in the Francis Huntington Snow Entomological Collection, University of Kansas. Additional paratypes in the collection of Dr. Paul N. Musgrave.

Stenelmis humerosa Mots.

(Pl. III, Fig. 6)

1859. Stenelmis humerosus Mots. Etudes Entomo. VIII,
p. 50.
1869. Stenelmis linearis Zimm. Trans. Am. Ent. Soc.
II, p. 259.

Original Description

"Une sixième espèce, rayée de testacé sur les élytres, se traube dans les eaux du fleuve Alabama aussi aux Etats-Unis. Elle est moitié plus petite que les Märkelii et bicarinata et se distingue principalement par la bande longitudinale des élytres, fortement dilatée à la base, occupant tout l'angle huméral; par son conselet plus trapézoïdale, nullement arqué sur les côtés, par la carène latérale plus fortement sinuée en dehors aux angles huméraux, et par ses antennes plus courtes, plus fortement en massue et de couleur entièrement testacée comme les tarses. Je l'ai nommée Stenelmis humerosus. Il vole le soir dans la chambre, se dirigeant vers la lumière même durant un orge."

Writer's Description

Size. Length, 2.3-2.7 mm.; width, .95-1.1 mm.

Form and Color. Body elongate, convex, nearly parallel. Color of elytra dark brown to nearly black; each elytron with an entire longitudinal vitta which may be somewhat separated on disc into a humeral and a sub-apical spot.

Vitta or spot covering humerus at base.

Head. Granulations between eye and band rounded, separated by several times their own diameters. Antennae and palpi light brownish testaceous. Antennae equal in length to pronotum.

Pronotum. Length, .7-.75 mm.; width, .68-.75 mm.

Entire median sulcus and from its anterior end to apex of pronotum fuscous. On either side of sulcus a fuscous triangular area extending from base of pronotum between sulcus and lateral tubercle to a point near middle of pronotum. A small fuscous spot near anterior angles of pronotum. Margins of sulcus and remainder of pronotum a dull yellowish-grey. These areas with granules moderate in size though nearly reduced to general surface, the granules separated by about twice their own diameters. Sides of pronotum nearly parallel in basal half, then slightly narrowed at middle and subparallel to apical angles. Width at base of pronotum nearly equal to that at middle, but slightly narrower at anterior angles than at base. Granules on either side of median sulcus nearly indistinct. Median sulcus moderate in depth, nearly obsolete on basal declivity and extending posteriorly from near apical one-third. Oblique impression on either side of sulcus almost wanting and only perceptibly separating lateral tubercles. Basal and anterior tubercles not at all conspicuous and but little raised above the disc of pronotum.

Elytra. Length, 1.75-1.88 mm.; width, .95-1.1 mm.

Each elytron with the vitta usually entire though somewhat clouded at middle of each elytron. Humeral part of vitta embracing umbone, covering fourth and fifth elytral intervals and extending to a point about half way between end of carina of sixth interval and elytral apex. First elytral stria complete from base to apex. Third interval scarcely, if at all, elevated at base. Elytral punctures deep on disc then becoming much smaller on apical declivity though never obsolete.

Venter. Grey or greenish-grey with nearly all of posterior half of abdominal segments dull reddish-brown. Abdominal emargination equal to width of last tarsal segment.

Legs. Hind tibiae, .75-.8 mm.; middle tibiae, .65-.72 mm.; anterior tibiae, .65-.72 mm. Last tarsal segment distinctly longer than preceding four combined. Granules of femora generally rounded and very closely placed, separated by less than their diameters. Femora and tibiae entirely grey, the tarsi dark brown.

Notes on Types. The type female of S. humerosa Mots., from Tennessee, and the type male of S. linearis Zimm., from South Carolina, have been examined. An examination shows them to be the same species. In 1870 Horn expressed an opinion that the two might be the same altho he had not seen the type of S. humerosa. Since S. humerosa has priority by ten years, S. linearis thereby becomes a synonym. The type of S. humerosa bears the following label:

"29 Juni vole a la mandelle dans la chambre dans uni nuit
organse. Alabam."

Remarks and Comparative Notes. The present species is closely related to S. mirabilis n. sp. but is easily separated from the latter by the testaceous instead of dark brown to black palpi. In addition the tarsi are not lighter at base as described for S. mirabilis.

Notes on Distribution. In addition to the types, four specimens have been examined from the following localities:

Md.: Offutts Isl., 16.7.16, Loomis and Barber Coll.

D.C.: "D.C." Otto Lugger Coll.

Mass.: Chicopee, July 20, W. Knaus Coll.

Location of Type. The female type of S. numerosa Mots. is located in the Zoological Museum Do Moscow, U.S.S.R. The type of S. linearis Zimm. is in the LeConte Collection at Harvard College.

Stenelmis mirabilis n. sp.

(Pl. IV, Fig. 1)

Size. Length, 2.7-2.9 mm.; width, 1.1-1.12 mm.

Form and Color. Body elongate, convex a little wider behind. Elytra dark to black. Each elytron distinctly bimaculate and never with the vitta entire. Humeral spot embracing umbone.

Head. Granulations between eye and band separated by about twice their diameters. Antennae brownish-piceous to black, lighter at base, the palpi piceous to black. Antennae slightly longer than pronotum.

Pronotum. Length, .86 mm.; width, .75-.77 mm. Pronotum usually dull grey to deep brown. Sides nearly parallel before the base, narrowed anteriorly to middle, sinuate, then straight to apex. A little narrower across the apex of pronotum than at base. Granules on either side of median sulcus at base separated by about twice their diameters. Median longitudinal sulcus distinct, moderately deep, distinctly narrowed posteriorly, and extending from the apical one-fourth nearly to base. Oblique impression on either side of median sulcus distinct and clearly separating lateral tubercles. Basal tubercle rounded and but little elongate. Anterior tubercle rounded, not prominent.

Elytra. Length, 1.95-2 mm.; width, 1.1-1.12 mm. Each elytron distinctly bimaculate, the vitta never entire. Humeral spot embracing the umbone, extending diagonally inside of the sixth interval, and usually covering a little

more than the fifth interval for one-fourth or one-fifth of its length. Sub-apical spot about equal to the dark band separating it from the humeral spot. Sub-apical spot extending to a point a little beyond end of carina of sixth interval. First elytral stria complete from base to apex. Punctures moderately deep on disc, becoming smaller and very fine on declivity though never entirely absent.

Venter. Dull brown to a blue-grey. Apical abdominal emargination about equal to the width of last tarsal segment.

Legs. Hind tibiae, .8-.85 mm.; middle tibiae, .62 mm.; anterior tibiae, .65 mm. Last tarsal segment distinctly longer than preceding four combined. Granules on hind femora separated by no more than their own diameter. Femora above grey, usually a light brown below at base; tibiae nearly entirely testaceous except extreme base and apices which are colored as the femora. Tarsi dark brown to black, the basal two-thirds of the last segment lighter.

Notes on Types. Holotype male, allotype female, Cos. Cob. Ct. (H.H.Knight Coll.); one paratype, Cos. Cob. Ct. (W. Knaus Coll.); one paratype, "N.C." (Otto Lugger Coll.); and an additional paratype from Anderson, S.C. Jl. 8, P.N. Musgrave, (P.N. Musgrave Coll.).

Remarks and Comparative Notes. This species is of nearly the same size and form of S. humerosa Mots., but is easily distinguished by its lighter tibiae and much darker tarsi. In S. humerosa the tibiae are of the same color as the femora. The cleaner examples of this species

are very striking in their type of coloration of the legs and elytra.

Location of Types. Holotype and allotype located in the Francis Huntington Snow Entomological Collection, University of Kansas. Paratypes in the W. Knaus Collection, P.N. Musgrave Collection, and that of the University of Minnesota.

Stenelmis antennalis n. sp.

(Pl. IV, Fig. 2)

Size. Length, 2.5-2.7 mm.; width, 1 mm.

Form and Color. Body elongate, parallel, convex.

Color of elytra deep brown to black. Each elytron with humeral and sub-apical testaceous or reddish spots which are always on the inside of the sixth interval.

Head. Antennae with the last six or seven segments nearly always black, the basal segments testaceous. Palpi testaceous. Antennae longer than pronotum.

Pronotum. Length, .75-.85 mm.; width, .65-.7 mm.

Basal one-third of pronotum and margins of median sulcus often dull grey, the remainder dull brown to black. Anterior angles and margin faintly rufescent. Sides rounded behind middle, a little convergent posteriorly; sinuate before the middle then sides parallel to apex. Width at base of pronotum equal to width at apex. Granules on either side of median sulcus very fine and generally separated from two to several times their diameters. Median longitudinal sulcus very shallow, a little narrowed behind and extending from the apical one-third or one-fourth to near the base. Oblique impression on either side of median sulcus often indistinct and faintly separating lateral tubercles. Basal tubercle faintly raised and elongate, the anterior one but scarcely evident.

Elytra. Length, 1.85-1.95 mm.; width, 1 mm. Each elytron with a pale or reddish humeral spot and a sub-

apical one which extends but little beyond apex of carina of sixth interval. Spots covering most of the fourth and fifth intervals, and never uniting to form an entire stripe. First elytral stria complete. Third interval only faintly elevated at base. Elytral punctures rather shallow on disc, moderate in size, and usually extending to apex though becoming much finer and occasionally obsolete on declivity.

Venter. Dull brown to grey, the posterior margin of abdominal segments usually lighter. Apical emargination equal to width of last tarsal segment.

Legs. Hind tibiae, .75 mm.; middle tibiae, .6-.62 mm.; anterior tibiae, .62-.64 mm. Last tarsal segment longer than preceding four combined. Granules of femora separated by a little less than their own diameters. Femora of same general color as venter. Tibiae and tarsi a little lighter.

Notes on Types. Holotype male, Lucedale, Miss., Mar. 1, 1932, H. Dietrich, (P.N. Musgrave Coll.); allotype female, Hilliard, Fla., 8-31-30, J.O. Nottingham; additional paratypes from the following localities: Mobile, Ala., VI 6 27, Darlington; DeFunisk Spgs., Fla., Jn. 29, 31, P.N. Musgrave; Whiskey Cr., Miss., Leaf III 4 1932, H. Dietrich; Lucedale, Miss., Jn. 22-23, Cedar Creek, P.N. Musgrave; Lucedale, Miss., 7-5-31, H. Dietrich; Clara, Miss., Wayne Co., June 26, 31.

Remarks and Comparative Notes. The uniform lighter palpi and darker antennae, comparatively narrower pronotum

and less elevated third elytral interval will easily distinguish this species from S. musgravei n. sp. to which it is related.

Location of Types. Holotype and paratypes in the collection of Dr. Paul N. Musgrave. Allotype and paratypes in the Francis Huntington Snow Entomological Collection, University of Kansas. Additional paratypes in the Harvard College Collection.

Stenelmis quadrimaculata Horn

(Pl. IV, Fig. 5)

1870. Stenelmis quadrimaculatus Horn, Trans. Am. Ent. Soc. III, p. 40.
1933. stenelmis blatchleyi Musgrave, Proc. Ent. Soc. Wash., Vol. 35, No. 4, p. 57.
1910. || Stenelmis sulcatus Blatchley, Col. of Ind. p. 681.

Original Description

"Similar in form to crenatus but differing as follows:-- Thorax more elongate, sides less rounded. Elytra more convex in both directions; second interval with a short basal carina, lateral carina very feeble; disc with striae of very large deep punctures, less strong at apex but not evanescent. Humeri with a rounded red spot and a short sub-apical stripe. Legs black, apex and base of tibiae, tarsi, and antennae ferruginous. Length, .14 inch; 3.5 mm.

"At the middle of the base of the thorax on each side of the scutellum are two small, smooth, puncture-like spots, these are seen also in the next species (S. vittipennis). The lateral tubercles of the thorax between the dorsal channel and the margin are here very distinct, and in the space enclosed between them and the channel is a rather deep impression. In form this is the most robust of our species and, with the exception of linearis, has the lateral carina of the elytra least distinct. One specimen, Vermont."

Writer's Description

Size. Length, 2.7-3.2 mm.; width, 1.1-1.25 mm.

Form and Color. Body elongate, convex, nearly parallel. Each elytron usually distinctly bimaculate and never with the vitta entire. Humeral spot on inside of sixth interval.

Head. Granulations between eye and band very fine, rounded, and separated by several times their own diameters. Antennae brownish, nearly piceous in some examples, but always lighter at base. The palpi deep brown to piceous. Antennae as long as pronotum.

Pronotum. Length, .86-1 mm.; width, .77-.87 mm. Inside of sulcus from near its base and occasionally a small area on either side, fuscous. Remainder of pronotum dull yellowish-grey. Sides nearly parallel in basal half, then gradually rounded and subparallel to apex. Slightly wider across rounded sides of pronotum than at base. Apex distinctly shorter than base. Granules on either side of sulcus at base separated by about twice their own diameters. Median longitudinal sulcus distinct, slightly narrowed posteriorly, and extending from about apical one-fourth to base. Oblique impression on either side of sulcus distinct and clearly separating lateral tubercles. Basal tubercle rounded.

Elytra. Length, 2-2.35 mm.; width, 1.1-1.25 mm. Each elytron distinctly bimaculate, with the vitta never entire. Humeral spot on inside of sixth interval and

and occupying nearly all of the fourth and fifth intervals. Band separating vittae just slightly shorter than humeral spot. Sub-apical spot extending a little beyond apex of carina of sixth interval. First elytral stria complete from base to apex. Third interval distinctly though not conspicuously elevated near base. Elytral punctures deep on disc then becoming smaller toward apex of elytra but never obsolete on declivity.

Venter. Dull red or brownish to greenish-grey with abdominal segments generally dull brown on posterior half. Apical emargination about same as width of last tarsal segment.

Legs. Hind tibiae, .85-.9 mm.; middle tibiae, .65-.75 mm.; anterior tibiae, .7-.82 mm. Last tarsal segment distinctly longer than preceding four combined. Granules of femora occasionally separated by as much as their own diameters though generally closely placed. Femora and tibiae of the same color as venter, though the tibiae sometimes faintly lighter. Tarsi reddish-brown.

Notes on Types. Cotypes of S. quadrimaculata Horn from Bengtn. Co., Vt., and the type of S. sulcata Blatch. from Marchall Co., Ind., have been examined. They are apparently the same. Variation of pronotal sculpture within many of our species might account for the present species being known under two names. Since S. quadrimaculata has priority by forty years, S. sulcata should be dropped from our list. S. blatchleyi Musgrave was the new name proposed for S. sulcata Blatchley since the latter name was preoccupied by

S. sulcata Grouvelle, a species described from Sumatra in 1892 (Not. Leyd. Mus. XIV, p. 166).

Remarks and Comparative Notes. S. quadrimaculata Horn is very closely related to S. musgravei n. sp. It may be distinguished by its larger size, less extensive fuscous areas on pronotum, and by certain features of the genitalia. In both species the median lobe of aedeagus possesses evenly rounded lateral processes. In S. quadrimaculata these processes are broader than in S. musgravei, being about two-thirds the width of the median lobe. The median lobe is more pointed and the extreme bases of the lateral lobes are more evenly rounded. In S. musgravei, the tip of median lobe is evenly rounded, and the bases of lateral lobes nearly subangulate externally.

Notes on Distribution. In addition to the types from Vermont, material from the following localities has been examined:

United States

Ind.: Marshall Co., 6-23-34, M.W. Sanderson

Mich.: Leelanau Co., 8-15-33, H.T. Peters; Livingston Co., June-July, H.B. Hungerford, Bass L.; Cheboygan Co., July, 1936, M.W. Sanderson, Black Lake.

N.Y.: Buffalo (F.C. Bowditch Coll. at Harvard College);
Buffalo (Otto Lugger Collection at Univ. of Minn.).

D.C.: Washington (H.H. Knight Collection).

Canada

Can.: "Can." (H.H. Knight Collection).

Que.: Wakefield, 20. VII 1932, W.J. Brown (Can. National Collection); Knowlton's Landing, 10, VII 1927, W.J. Brown (Can. National Collection).

Location of Types. Cotypes in the Horn Collection at the Philadelphia Academy of Sciences. The type of S. sulcata Blatch. in the collection of Prof. W. S. Blatchley, Indianapolis, Ind.

Stenelmis musgravei n. sp.

(Pl. IV, Fig. 4)

Size. Length, 2.4-2.65 mm.; width, .95-1.05 mm.

Form and Color. Body elongate, convex, nearly parallel. Elytra black, each elytron usually distinctly bimaculate and at least a median clouding on vitta. Humeral spot usually on the inside of the sixth interval.

Head. Granulations between eye and band separated from two to three times their diameters. Antennae and palpi dusky to piceous, the palpi ordinarily darker. Antennae about equal in length to pronotum.

Pronotum. Length, .77-.8 mm.; width, .67 mm. Entire median sulcus to apex of pronotum, and an elongate triangular area on either side of sulcus to a point about two-thirds from base;—deep brown to black. Remainder of pronotum dull yellowish-grey. Sides of pronotum a little convergent from rounded sides to base. Narrowed about the middle then subparallel to apex. Slightly narrower at apex of pronotum than at base. Granules on either side of median sulcus separated by once or twice their own diameters. Median longitudinal sulcus distinct, narrowed posteriorly, and extending from about the apical one-fourth or one-fifth to near base. Oblique impression on either side of median sulcus moderately deep and separating lateral tubercles. Basal tubercle rounded, a little elongate; the anterior tubercle rounded, not prominent.

Elytra. Length, 1.75-1.85 mm.; width, .95-1.05 mm.

Each elytron nearly always distinctly bimaculate, and with the humeral spot usually on the inside of the sixth interval. Maculae occupying nearly all of fourth and fifth intervals according to limitations of spot. Band separating spots variable in size but never entirely absent, occasionally reduced to a faint cloud. Subapical spot terminating beyond apex of carina of sixth interval. First stria complete from base to apex. Third interval distinctly elevated at base. Elytral punctures deep on disc, finer posteriorly, never obsolete on declivity.

Venter. Light brown to a greenish-grey, the posterior margin and median longitudinal band on last segment lighter. Apical emargination equal to width of last tarsal segment.

Legs. Hind tibiae, .75 mm.; middle tibiae, .62-.65 mm.; anterior tibiae, .64-.67 mm. Last tarsal segment distinctly longer than preceding four combined. Granules of femora separated by less than their own diameters. Femora and tibiae of the same color as venter. Tarsi dark brown to black, the basal two-thirds of last segment often a little lighter.

Notes on Types. Holotype male, allotype female, and one paratype, Winchester, Va., 7-21-34, M.W. Sanderson. Additional paratypes from Schellburg, Pa., VIII 16; Wardensville, W. Va., July 19, P.N. Musgrave, Trout Run; Sleepy Creek Route 9, Morgan Co., W. Va., July 23, 1933; Offutts Isl., Md., 16-7-16, Loomis and Barber, at light; Hollister, Mo.,

7-28-34, M.W. Sanderson; and Batavia, N.Y., Sept., 1915,
H.H. Knight.

Remarks and Comparative Notes. As indicated after the description of S. quadrimaculata Horn, this species is closely related but is readily separated by its smaller size. The genitalia are of the same general type but exhibit the differences indicated under S. quadrimaculata Horn. It shows some affinities with S. antennalis n. sp. but is easily separated by the color of the palpi which are always as dark as or darker than the antennae. The palpi are always testaceous or lighter in S. antennalis n. sp. In two examples of S. musgravei n. sp., the humeral spot covers a part of the umbone. However, this is not usual and is not to be regarded as characteristic of the species. These specimens, in this particular, come close to S. humerosa Mots. but are distinguished by the distinctly raised third intervals.

Location of Types. Holotype, allotype, and paratypes in the Francis Huntington Snow Entomological Collection, University of Kansas. Additional paratypes in the collection of Dr. Paul N. Musgrave.

Stenelmis sinuata Lec.

1852. Stenelmis sinuatus Lec. Proc. Ac. N.S. Phila.
VI, p. 44.

Original Description

"Elongatus, piceus, thorace elongato, inaequali, pone apicem magis angustato, angulis anticis porrectis, apice medio producto et rotundato, lateribus late sinuatis, elytris punctato-striatis, interstitio 2^{ndo} basi, 5^{to} que carinatis, macula humerali alteraque subapicali flavis ornatis, tarsis antennis ferrugineis. Long. '12.

"One specimen Tolula, Ga.; the thorax is elevated in the middle, deeply channelled, and has two tubercles on each side near the margin."

Writer's Description

Size. Length, 3.25-3.45 mm.; width, 1.2-1.35 mm.

Form and Color. Body elongate, moderately subdepressed, distinctly inflated behind. Elytra shiny brown; each elytron with a faint longitudinal vitta on inside of sixth interval.

Head. Granulations between eye and band small but prominent and separated from two to four times their diameters. Antennae and palpi testaceous. Antennae considerably shorter than pronotum.

Pronotum. Length, 1.0-1.1 mm.; width, .87-.95 mm.

Disc of pronotum light brown but faintly shining. Pronotum generally widest behind middle then a little convergent to

the hind angles before which there is frequently a slight sinuation. Sides rather suddenly narrowed before the middle, deeply sinuate, the anterior angles usually strongly divergent. The extreme apical angle truncate, the truncation sometimes obtuse. Pronotum usually as wide at base as behind the middle, but never wider at base. Width across the anterior angles but little less than the width at base. Granules on either side of median sulcus at base separated by about twice their diameters. Median longitudinal sulcus very distinctly narrowed posteriorly from near the apical one-fourth to the base. Oblique impression on either side of median sulcus distinct, clearly separating lateral tubercles. Basal tubercle elongate but not distinctly carinate behind. Anterior tubercle moderately elevated and rounded.

Elytra. Length, 2.35-2.5 mm.; width, 1.2-1.35mm.

Each elytron maculate. The vitta only narrow and occupying but little more than fifth interval. First elytral stria complete from base to apex. Third interval conspicuously and acutely elevated at base. The elevation occupying no more than one-fourth of the total length of the interval. Elytral punctures are deep on disc and very conspicuous to the apex.

Venter. Nearly uniformly dark brown in the South Carolina specimen. In all others the color is not distinguishable

due to a fine coat of foreign material. Emargination of last abdominal segment a little less than width of last tarsal segment.

Notes on Type. The type is a female and is labeled Tallulah, Ga.

Remarks and Comparative Notes. No males of this species have been examined, though 11 specimens are before me. Most of the examples are covered with vegetable debris, and in some individuals the vittae are all but invisible. This species perhaps shows its closest relationship to S. vittipennis Zimm. and allies, but is readily separated by having the sides of pronotum strongly divergent in apical third. The apical angles of pronotum are not acute as in most of our species, but subtruncate. It is nearly the size of S. grossa n. sp. and S. douglasensis n. sp., but differs by its granulate instead of punctate legs, pronotum, and venter.

Notes on Distribution. In addition to the type from Tallulah, Ga., the following localities are represented in the material at hand:

Ga.: Wrens, July 27, 1931, P.N. Musgrave

Ala.: Mobile, June 25, 1931, P.N. Musgrave

S.C.: "S.C." (Harvard College Collection)

Miss.: Lucedale, June, P.N. Musgrave, in Reedy Creek.

Location of Type. Type in the LeConte Collection at Harvard College.

Stenelmis decorata n. sp.

(Pl. IV, Fig. 5)

Size. Length, 2.87-3 mm.; width 1.1-1.15 mm.

Form and Color. Body elongate, usually distinctly wider behind, convex. Each elytron with an entire yellowish vitta which is often clouded medially though not distinctly bimaculate. Vitta on inside of sixth interval.

Head. Granules between eye and band separated from two to three times their own diameters. Antennae and palpi yellow-testaceous, the antennae a little longer than pronotum.

Pronotum. Length, .88-.95 mm.; width, .75-.8 mm. Color varying from deep brown to light grey, basal one-third or more, often lighter. Sides rounded just behind the middle, then almost parallel to base, scarcely sinuate before the hind angles. Narrowed and sinuate before the rounded sides then parallel to apex. Width of pronotum at apex but little less than width at base. Granules immediately on either side of median sulcus at base separated by twice their diameters. Median longitudinal sulcus deep, extending from near apical one-fourth of pronotum to base, often a little narrowed posteriorly. Oblique impression distinct and clearly separating lateral tubercles. Basal tubercle small, slightly elongate though never extending to pronotal base; anterior tubercle rounded, distinct, but not prominent.

Elytra. Length, 2.12-2.32 mm.; width, 1.1-1.15 mm.

Each elytron with the vitta entire, on the inside of sixth interval, covering the fourth and fifth intervals, and ex-

tending a little beyond apex of carina of sixth. First elytral stria complete from base to apex. Third interval elevated on basal declivity though usually not acute. Elytral punctures on disc moderate in depth and size, smaller toward apex, never obsolete on declivity.

Venter. Light brown to grey, posterior borders of abdominal segments ordinarily lighter. Apical emargination equal to width of last tarsal segment.

Legs. Hind tibiae, .9-1.1 mm.; middle tibiae, .75-.85 mm.; anterior tibiae, .8-.9 mm. Last tarsal segment a little longer than four preceding combined. Femora and tibiae uniformly dark brown to grey, the tarsi entirely testaceous.

Notes on Types. Holotype male, allotype female, Lawrence, Kans. 8-10-32, M.W. Sanderson, at light. Paratypes collected from June 28-Sept. 24, 1930-1932, Lawrence, Kans., at light. Additional paratypes from Douglas Co. Kansas., F.H. Snow; Washington, D.C. (H.H. Knight Coll.); "Ind." (Otto Lugger Coll.); Pike Co., Ill., 7-10-34, Lowry & Hack.

Remarks and Comparative Notes. Comparison of the hind tarsi of S. decorata n. sp. with those of S. vittipennis Zimm. and S. märkelii Mots. shows that those of the present species are relatively longer and more slender. The pronotum is usually a little narrower, and the whole aspect is a more slender one than the other two species. It is also on the average smaller. It is readily distinguished from S. hungerfordi n. sp., with which it is associated by genital characters, by its narrower form, and distinctly maculate elytra. It is separated from S. vittipennis Zimm.

and S. markëlii Mots. by the absence of lateral processes on the median lobe of aedeagus.

Location of Types. Holotype, allotype, and paratypes in the Francis Huntington Snow Entomological Collection, University of Kansas. Additional paratypes in the collection of Dr. Paul N. Musgrave.

Stenelmis vittipennis Zimm.

(Pl. IV, Fig. 6; Pl. V, Figs. 2, 3 & 5)

1869. Stenelmis vittipennis Zimm. Trans. Am. Ent. Soc.
II, p. 259.

Original Description

"Length $1\frac{1}{4}$ line. Similar to sinuatus, but somewhat broader, and less convex; above blackish-gray, antennae, tarsi, abdomen, and head of prothorax, ferruginous; prothorax longer than wide, scarcely narrowed in front, with parallel sides, long and pointed front angles and slightly elevated dorsal costae; elytra punctate-striate, the inner intervals broader than in sinuatus, 3rd tolerably flat in front, and only the 6th costiform.--S. Carolina.

Writer's Description

Size. Length, 3-3.4 mm.; width, 1.1-1.35 mm.

Form and Color. Body elongate, moderately convex, nearly parallel. Color of elytra very dark brown to black. Each elytron with an entire testaceous vitta confined to inside of sixth interval.

Head. Granules between eye and band minute, usually separated by several times their diameters, in some cases nearly absent. Antennae and palpi yellow-testaceous. Antennae equal to or slightly shorter than pronotum.

Pronotum. Length, .97-1.05 mm.; width, .8-.95 mm. Color, dull grey, the sulcus fuscous anteriorly. Basal one-third or more of sides subparallel. Margin narrowed anteriorly, sinuate and with sides straight to apical angles. Granules

on either side of median sulcus at base minute, separated from two to several times their own diameters. Median longitudinal sulcus usually moderate in depth with sides a little narrowed posteriorly; extending from apical one-fourth nearly to base. Oblique impression on either side of sulcus separating lateral tubercles, the impression usually faint. Basal tubercle but slightly raised above the disc and a little elongate, never carinate; anterior tubercle usually rounded and inconspicuous.

Elytra. Length, 2.25-2.6 mm.; width, 1.1-1.35 mm. Each elytron with vitta entire, on inside of sixth interval, and extending posteriorly to a point usually half way between apex of elytron and carina of sixth interval. Vitta covering fourth and fifth intervals, faintly clouded medially in some specimens. First interval elevated at base, though occasionally but little raised. Elytral punctures moderate on disc; finer toward apex but never obsolete.

Venter. Very light greyish-blue to darker grey, the abdomen distinctly iridescent. The last segment with apical margin usually lighter and which continues as a narrow band to base. Apical abdominal emargination equal to width of tarsal segment.

Legs. Hind tibiae, .97-1.12 mm.; middle tibiae, .75-.87 mm.; anterior tibiae, .87-.97 mm. Last tarsal segment distinctly longer than four preceding combined. Granules on femora very small, rounded, and separated from about two to four times their diameters. Tibiae and tarsi uniformly colored as venter though less iridescent.

Notes on Type. The type of this species from South Carolina has been examined.

Remarks and Comparative Notes. The present species is closely related to S. märkellii Mots. and S. decorata n. sp. It may be separated from these two species by the subangulate lateral processes of the median lobe of aedeagus. It also averages a little larger in size than either of the other two species.

Notes on Distribution. In addition to the type, the species has been examined from the following localities:

United States

Kans.: Lawrence (Douglas Co.), June 28-Aug. 25, 1930-1932, M.W. Sanderson and L.S. Henderson; Kiowa Co., July 5, 1932, R.H. Beamer; Riley Co., July 12-19, J.B. Norton, (Kans. State College Coll.); Greenwood Co., 8-1-1923, Beamer and Lawson.

N.J.: Spotwood (H.H. Knight Collection).

W. Va.: Fairmont, Aug. 3, P.N. Musgrave, at light.

Canada

Que.: Wakefield, 20-VII 1932, W.J. Brown (Canadian National Collection); Knowlton, 29. VII. 1930, L.J. Milne.

Man.: Aweme, on various dates as follows: 28-30 VIII, 1917, N. Criddle; 13 VIII, 1932, N. Criddle; 12 IX 1922, P.M. White (All from Canadian National Collection).

Location of Type. Type in the LeConte Collection, Harvard College.

Stenelmis convexula n. sp.

(Pl. V, Fig. 1)

Size. Length, 2.75-3.1 mm.; width, 1.1-1.12 mm.

Form and Color. Elytra reddish brown to dull grey.

Body elongate, convex, distinctly wider behind. Each elytron with a faint humeral and sub-apical spot. Humeral spot on inside of sixth interval.

Head. Granulation between eye and band separated by twice their own diameters. Antennae and palpi testaceous. Antennae about equal to length of pronotum.

Pronotum. Length, .87-.9 mm.; width, .75-.85 mm.

Disc of pronotum dull brown to grey. Anterior margin and angles faintly rufescent. Pronotum widest behind the middle. Slightly convergent to base and generally sinuate before the hind angles; narrowed before the rounded sides, then sides parallel to apex. Pronotum wider at base than apex. Granulation on either side of median sulcus very fine, separated by about three times their own diameters. Median longitudinal sulcus shallow and generally occupying only the median one-third of pronotum. Oblique impression on either side ill-defined and barely separating lateral tubercles. Posterior tubercle rounded, not at all elongate; the anterior tubercle nearly indistinct.

Elytra. Length, 2-2.25 mm.; width, 1.1-1.12 mm. Each elytron usually with very faint humeral and subapical spots. Spots on inside of sixth interval and occupying no more than fifth interval at base, sub-apical spot a little broader

and terminating about the end of carina of sixth interval. First elytral stria complete. Third interval but very slight and indistinctly elevated at base. Elytral punctures moderate on disc becoming finer toward apex and in some examples nearly obsolete on declivity.

Venter. Dull brown to grey. The abdominal segments a little lighter medially. Last tarsal segment with a narrow apical emargination equal to width of last tarsal segment.

Legs. Hind tibiae, .75-.87 mm.; middle tibiae, .62-.7 mm.; anterior tibiae, .65-.75 mm. Last tarsal segment longer than preceding four combined. Granules of femur separated by no more than their own diameters. Femora and tibiae colored above as venter. Femora noticeably lighter below. Apex of femur, base and apex of tibia lighter. Tarsi reddish brown.

Notes on Types. Holotype male, allotype female and twenty-five paratypes, DeFuniak Springs, Fla., June 28, 1931, P.N. Musgrave.

Remarks and Comparative Notes. This species bears some resemblance to S. fuscata Blatch. and S. hungerfordi n. sp. It differs from the former by the possession of distinct elytral spots, and from this species and S. hungerfordi, it differs by its more convex and broader form. The lateral processes of aedeagus are rounded but broader than S. märkelii Mots. S. convexula n. sp. appears to be a little more convex through the humeri than other species in our fauna.

Location of Types. Holotype, allotype, and paratypes in the collection of Dr. Paul N. Musgrave, Fairmont, West Virginia. Additional paratypes in the Francis Huntington Snow Entomological Collection, University of Kansas.

Stenelmis märkelii Mots.

(Pl. V, Figs. 4, 7 & 9)

1854. Stenelmis märkelii Mots. Etudes Entomologiques,
p. 12.

1859. Stenelmis märkelii Mots. Etudes Entomologiques,
p. 50.

Original Description

"A ces espèces se joignent les Stenelmis sinuatus,
bicarinatus, märkelii et pusillus, qui tous ont sur chaque
élytre des taches ou des bandes de teinte testacée. Le
Stenelmis Märkelii Motsch. que J'avais déjà mentionné dans
ces Etudes, 1854 p. 12, se distingue facilement du Stenel.
bicarinatus, par ses antennes et ses tarsi entièrement d'un
testacé roussâtre, par son corselet plus rétréci en avant,
plus arrondi au milieu, les canelures médianes plus pronon-
cées, par ses élytres plus larges et plus ovalaires et les
intervalles 1 et 2 distinctement relevés en carène à leur
base."

Writer's Description

Size. Length, 3-3.25 mm.; width, 1.17-1.3 mm.

Form and Color. Body elongate, convex, nearly parallel.
Color of elytra piceous-brown to black, each elytron with
an entire longitudinal testaceous vitta which is confined
to inside of sixth interval.

Head. Granules between eye and band separated from one
to several times their own diameter. Antennae and palpi

light brownish-testaceous. Antennae about equal in length to pronotum.

Pronotum. Length, .9-1 mm.; width, .85-.9 mm. Median sulcus, and from its anterior extremity to apex of pronotum, fuscous. Remainder of pronotum dull gray. Sides rounded behind the middle then slightly convergent to base. Narrowed anteriorly, with a shallow sinuation before anterior angles. Granules on either side of sulcus at base and entire upper surface separated by about twice their diameters. Median longitudinal sulcus moderate in depth, narrowed posteriorly and extending from apical one-third to near the base. Oblique impression on either side of median sulcus inconspicuous and shallowly separating lateral tubercles; the tubercles rounded and barely evident.

Elytra. Length, 2.25-2.4 mm.; width, 1.17-1.3 mm. Each elytron with the vitta entire, on inside of sixth interval, and extending posteriorly to a little beyond apex of carina of sixth interval. Vitta covering fourth and fifth intervals except at middle where vitta is slightly narrowed. First elytral stria complete from base to apex. Third interval in type just perceptibly elevated near base. Elytral punctures moderate in size and depth on disc, never obsolete on apical declivity.

Venter. Light grey to brown with the abdominal segments nearly uniform in coloration. Apical abdominal emargination equal to width of last tarsal segment.

Legs. Hind tibiae, .9-1.12 mm.; middle tibiae, .8-.9mm;

anterior tibiae, .85-1 mm. Last tarsal segment distinctly longer than preceding four segments combined. Granules on femora of most examples generally separated from once to twice their diameters. Femora and tibiae entirely grey, the tarsi reddish-brown.

Notes on Types. The type series of four males bearing the label: "Stenelmis Märkelii Motsch, Tenness." has been examined. One of these specimens has been dissected and designated as lectotype. The granules on the femora of three of the specimens are a little more closely placed than on the specimen selected as the type.

Remarks and Comparative Notes. This species is very closely related to S. vittipennis Zimm. and is only satisfactorily separated from that species by the character of the aedeagus. The processes of the median lobe of S. märkelii Mots. are evenly rounded, and not subangulate anteriorly as in S. vittipennis Zimm. There is also a close resemblance to S. decorata n. sp. but the latter has the median lobe without processes.

Notes on Distribution. This species is very closely related to S. vittipennis Zimm. and is only satisfactorily separated from that species by the character of the aedeagus. The processes of the median lobe of S. märkelii Mots. are evenly rounded, and not subangulate anteriorly as in S. vittipennis Zimm. There is also a close resemblance to S. decorata n. sp. but the latter has the median lobe without processes.

Notes on Distribution. In addition to the type series from Tennessee, the species has been examined from:

Ark.: Berryville, 7-4-34, R.H. Beamer, at light.

Mo.: Hollister, 7-28-34, M.W. Sanderson, Long Creek

Mass.: Chicopee (W. Knaus Collection).

Penn.: "Penn." (Otto Lugger Collection); "Pa."

Location of Types. In the Zoological Museum of Moscow,
U.S.S.R.

ADDENDA

The following two species of *Stenelmis* are the only known Western Hemisphere species not found in the United States. Although neither is closely related to the others, their original descriptions are added here for the sake of completeness.

Stenelmis geayi Grouv.

1908. *Stenelmis Geayi* Grouv. Bull. du Mus. d'Hist. Nat., 14, pp.181-182.

Original Description

"Oblongo-elongata, subparallela, convexa, opaca, nigro-fumosa, maculis griseis in capite prothoraceque, avellaneis in elytris variegatus. Antennae tenues, rufo-testaceae, articulis omnibus multo longioribus quam latis. Caput transverso-oblongum, margine antico ante bases antennarum inflexo; oculis magnis, satis admotis, labro rufo-testaceo. Prothorax antice valde angustus vix longior quam ad basin latus, in longitudinem subsulcatus; haud dense punctulatus, punctis ad latera majoribus; margine antico valde producto, medio et utrinque sinuato; lateribus arcuatis, ad basin sinuatis; basi trisinuata; angulis anticis late obtusis, subhebetatis, posticis acutis, extus productis. Scutellum suborbiculare. Elytra prothorace latiora, ad apiceum subseparatim acuminata, magis duplo longiora quam simul lata, punctato-striata; intervallis striarum punctis latioribus; humeris calosis, subdentatis; disco ad apiceum sat abrupte declivo, intervallo 6° ad initium partis inclinatae per

tuberculum acuminatum armato. Tarsi rufo-testacei.

Long., 5-5 millim. 5.

"Oblong, allongé, subparallèle, convexe, noir, grisâtre, légèrement violacé, varié de taches grises sur la tête et le prothorax; grises, légèrement rosées sur les élytres; taches mal limitées, formant principalement sur le prothorax une band antérieure médiane et deux bandes latérales, basillaires, et sur les élytres une série de bandes linéaires couvrant les stries, se soudant parfois et groupées à la base sur les 2^e, 3^e, 4^e, et 5^e stries, sur les côtés sur les 4^e, 5^e et 6^e, sur le disque vers la partie déclive, sur les 2^e et 3^e; strie suturale presque entièrement couverte par une tache linéaire, souvent interrompue sur les intervalles de points. Antennes roux-testacé grêles; tous les articles beaucoup plus longs que larges. Tête en ovale transversal, infléchié un peu en avant de la naissance des antennes, celles-ci relativement rapprochées à la base; yeux gros; labre roux testacé; dernier article des palpes maxillaires allongé, oblong. Prothorax fortement rétréci en avant, un peu plus long que large à la base, longitudinalement subsilloné dans le milieu, couvert d'une punctuation profonds, peu serrée, fine sur le disque, plus forte sur les côtés; bord antérieur fortement saillant en avant, arrondi, sinué dans le milieu et de chaque côté; bords latéraux arrondis, sinues avant la base; base trisinuée; angles antérieurs largement obtus, postérieurs aigus, réfléchis

en dehors; sur le disque de chaque côté du sillon longitudinal, vers le premier tiers à partir de la base, une petite élévation conique. Écusson suborbiculaire, Élytres plus larges que le prothorax, subacuminés séparément au sommet, environ deux fois et un tiers aussi longs que larges ensemble, ponctués-striés; intervalles des stries plus larges que les points, ceux-ci plus forts à la base qu'au sommet; partie apicale des élytres assez fortement et brusquement déclive; calus huméraux allongés, subdentés; 8^e intervalle externe légèrement caréné, terminé vers la partie déclive de l'élytre par un tubercule acuminé. Tarses roux-testacé. Métasternum fortement creusé pour recevoir la saillie du prosternum; saillie du premier segment abdominal très largement obtuse.

"11 exemplaires.--Guyane; rivière Lunier (F. Geay).
Collection du Muséum de Paris.

"Espèce remarquable par les taches d'un aspect limoneux, mal définies qui décorent son prothorax et ses élytres."

Writer's Notes

Two specimens of this species from the type series have been studied. It is not closely related to any species found within the United States although it possesses certain characters peculiar to the Sinuata-humerosa Group. The last tarsal segment is very much longer than the four preceding combined, and the claw is proportionately larger. The punctures of the pronotum are very fine, a character

which is found only in S. grossa Sand. and S. douglasensis Sand. both of which are in the Sinuata-humerosa Group.

Otherwise S. geayi Grouv. departs from all other species in the Western Hemisphere in many characters. The entire body is peculiarly patterned with dark and light grey which extends on to the legs; the antennae are very slender and are longer than the pronotum by the last three segments. The antennae and palpi are brownish-testaceous. The pronotal sulcus is shallow and extends nearly the full length of pronotum. The margin of pronotum at the anterior end of sulcus is distinctly emarginate. On either side of sulcus near basal third is a rounded prominence, and opposite this, near lateral margin, is another slightly smaller prominence. The third elytral interval is elevated a little behind extreme base and with the intervals on either side slightly prominent. The sixth interval is elevated and prominent at extreme base. In the apical fourth of the seventh elytral interval, there is a conspicuous dentiform process. The apices of the elytra are separate.

For the present I must regard this as congeneric with the European Stenelmis canaliculata (Gyll.) although its facies and robustness are quite unlike other species known to me. In general appearance, it recalls certain Curculionids. The absence of patches of tomentum on the inside of the tibiae would seem to exclude it from the closely related Cylloepus.

Types are located in the Paris Museum and in the Francis Huntington Snow Entomological Collection, Univ. of Kansas.

Stenelmis nevermanni Hinton

1936. Stenelmis nevermanni Hntn. Trans. Royal Ent.
Soc. London, 85, pp.424-426.

Original Description

"Male. Elongate, subparallel, moderately convex. Surface throughout microscopically alutaceous; above with the scutellum glabrous, elsewhere sparsely clothed with very fine, moderately long, recumbent, pale-testaceous hairs; elytra near apex with a few fine, erect hairs which are often about as long as the combined length of the two basal antennal segments; upper surface in many specimens brownish-cinereous due to a fine deposit of earthy material; beneath clothed throughout with minute, dense tomentum and also clothed as above. Derm pale brownish-piceous, feebly shining. Head with the clypeal suture nearly straight; anterior margin of clypeus truncate, with the angle on each side obtusely rounded; antennae long and slender, extending slightly beyond basal prothoracic angles. Surface very finely granulate, with the granules apparently seldom separated by more than five times their diameters. Prothorax longer than broad (30:26-5), broadest across basal one-third; base broader than apex (25:19). Apical margin feebly arcuate, feebly sinuate on each side behind eye; apical angles inconspicuous, when viewed laterally feebly produced forwards, obtusely rounded; sides moderate-

ly converging towards apex, feebly, broadly sinuate in apical one-half and feebly, more narrowly sinuate before basal angles, lateral margins indistinct, nearly obsolete, finely crenate due to fine lateral granules; basal margin moderately strongly trisinate, broadly so on each side and narrowly so in front of scutellum. Pronotum unevenly convex, without definite sublateral carinae; median longitudinal impression feeble, extending from basal one-fourth to apical one-third, deepest at apical one-third. Surface slightly coarsely, densely, often confluent rugosely punctate; with fine granules which are especially anteriorly and at sides separated mostly by two to seven or more times their diameters. Elytra more than twice as long as prothorax (68:30), broader across apical one-third than at humeri (39:35). Intervals nearly flat, alternate discal intervals (1,3,5, and 7) slightly paler in colour than others; striae punctures moderately coarse, subquadrate to round and on disk separated mostly by one to five times their diameters. Apices moderately broadly but somewhat shortly produced, conjointly truncate. Scutellum elongate, subovate, broadly rounded basally, acuminate apically, length to breadth ratio is 6.5:3.8, flat, glabrous, shining. Surface beneath finely granulate. Prosternal process as figured. Metasternum depressed posteriorly; with the median longitudinal line extending only to anterior one-third. Middle of first ventral abdominal segment not

noticeably depressed, granulate similarly to metasternum, sides and other ventral segments much more finely granulate than metasternum. Claws slender, not toothed. Length, 3.6 mm.; breadth, 1 mm.

"Female externally similar to male.

"Type: a male in my collection Costa Rica: Reventazon, 1.xi.1934, at light (F. Nevermann).

"Paratypes: Twelve collected by the same collector at the same locality during the following different times: --.xi.1931, --.ii.1932, --.vii.and --.xi.1934.

"Certain specimens appear to have a feebly developed fringe of tomentum on the inner apices of the tibiae, but in all other respects the species is a true Stenelmis. It is the only species of this cosmopolitan genus so far recorded from the Mexican or central American region. It is close to none of the North American (U.S.A.) species known to me."

Writer's Notes

Two specimens of this species from the type series have been studied. Again this species is not closely related to those within the United States although it possesses certain characters which would more closely associate it with the Grenata Group. The last tarsal segment is a little smaller than the preceding four combined, and the claw is small and slender. The antenna is longer than the pronotum by the length of the last three segments. The third

elytral interval is but slightly elevated behind the extreme base, and the sixth interval is not at all cariniform as in the United States species. The pronotum and venter are, in part, granulate, but the legs are minutely punctulate. The extreme apices of the elytra meet at the suture, and are squarely truncate.

This species, although agreeing with S. geayi Grouv. by its longer antennae, is perhaps more closely related to the United States species. It is smaller than S. geayi, slender, and is not variegated with color.

The type and paratypes are located in the collection of Mr. Howard E. Hinton, Berkeley, Calif. A paratype has been deposited in the Francis Huntington Snow Entomological Collection, University of Kansas.

The two references below are to species which originally were included in *Stenelmis*:

Cylloepus puncticollis (Hntn.)

1934. Stenelmis puncticollis Hntn. Revista de Entomologia, IV, pp1 198-199.

I have not examined this species, but in a letter from its author, it has been referred to *Cylloepus*. Cleaning and study of the anterior tibiae have shown the presence of tufts of tomentum on the inner sides.

Microcylloepus pusillus (Lec.)

1852. Stenelmis pusillus Lec. Proc. Ac. N.S. Phila.
VI, p.44.
1869. Limnius pusillus (Lec.) Zimmerman, Trans. Am.
Ent. Soc., II, p.259.
1870. Elmis pusillus (Lec.) Horn, Trans. Am. Ent. Soc.
III, pp.29-42.
1935. Microcylloepus pusillus (Lec.) Hinton, Stylops,
Vol. 4, pt. 8, pp.178-179.

The new genus Microcylloepus was erected by Hinton for this and a number of related species.

Stenelmis canaliculata (Gyll.)

I have examined the type of Stenelmis elongata Mots.* which is labeled: "Stenelmis elongatus Motsch. Am. bor.?". Careful comparison of the type with an authentically determined specimen of the European Stenelmis canaliculata (Gyll.) convinces me that the two are the same. S. elongata Mots. thereby becomes a synonym of S. canaliculata (Gyll.) and should be dropped from our lists.

* Etud. Entom. VIII, 1859, p.51

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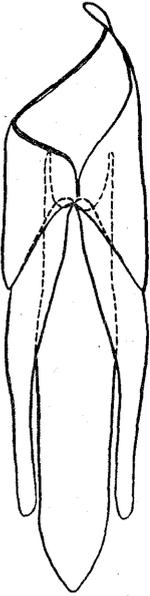
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PLATE I

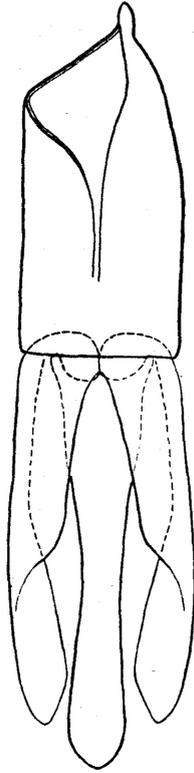
Figs. 1 to 6. Male genitalia of *Stenelmis* species.

(Dorsal view)

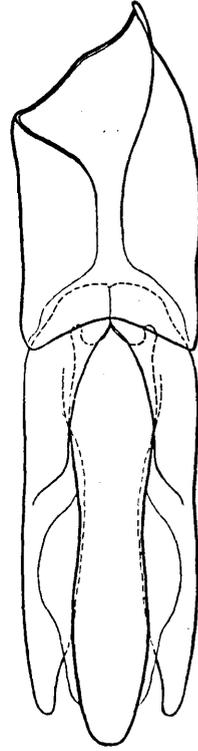
PLATE I



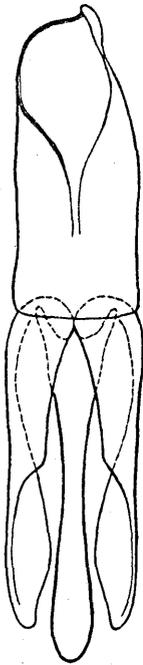
1. *S. NUBIFERA*



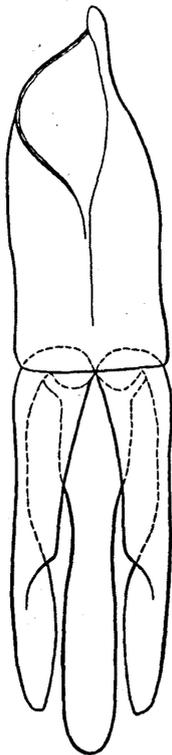
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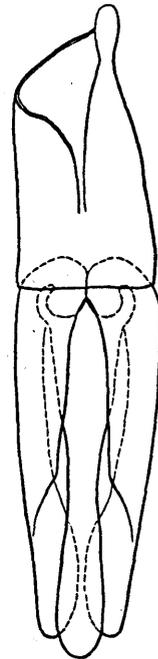
3. *S. CRENATA*



4. *S. EXIGUA*



5. *S. BEAMERI*



6. *S. LATERALIS*

PLATE II

Figs. 1 to 5. Male genitalia of *Stenelmis* species.

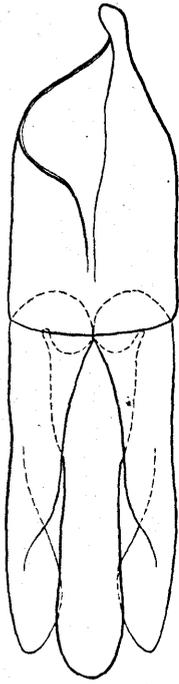
(Dorsal view)

Fig. 6. A typical antenna of *Stenelmis*.

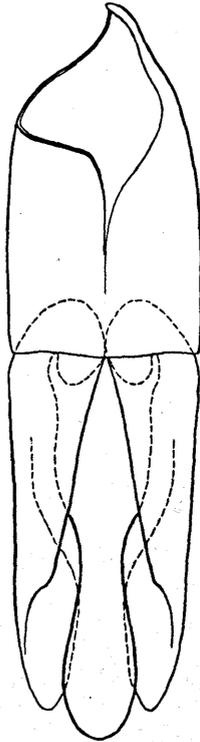
Fig. 7. Antenna of the Western *Stenelmis nubifera*

Fall showing segments 4 and 5 together subequal
to the third segment.

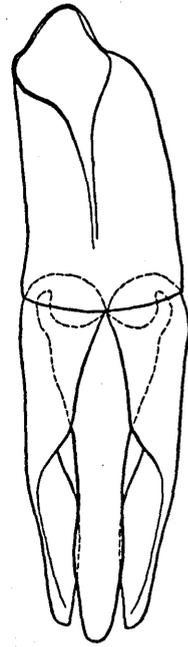
PLATE II



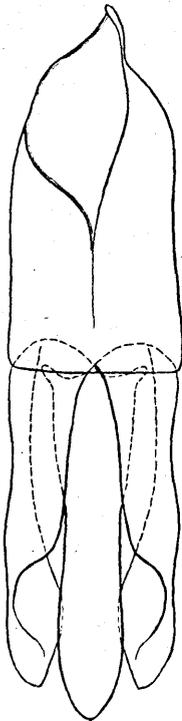
1. *S. CONCINNA*



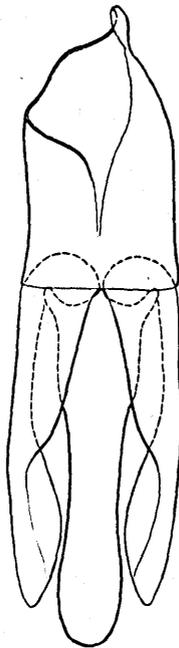
2. *S. TARSALIS*



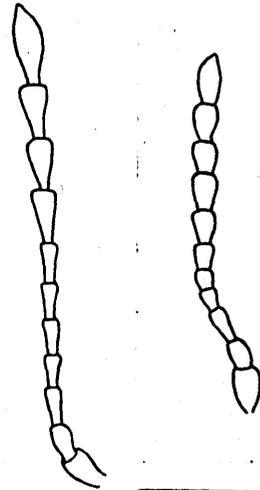
3. *S. KNOBELI*



4. *S. BICARINATA*



5. *S. MERA*



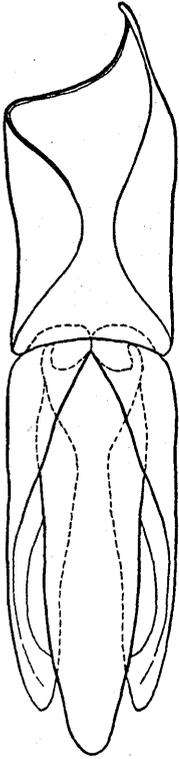
7. *S. NUBIFERA*

6. *S. BICARINATA*

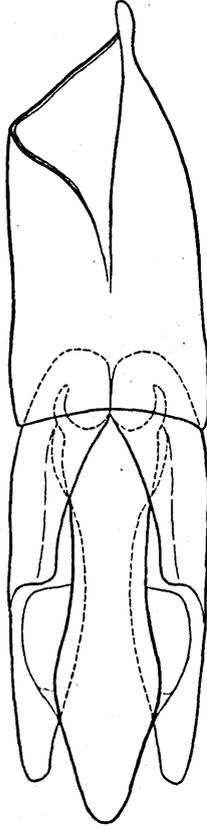
PLATE III

Figs. 1 to 6. Male genitalis of *Stenelmis* species.
(Dorsal view)

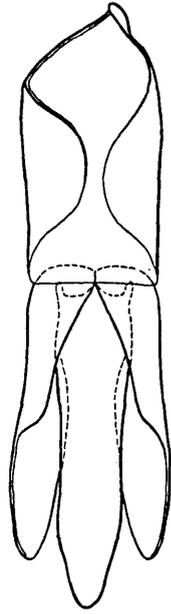
PLATE III



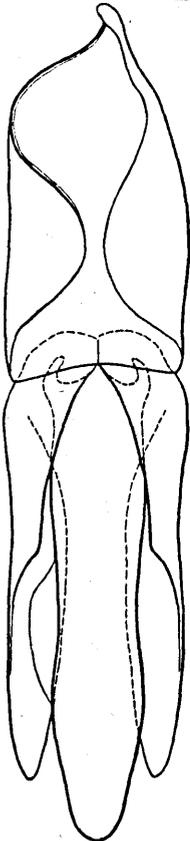
1. *S. DOUGLASENSIS*



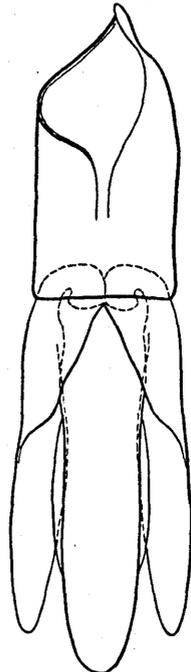
2. *S. GROSSA*



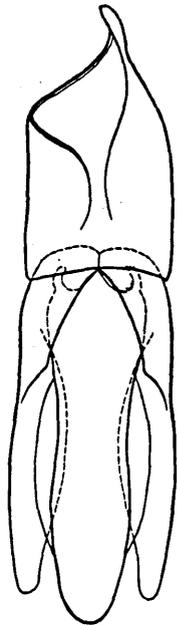
3. *S. PARVA*



4. *S. FUSCATA*



5. *S. HUNGERFORDI*



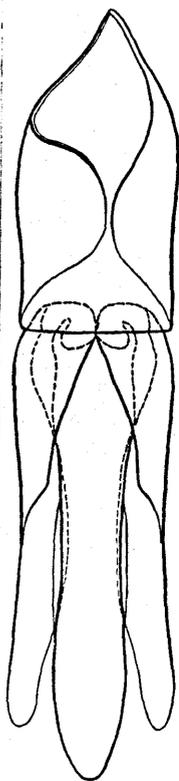
6. *S. HUMEROSA*

PLATE IV

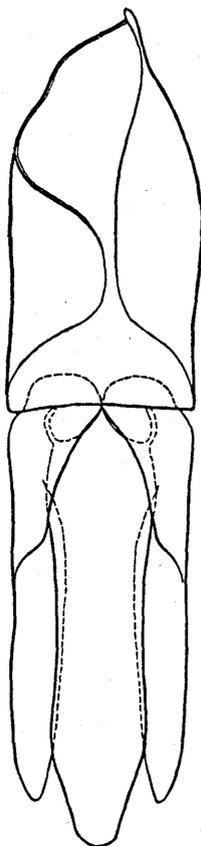
Figs. 1 to 6. Male genitalia of *Stenelmis* species.

(Dorsal view)

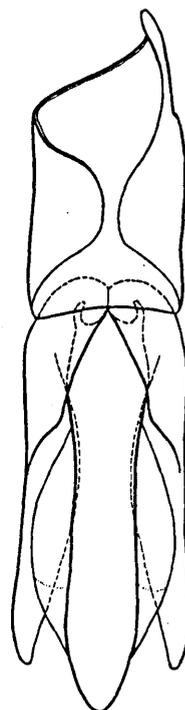
PLATE IV



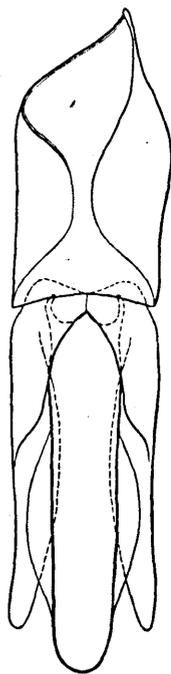
1. *S. MIRABILIS*



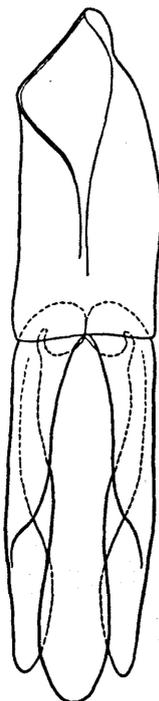
2. *S. ANTENNALIS*



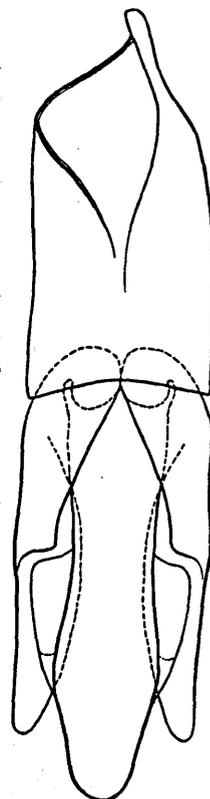
3. *S. QUADRIMACULATA*



4. *S. MUSGRAVEI*



5. *S. DECORATA*



6. *S. VITTI PENNIS*

PLATE V

Figs. 1 and 4. Male genitalia of *Stenelmis* species.

(Dorsal view)

Fig. 2. Middle femur and tibia of female showing absence of spinous ridge on tibia.

Fig. 3. Middle femur and tibia of male showing the spinous ridge on tibia.

Fig. 5. Ventral view of last tarsal segment showing the truncate lower margin at apex.

Fig. 6. Ventral view of last tarsal segment showing a projection of lower margin.

Fig. 7. Tarsus of a species of Sinuata-humerosa Group. The terminal segment is equal to the four preceding combined; the claws are more robust.

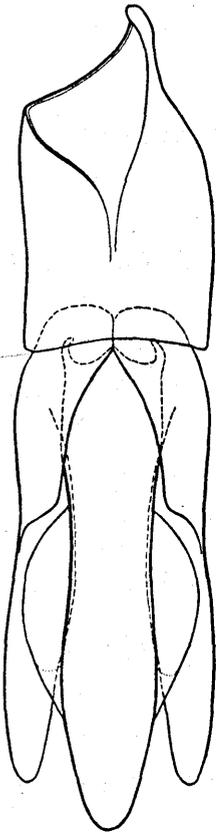
Fig. 8. Tarsus of a species of Crenata Group. The terminal segment is shorter than the four preceding combined; the claws are more slender.

Fig. 9. Last visible ventral abdominal segment showing apical emargination.

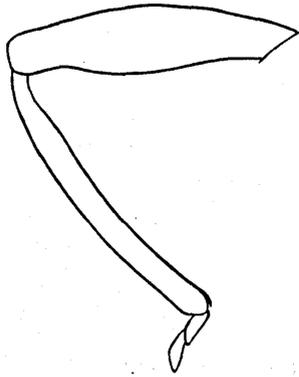
Fig. 10. Hind wing of a species of Crenata Group.

This is also typical for members of the Sinuata-humerosa Group. A well developed wing, such as figured, and a much reduced one have been found in Stenelmis crenata (Say).

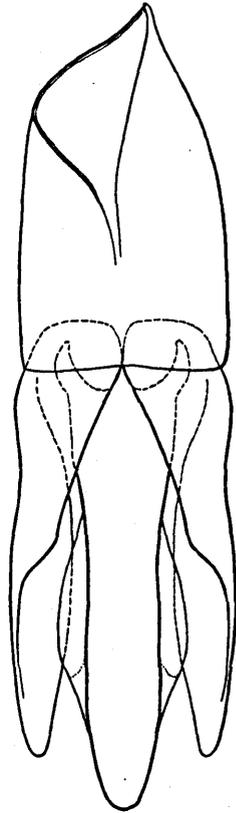
PLATE V



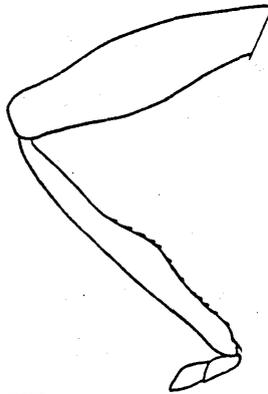
1. *S. CONVEXULA*



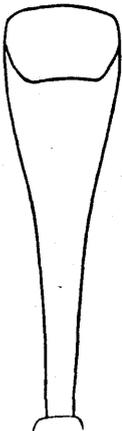
2. *S. VITTIPENNIS*



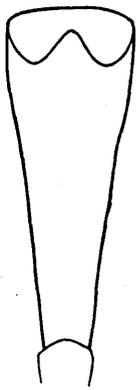
4. *S. MARKELII*



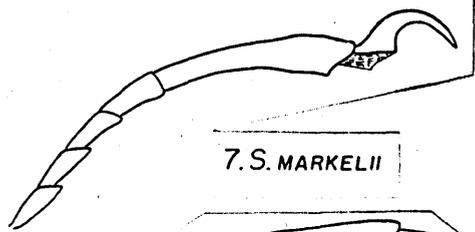
3. *S. VITTIPENNIS*



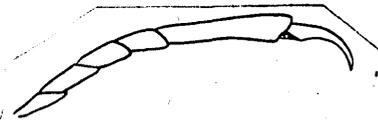
5. *S. VITTIPENNIS*



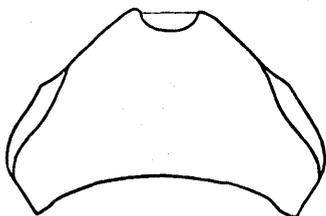
6. *S. TARSALIS*



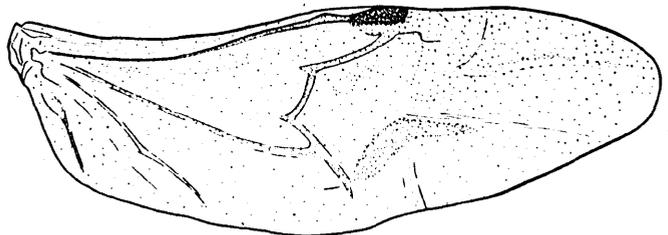
7. *S. MARKELII*



8. *S. LATERALIS*



9. *S. MARKELII*



10. *S. BICARINATA*

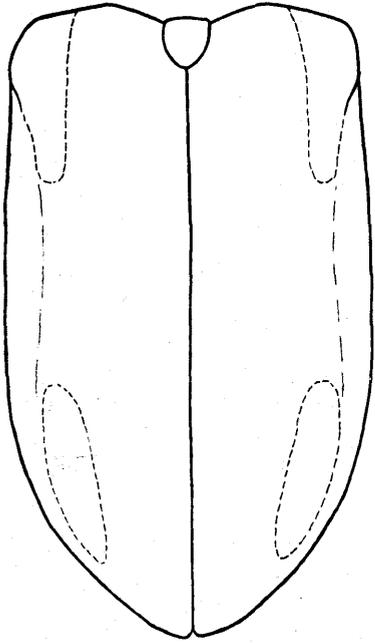
PLATE VI

Figs. 1, 2, 4 and 5. Elytral patterns of *Stenelmis* species. The testaceous spots are within the dotted areas.

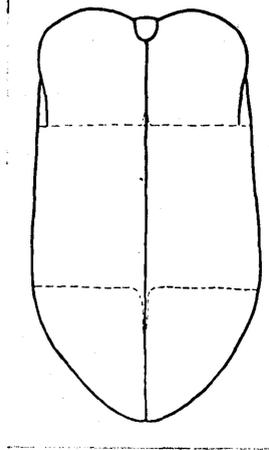
Fig. 3. Elytral pattern of a bimaculate form of *Stenelmis crenata* (Say).

Fig. 6. Elytral pattern of *Stenelmis sexlineata* Sand. The extreme lateral vittae are outside of the sixth intervals and are not shown in this figure.

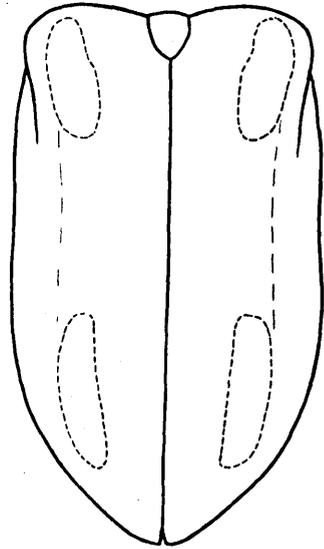
PLATE VI



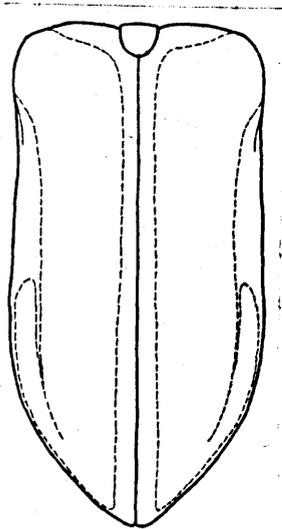
1. *S. TARSALIS*



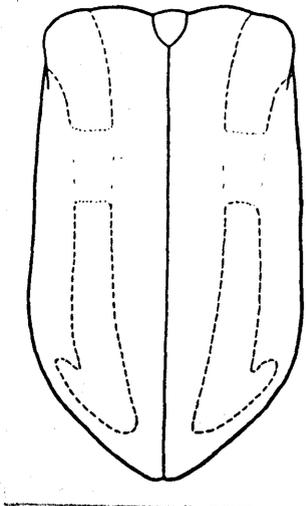
2. *S. NUBIFERA*



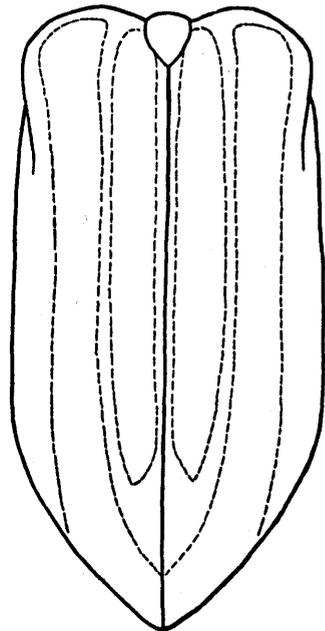
3. *S. CRENATA*



4. *S. LATERALIS*



5. *S. MERA*



6. *S. SEXLINEATA*

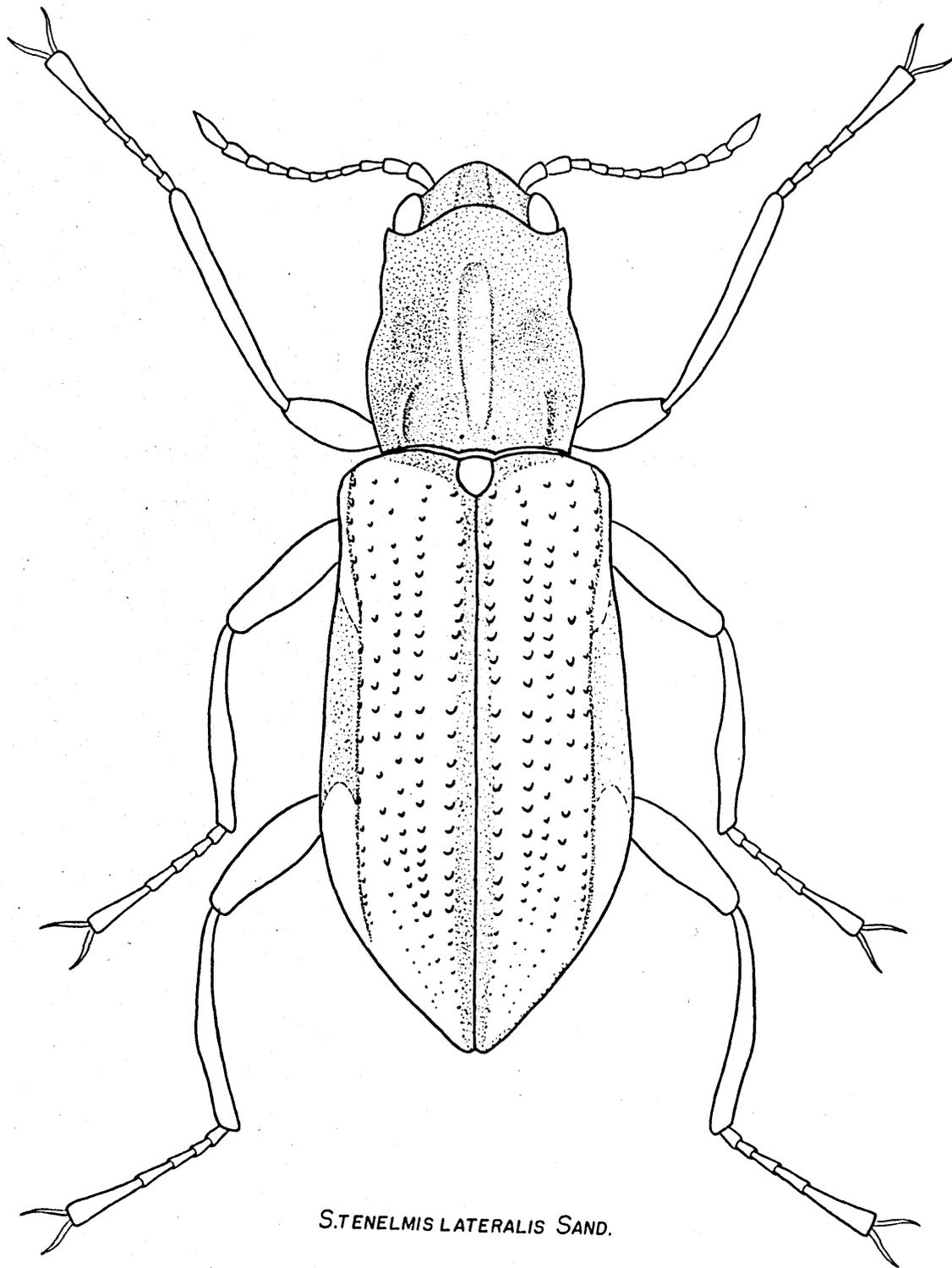
PLATE VII

Figure drawn to scale of Stenelmis lateralis Sand.

This figure demonstrates the median sulcus of pronotum, and the lateral tubercles. It also illustrates a species in which the vitta or basal elytral spot covers the humeral umbone. In this species the vitta near the apex of elytra extends cephalad on the outside of the sixth interval.

Only the ridge of the middle tibia of the male is indicated in this figure; the spines have not been figured.

PLATE VII



S. TENELMIS LATERALIS SAND.

PLATE VIII

Figures from Dufour showing certain characteristics of the digestive tracts, etc., of Stenelmis canaliculata (Gyll.), and Macronychus quadrituberculatus Müll.

L. DUFOUR. — *Anaomie des Coléoptères.*

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EXPLICATION DES FIGURES.

Pl. 6 et 7.

- Fig. 1. *Macronychus quadrituberculatus*.
Fig. 2. Mesure de sa longueur naturelle.
Fig. 3. Antenne détachée pour mettre en évidence sa composition.
Fig. 4. Aile bien développée et propre au vol.
Fig. 5. Aile rudimentaire.
Fig. 6. Mandibule avec sa lame membraneuse.
Fig. 7. Lèvre avec ses palpes.
Fig. 8. Mâchoire avec son palpe.
Toutes ces figures considérablement grossies.
Fig. 9. *Stenelmis canaliculata*.
Fig. 10. Mesure de sa longueur naturelle.
Fig. 11. Une patte antérieure détachée pour mettre en évidence sa composition.
Fig. 12. Mandibule avec sa lame membraneuse.
Fig. 13. Pointe de la mandibule vue de face pour mettre en évidence les deux petites dents qui l'accompagnent.
Fig. 14. Lèvre avec ses palpes.
Fig. 15. Mâchoire avec son palpe.
Fig. 16. Lobe interne de la mâchoire pour mettre en évidence ses poils et ses dents membraneuses.
Toutes ces figures considérablement grossies:
Fig. 17. Tête et appareil digestif considérablement grossis du *Macronique*.
a. Tête où sont en évidence les antennes, le dernier article des palpes, le labre, les yeux; b. œsophage et gésier; c. bourses gastriques étalées en verticille; d. ventricule chylique; ee. vaisseaux biliaires; f. intestin; g. dernier segment dorsal de l'abdomen.
Fig. 18. Une des six colonnes calleuses et velues qui garnissent antérieurement le gésier.
Fig. 19. Tête et appareil digestif considérablement grossis du *Stenelmis canaliculata*.
a. Tête où sont en évidence les antennes, le dernier article des palpes maxillaires, les yeux, le labre; b. œsophage suivi du ventricule chylique; cc. vaisseaux hépatiques; d. portion grêle de l'intestin; e. gros intestin; f. dernier segment dorsal de l'abdomen.

PLATE VIII

Ann. des Scienc. nat. 2^e Série.

Zool. Tom. 3. Pl. 6

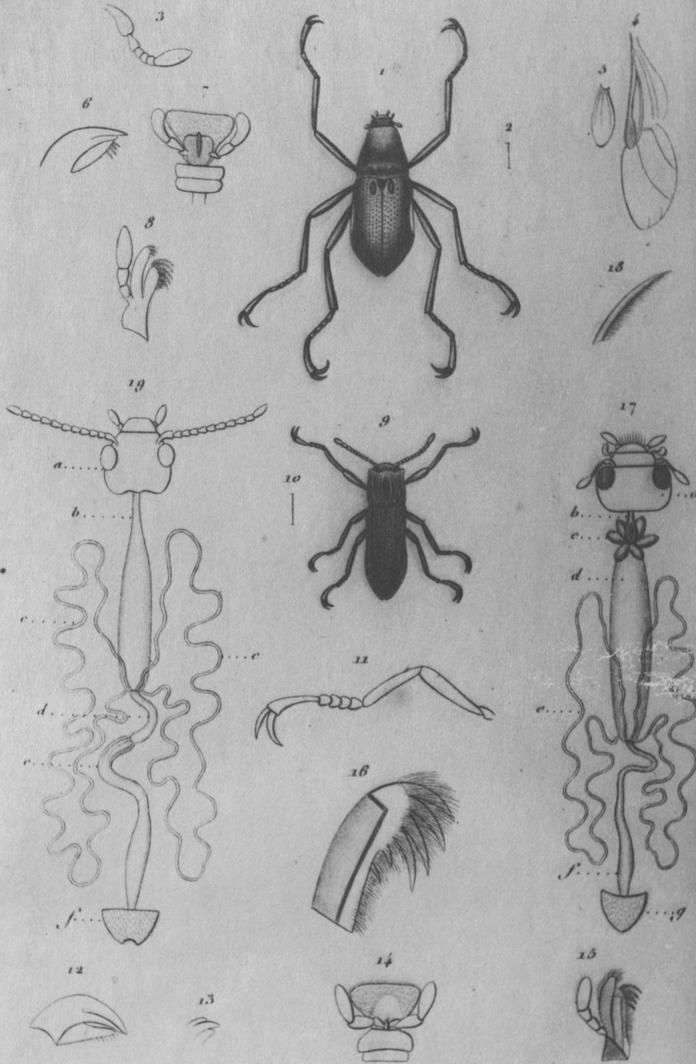


Fig. 1-8 et 17-18. *Macronychus quadrinuberculatus*.

Fig. 9-16 et 19. *Stenelmis Canaliculatus*.

PLATE IX

Figures from Dufour showing features of the reproductive systems of Macronychus quadrituberculeus Mull., a species of Elmis, Stenelmis canaliculata (Gyll.), and Stenelmis consobrina Duf.

Fig. 20. Appareil générateur mâle considérablement grossi du *Macronique*. *aa*, Testicules; *b*, vésicules séminales; *c*, armure copulatrice.

Fig. 21. Un testicule encore plus grossi pour mettre en évidence les deux capsules spermifiques et l'origine du conduit déférent.

Fig. 22. Appareil générateur mâle considérablement grossi du *Stenelmis canaliculatus*. *aa*, Testicules; *bb*, conduits déférens; *cc*, vésicules séminales principales; *d*, seconde paire des vésicules séminales; *e*, canal éjaculateur; *f*, armure copulatrice.

Fig. 23. Testicule encore plus grossi vu par sa face inférieure.

a, Capsules spermifiques principales; *b*, troisième capsule spermifique non courbée en crosse; *c*, conduit déférent.

Fig. 24. Appareil générateur mâle considérablement grossi de l'*Elmis Volkmar*. *a*, Testicules; *bb*, vésicules séminales principales; *cc*, Deux autres paires de vésicules séminales; *d*, canal éjaculateur; *e*, portion de l'armure copulatrice; *f*, dernier segment dorsal de l'abdomen; *g*, portion de l'intestin.

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CH. MORREN. — *Influence de la lumière*

Fig. 25. Appareil générateur femelle considérablement grossi du *Macronique*.

a, Ligament suspenseur commun des ovaires; *bb*, ovaires; *cc*, calice des ovaires; *d*, col des ovaires; *e*, oviducte; *f*, glande sébifique; *g*, dernier segment dorsal de l'abdomen; *h*, portion de l'intestin.

Fig. 26. Appareil générateur femelle considérablement grossi du *Stenelmis consobrinus*. *aa*, Ovaires vierges; *b*, cols des ovaires; *c*, oviducte; *d*, ganglions nerveux; *e*, dernier segment dorsal de l'abdomen; *f*, glande sébifique; *g*, portion du ventricule chylique intestin et vaisseaux hépatiques.

Fig. 27. Un ovaire vierge étalé et penné, considérablement grossi, du même insecte.

Fig. 28. Appareil sébifique considérablement grossi du *Stenelmis canaliculatus*. *a*, Cols des ovaires; *b*, vaisseau sécréteur de la glande sébifique; *c*, réservoir de l'humeur sébacée; *d*, canal excréteur contourné en tire-bouchon serré; *e*, oviducte; *f*, dernier segment dorsal de l'abdomen; *g*, portion de l'intestin.

PLATE IX

Ann. des. Scienc. nat. 2^e Serie.

Zool. Ess. 3. Pl. 7.

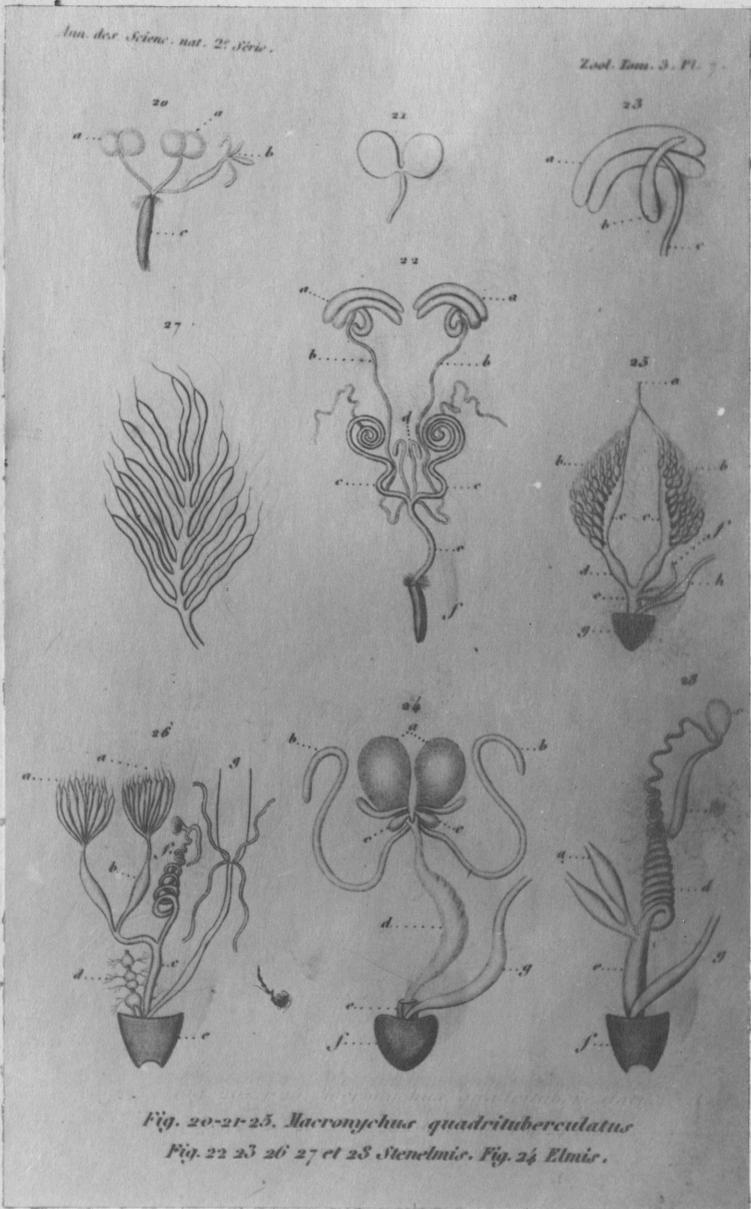


Fig. 20-21-25. *Macronychus quadrituberculatus*
 Fig. 22 23 26 27 et 28 *Stenelmis*. Fig. 24 *Elmis*.

Abstract

This paper, according to its title, is a Monographic Revision of the North American species of *Stenelmis*. It contains virtually all that has been written on this genus of Dryopidae for the Western Hemisphere. This included all that is known on the biology and morphology of the genus in addition to the taxonomy.

Approximately 600 species of Dryopidae have been described of which sixty-eight belong to the genus *Stenelmis*. Fifteen species of this number have been described from North and South America, of which four species: *Stenelmis sulcata* Blatch. (*blatchleyi* Musgr.), *S. linearis* Zimm., *S. sordida* Mots., and *S. elongata* Mots. are reduced to synonymy in this paper. Eighteen species of *Stenelmis* are described here for the first time. They are: *Stenelmis sexlineata*, *S. exigua*, *S. beameri*, *S. lateralis*, *S. concinna*, *S. tarsalis*, *S. knobeli*, *S. exilis*, *S. mera*, *S. douglasensis*, *S. grossa*, *S. parva*, *S. hungerfordi*, *S. mirabilis*, *S. antennalis*, *S. musgravei*, *S. decorata*, and *S. convexula*.

With the exception of *Stenelmis crenata* (Say), the types, cotypes or paratypes have been examined for each of the American species. Since the type or types of *S. crenata* are lost, new types are designated.

The key to *Stenelmis* is based to some extent upon the color patterns of the elytra. Considerable use has, however, been made of the tarsal claws and segments, tubercles of the pronotum, apical abdominal emargination, granulation,

the male genitalia, and a number of other characters not heretofore used. Males have been studied of all the species except two. With these exceptions, a figure of the genitalia is given for each species. This is the first time that a comparative study has been attempted of the male genitalia of Stenelmis. Technique is given for dissecting and mounting the genitalia.

The original and my own description or notes have been given for each of the American species.

A brief history of the classification of the entire family has been given from the time that the first Dryopid was described. The family was unknown to Linnaeus.

Although no fossil ^{*Stenelmis*} ~~Dryopidae~~ are known, a complete geological history is given for the family.