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POSSIBLE ECONOMIC RELATIONS OF THE HAWAIIAN INSECT FAUNA TO CALIFORNIA AGRICULTURE*

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The insect fauna of the Hawaiian Islands, both native and accumulated, is of direct interest and in some cases of serious concern to mainland agriculture, particularly to California which is the first mainland point of contact which grows commercially in her warm interior valleys or along the coast many of the host fruits or plants indigenous to the Islands.

Geographically as well as figuratively the Islands represent the last stepping-stone across the Pacific between the far East and the continental United States. For more than one hundred and fifty years they have been the focal point of nearly all trade routes travelled by surface ships moving to Pacific Coast ports from that vast area of the old world which includes Japan, Formosa, Eastern Asia, China, the Malay Peninsula, India, the Philippines, Australia, New Zealand and Oceania. More recently rapidly developing air transportation is closely following the same channels. Carriers over these routes have been and will continue to be the only means of transporting the myriad insect species representing known and potential plant pests in those areas to the Pacific Coast because natural spread is obviously precluded by the extended intervening water barriers.

It is not surprising, therefore, that over the years, in spite of quarantine safeguard measures which have been rigorously enforced during the latter part of that period, there may have accumulated in the Islands, as an addition to the local fauna an assortment of species which have not previously found it possible to complete the final and longer jump to the mainland.

Until very recently the 2,400 miles of water lying between the Islands and the mainland has, as just stated, proven a very effective barrier against natural spread. This natural safeguard has been further augmented by the limited number of available mainland ports of entry and the restriction of transportation due

* Presidential address read before the Pacific Coast Entomological Society on December 5, 1942.

to the long haul involved and to the small number of major carrier lines. All of these factors have combined to make the enforcement of prohibitory or restrictive plant quarantines practical.

The picture, however, is rapidly changing under the impetus of war conditions which are forcing advanced changes in transportation methods and materially increasing the number of trans-Pacific contacts with and via the Hawaiian Islands.

Whereas yesterday the fastest passenger ships took four and one-half days to traverse the distance between Honolulu and San Francisco and the slower freighters from five to eight days, passenger carrying planes with appreciable cargo space now make the same trip in as little as nine hours. Whereas arrivals averaged less than one a day they are rapidly approaching several daily. In one recent month as many passengers arrived by air as were carried by surface ships. And whereas ports of entry have been limited to the few natural harbors available to surface ships, air travel requirements have opened a wide vista of practical landing fields, whether for land or sea planes, throughout the entire length and breadth of the coastal area.

As already intimated the war situation itself has played an important part in this changing picture, forcing changes through necessity that might otherwise have taken a generation to develop. It has been responsible for materially increasing the hazards of introducing new pests through the medium of host fruits and plants carried in cargo, ships stores and quarters and in crew and passenger baggage. Ships and operating personnel have been diverted into the Hawaiian theater which have never been in those waters before and therefore are not familiar with the potential pest problems peculiar to that area. Air movements have made it possible to successfully transport field-ripened fruits which represent the optimum in host carriers. As a result more host plant material has been intercepted at coast ports and landing fields, with a higher ratio showing infestation, than at any time prior to December 7, 1941.

In view of this situation it seems worth-while to review some of the known economic insects established in the Islands which might, if introduced, prove equally important to California agriculture and to call attention to some of the little-known species which might become important if introduced into a new habitat. We shall also consider the potentialties of the means by which they might be introduced. In the present instance such a review is based on regulations directed against recognized pests

as covered in Federal(1)** and State(2) quarantines and on records of Hawaiian entomologists as reported in the Proceedings of the Hawaiian Entomological Society(3) and in the Annual Reports of the Hawaiian Agricultural Experiment Station(4). These sources of information have been supplemented by records covering an extensive list of insects(5) intercepted during the past ten years during the inspection of cargo, ships stores and quarters and passengers and crew baggage arriving at San Francisco from Hawaii.

Meriting first consideration in such a review are those species known to be seriously injurious to agriculture which are covered by specific quarantines, heading which is obviously the Mediterranean Fruit fly (*Ceratitis capitata* Wied.) common to a wide range of fruits, vegetables and fleshy seeds in the Islands. Possibly this insect is more commonly thought of in California as a potential pest of citrus because of the extensive publicity given to its attack on grapefruit during its brief occurrence in Florida. However, it offers promise of being a more serious pest of peaches and other closely related fruits. Knowledge of the ecological factors involved indicates that it could be of serious economic importance on such hosts if introduced into the warmer interior valleys or into the area along the coast from San Francisco south to the Mexican border.

Because of its wide range of hosts, the opportunities for the introduction of the Med-fly are probably greater than for any other insect. Except for the understanding cooperation of the carrier lines these hosts might be carried in quantity on every arrival from Hawaii. Fortunately, one of the incentives which has made many hosts attractive to the travelling public—their novelty—has been removed by extensive commercial plantings of similar fruits on the mainland. Also, some of the desire always prompted by prohibitions has been nullified by permitting preferred host fruits to move under certified origin treatment. Approved treatments consist of exposure to a temperature of 35° F. for fifteen days or 110° F. for eight hours or subjection to fumigation using methyl bromide. Host fruits may also move as frozen fruit at 20° F. Though any of these treatments is completely effective against all stages of the Med-fly, the effect on the host from the commercial standpoint has been such that their use seems to have proven practical only in the case of heat.

** Numbers in parentheses refer to bibliographic citations at the end of the paper.

However, there are many hosts not open to such treatments which are entirely unsuspected by the average traveler. Outstanding in this category is the fresh coffee berry. Its brilliant coloring makes it attractive as a souvenir and its novelty prompts tourists to attempt its propagation as an ornamental. Being a preferred host of the Med-fly and seldom encountered uninfested, it offers one of the most likely means of introduction. The fact that the Med-fly has not become established here during the thirty years which have elapsed since it first made its appearance in the Islands speaks well for the safeguard measures which have been carefully enforced during that period.

Deserving second consideration is the Melon fly (*Dacus cucurbitae* Coquillet) which is closely associated with the Med-fly in the Islands. It also attacks a wide range of fruits but more particularly fleshy vegetables and their above-ground stems. Its hosts include the balance of the fresh fruits and vegetables not included in the host range of the Med-fly, though there is of course some overlapping. Together these two insects could prove serious over a wide range of California's tremendous acreage of deciduous and sub-tropical fruits and over her equally large acreage of such vegetables as cucumbers, tomatoes, melons, thin-skinned squash, green beans and others. Hosts of the Melon Fly from Hawaii are most likely to be carried as ships stores and find their way ashore in refuse unless prevented by adequate inspections and other safeguard measures.

Considering other insects in their seeming order of importance, the pink boll worm (*Pectinophora gossypiella* Saund.) is also of outstanding importance. California's ability to consistently produce nearly twice as much cotton per acre, over her 500,000 acres, as the national average, is in part attributable to the absence of any real major pests of that host in the state. The pink boll worm is recognized as second to the Cotton boll weevil as such a pest and is common to cotton in the Islands. While not grown extensively there, some is grown commercially. Cotton bolls gathered as souvenirs and carried in passenger or crew baggage or used as supplementary packing in mail packages, particularly at Christmas time, as is not at all uncommon, are invariably found to carry larvae. In addition to attacking both cultivated and wild cotton, the pink boll worm is also recorded as attacking the seed of *Thespesia populnea* in Hawaii. This is a small tree common to the Islands of the Pacific, belonging in the Malvaceae and sometimes grown in moist warm places in Southern California as an ornamental.

In addition to the pink boll worm there are a number of potential pests reported as attacking the native wild cotton (*Gossypium tomentosum*) in Hawaii which might possibly adapt themselves to cultivated cotton if introduced to the mainland. None of these are included in Smith's list of insects attacking cotton in California (11). They include a weevil (*Rhyncogonus simplex* Perkins) whose larvae inhabit the soil and whose adults feed on the foliage; three species of plant bugs, *Ithamar hawaiiensis* Kirkaldy, *Nysius delectus* White, and *Nysius coenosolus* Stål., which are foliage feeders; a mealybug (*Pseudococcus filamentosus* Ckll.); a fulgorid (*Oliarus discrepans* Giffard); a thrips (*Taeniothrips hawaiiensis* Morgan); and the cotton blister mite (*Eriophyes gossypii* Banks). The pineapple mealybug (*Pseudococcus brevipes* Ckll.), commonly infesting nearly all Hawaiian pineapples received at mainland ports, is reported from cotton in the Islands.

While sweet potato production is not as extensive in California as in many other states, it is singularly free from serious insect pests and the acreage is sufficient to warrant an interest in those pests which might be introduced from Hawaii. Among the more important(11) are the larger sweet potato weevil (*Cylas formicarius* Fabr.) an introduced species; the smaller sweet potato weevil (*Cryptorhynchus batatae* Waterhouse) which is the common West Indian form and quite destructive at times, and a third species (*Euscepes postfasciatus* Favim), the adults and larvae of all of which bore into both the tubers and the above-ground stems; the sweet potato stem borer (*Omphisa anastomosalis* Güenee), a pyralid introduced into the Islands from China, whose common name describes its attack; the sweet potato leaf roller (*Phlyctaenia despecta* Butler) which is indigenous and which seriously skeletonizes the foliage; the sweet potato leaf miner (*Bedellia orchidella* Walsm.); and the sweet potato thrips (*Dendrothripoides impomeae* Bagnall). The latter is said not to be as injurious in the Islands as in other countries where it is present and is given credit for being predaceous on eggs of the sweet potato leaf miner. However, this complement of insects attacking every part of the plant would represent rather undesirable introductions into California and that possibility should be of concern to any commercial grower of sweet potatoes in the State. Fortunately a Federal quarantine prohibits the entry of sweet potatoes of Hawaiain origin or any parts of the plant at mainland ports. Possibility of introduction is, therefore, prac-

tically restricted to host material discarded as ship refuse against which adequate safeguards are already established.

McKenzie(9) records ten pests of avocado in the Hawaiian Islands, only one of which, the palm mealybug (*Pseudococcus nipae* Mask.), he records as occurring in California. That species is listed as a minor pest here. Included in those he lists as occurring in the Islands are, of course, the Med-fly as previously covered. Also included are the following: a coccid (*Aspidiotus persearum* Ckll.), an aleyrodid (*Aleurocanthus woglumi* Ashby), three *scolytids* (*Crossotarsus externedentatus* Favim, *Hypothenemus eruditus* Westw., and *Xyleborus immaturus* Blackb.), a tortricid (*Amorbia emigratella* Busck) and a xyloryctid (*Stenoma catenifer* Wlsm.). To this group might be added another scolytid (*Sinoxylon conigerum* Gerst.) which bores into and severs living twigs, and another coccid (*Fiorinia fioriniae* Targioni). The latter has been found heavily infesting fruit from the Islands on many occasions suggesting rather widespread distribution. Though present in California on palm, to a limited degree, it has never been taken on avocado within the State. Possibly the Hawaiian variety represents one of those strains within a species which has adapted itself to a specific host which would show the same preference if introduced to the mainland. It has been observed as being equally affected by the effective heat treatment under which Med-fly hosts are permitted to be brought into the State, all stages including the eggs seeming to be completely killed.

Present in the Islands and of particular interest to citrus growers are several species of coccids not found in California orchards. Most prominent among these is the coffee scale (*Coccus viridis* Green). It is one of the soft scales and was first reported from lemon in Fiji.(3) It is credited with destroying the coffee industry in Ceylon twenty to twenty-five years ago, and is reported as having a preference for orange second only to coffee. It seems to be quite widespread in the Islands where it is more or less of a general feeder. It might be introduced into mainland orchards on any one of a number of ornamentals such as gardenia, Panax, Plumeria, Fitchia and others. Its preference for gardenia is responsible for State regulations prohibiting the entry of flower leis from Hawaii when made from the flowers of that host. This scale is reported as being a heavy smut producer and difficult to control with oil emulsions. The other coccids referred to include *Parlatoria zizyphus* (Lucas) and *Unaspis yanonensis* (Kuw.) which are also common to citrus in

the Orient. The Japanese mealybug (*Pseudococcus krauhniae* Kuwana), of which a very restricted infestation on orange in the Ojai Valley in Ventura County was recorded some twenty-odd years ago, has been repeatedly intercepted from the Islands at Pacific Coast ports on *Jasminum* sp., gardenia and cacti. A white fly (*Aleyrodes giffardi* Kirk.), (8) representing an introduced species, occurs on citrus trees in and around the City of Honolulu.

In addition to the Melon fly, which is recorded as a serious pest of green beans in the Islands, there are two other serious pests of that host which, if introduced, could prove very costly to the growers of all types of beans which represent one of California's most valuable dry farm crops, and also to growers of green peas. One is a pyralid commonly known as the bean pod borer (*Maruca testulalis* Geyer) (4) which is recorded as seriously damaging both limas and string beans in the Islands as well as green peas. Of more or less widespread distribution throughout the tropic and sub-tropic zones, this species is considered to be of sufficient importance to be the subject of Federal quarantines restricting the movement of its hosts from Puerto Rico to the eastern seaboard. More recently it has been repeatedly intercepted in similar hosts entering the United States from Mexico at Mexican border ports, though fortunately moving east rather than into California. This species is sometimes responsible for damage credited to a lycaenid (*Cosmolyce boetica* Linn.), the second of the two serious pests referred to. This species is commonly called the bean butterfly. Its larvae are a serious pest of green beans, destroying the flowers as well as attacking the pods. Both of these species are commonly intercepted on the so-called Mauna loa flower leis (*Dioclea violacea*), one of the most popular types worn or carried by passengers returning from the Islands. For that reason such leis are prohibited entry into California by State regulations(2). Another insect species of economic importance to beans in the Islands is a jassid (*Empoasca solana* DeLong), which is credited with destroying plants on occasion. The adults and nymphs feed on the under sides of the leaves and are responsible for what is termed "hopper burn." In addition to beans it attacks lettuce, potato and celery among other hosts. However, the number one pest of green beans in Hawaii is considered the Oriental rose beetle (*Adoretus sinicus* Burm.) (4), a scarabiid whose larvae feed on the roots in the soil and whose adults, when abundant, often completely skeletonize the leaves.

California has just completed the 1942 tomato season with a

record of 781,000 tons canned—one-fourth of the total national canned production. While several important insect pests of this host already are present in the State, such as the tomato pin worm, and corn earworm, and more recently the tomato russet mite, there are several pests of tomato in the Islands which could add considerably to the total damage from insect attack, if introduced. Among those of major importance are the Med-fly and the melon fly previously mentioned under other hosts. Of lesser importance are the so-called Mexican leaf roller (*Amorbia emigratella* Busck), which also attacks broccoli and potato and has been included under potential pests of the avocado; and a gall midge (*Contarinia solani* Riibsaamen), which is partly responsible for the heavy blossom drop experienced in some districts.

There are a number of miscellaneous insect pests of green vegetables present in the Islands in addition to the Melon fly or to those just mentioned as attacking green beans and peas, any one of which might prove of economic importance if established in any part of the extensive truck crop acreage in California. Among those of seeming importance are a thrips (*Taeniothrips alliorium* Priesner) attacking onions. This was originally described by Moulton as *T. carteri* but later corrected to *alliorum* on comparison with specimens from Japan; *Taeniothrips hawaiiensis* (Morg.), a general feeder in the Islands which is reported as damaging asparagus; and a plant bug (*Nysius nemorivagus* White) recorded as attacking cucumbers and as causing silver wilt to terminal shoots of Irish potato. Of the hosts mentioned, asparagus and cucumbers have been offered for entry under the heat treatment for Melon and Med-fly which seems to be effective against many other insects. Potatoes and onions may be brought in under Federal certified inspection though few, if any, of the latter have been offered.

Ornamentals brought in as rooted plants, admissible only without soil, but more often as cuttings, offer a more widespread opportunity of introducing particularly new species of scale insects and mealybugs, and, as propagative material for planting, present a more certain means of their establishment if not intercepted. A single handful of miscellaneous cuttings brought back by a visitor to the Islands for planting in California merely "because they were pretty" when seen blooming in the Islands was found to carry as many as seven species of scale insects not known to occur in California. Any one of these species might find a more preferred host of economic importance on the mainland, or turn out to be a general feeder comparable to the olive

scale (*Parlatoria oleae* Colvé) which has recently attained economic importance in Central California. Among those which might be introduced from Hawaii are *Lepidosaphes tokionis* Kuwana on croton, orchids or strelitzia; *Phenacaspis eugeniae* var *sandwichensis* (Full.) and *Ripersia palmarum* (Ehrh.) on sprouted coconuts; *Ceroplastes rubens* (Mask.) and *Lepidosaphes uniloba* (Kuwana) on Maiele; *Lepidosaphes pallida* (Green) on juniper; *Coccus acuminatus* (Sign.), *Coccus viridis* (Green) and *Protopulvinaria pyriformis* (Ckll.) on gardenia; *Pseudaonidia clavigera* (Ckll.), *Pseudaonidia tesserata* (deCharm), *Morganella longispinae* (Morg.) and *Asterolecanium pustulans* (Ckll.) on hibiscus; *Pinnaspis buxi* (Bouché) on strelitzia; *Odonaspis secreta* (Ckll.) and *Antonina bambusae* (Maskell) on bamboo; *Leucaspis cockerelli* (Green) on cacti; *Tylococcus giffardi* (Ehrhorn) on pandanus; *Aonidiella inornata* (McKenzie) on betel palm and pikake; and *Pulvinaria psidii* (Maskell) on *Jasmimum* spp. Among the mealybugs which might be introduced on ornamentals are *Pseudococcus filamentosus* (Ckll.) on *Areca sp.*, *Pseudococcus virgatus* (Ckll.) on betel palm and *Pseudococcus krauhniae* (Kuwana) on *Jasmium*, gardenia or cacti. Undoubtedly, there are many other coccids which might be included but those cited represent actual interceptions made at Pacific Coast ports on the hosts given, which hosts were intended for planting in various localities in California.

Our recent experience with the rapid spread of the gladiolus thrips (*Taeniothrips simplex* Morr.) and the extensive damage resulting from its attack on commercial, as well as private, gladioli plantings should make us rather thrips conscious as far as new additions to our already extensive State fauna is concerned. From that standpoint there are several species present in the Islands which might prove destructive if introduced and established. *Haplothrips gowdeyi* (Frank.) has a high population density and a wide range of hosts. It is normally a flower feeder but often attacks the foliage. *Taeniothrips hawaiiensis* (Morgan) is a general feeder on Leguminoseae and Convolvulaceae. In addition to cotton and asparagus, as previously mentioned, it also attacks alfalfa. *Taeniothrips alliorium* (Priesner) has already been mentioned as attacking onions. *Selenothrips rubrocinctus* (Giard.) is reported as seriously damaging guava and plum causing a silvering of foliage and a cracking of the fruit. *Thrips panicus* (Moulton) is reported on rice.

Speaking of rice, which is an important crop in California, one of the major insect pests of this host in Hawaii and in the

Orient from which it was introduced into Hawaii, is the rice stem borer (*Chilo simplex* Butl.). Infestation in the Islands is heavy and the damage often severe. It also attacks corn, wheat and sugar cane. Over-wintering larvae are eeasily carried in rice straw which was generally used as packing for bananas up to 1928. At that time it was discontinued because of this insect, being replaced with banana leaves. Rice straw is still used as packing for fragile merchandise and must be carefully watched for and removed when found.

Due to the Federal prohibition against soil associated with plant material(1) there seems to be little danger of introducing the Oriental rose beetle (*Adoretus sinicus* Burm.) or the Oriental beetle (*Anomala orientalis* Waterhouse) common to the Islands, whose larvae are normally found in that medium. Both are Scarabaeids, the latter being somewhat similar in habits and life history to the Japanese beetle (*Popillia japonica* Newm.).

Flower leis have long been looked on with suspicion as potential carriers of a wide range of insects either as hosts or as transients(2). The introduction hazards in this respect have been greatly increased by overnight air transportation. During a recent survey made by the author, forty-one species of insects, over half of which are more or less of economic importance, were taken on twelve different types of leis. In the final analysis the so-called Mauna loa was prohibited as a host of the bean pod borer (*Maruca testulalis* Geyer) and the bean butterfly (*Cosmolyce boeticus* L.), bougainvillea as a host of the bean butterfly and gardenia as a host of the coffee scale (*Coccus viridis* Green). The balance are being disregarded as not of sufficient importance, or as not liable to introduction through the means of such carriers.

While the foregoing list of economic or potentially economic insect species which might be introduced into California from Hawaii is far from complete, it is sufficiently comprehensive to emphasize the importance of exercising adequate safeguard measures against such possibilities. In that respect they offer considerable food for thought, particularly in view of the changing conditions favorable to the transportation of their hosts as discussed in the opening paragraphs of this paper. While prohibiting the entry of their hosts may have been effective up to now, the development of effective means of disinfection supports the present trend toward approved movement under supervised origin treatment. The latter approach merits serious consideration from the standpoint of the gradually widening field of entry

under air transportation which it will be increasingly difficult to cover in the future by prompt inspections at destination.

Bibliography

(1) Federal Quarantine No. 13, Hawaiian Fruits and Vegetables.
Federal Quarantine No. 30, Sweet Potatoes.
Federal Quarantine No. 47, Cotton, Cottonseed and Cottonseed Products.
Federal Quarantine No. 60, Sand and Soil with Plants.
B.E.P.Q. No. 462, Restrictions affecting the Importation and Interstate Movement of Frozen-pack Fruits.
B.E.P.Q. No. 481, The Shipment of Fruits and Vegetables from Hawaii to the Mainland authorized under Supervised Sterilization.
B.E.P.Q. No. 510, Amending Authorization of the Shipment of Fruits and Vegetables from Hawaii to the Mainland to include Fumigation with Methyl Bromide under Supervision.

(2) California M. Q. Circular No. 16, Flower Leis and Cut Flowers from Hawaii .
California M. Q. Circular No. 40, Hawaiian Vegetables Approved for Shipment to Mainland.

(3) Proceedings of the Hawaiian Entomological Society, Volume VII, No. 1 (1928) to Volume IX, No. 2 (1942) inclusive.

(4) Hawaiian Agricultural Experiment Station Annual Reports, 1938-39-40. (Entomology included first time in 1938.)

(5) List of Intercepted Plant Pests, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, 1932-42 inclusive.

(6) Essig, E. O., "Insects of Western North America," The Macmillan Co., New York (1926).

(7) Fullaway, David T., "Insects Attacking the Sweet Potato in Hawaii," Bulletin No. 22, Hawaii Agricultural Experimental Station, T. H. (1911).

(8) Kirkaldy, G. W., "A Catalogue of the Hemipterous Family Aleyrodidae and Aleyrodidae of Hawaii and Fiji," Bulletin No. 2, Division of Entomology, Board of Commissioners of Agriculture and Forestry, T. H. (1907).

(9) McKenzie, Howard L., "Biology and Control of Avocado Insects and Mites," Bulletin No. 592, University of California (1935).

(10) Quayle, H. J., "The Mediterranean and other Fruit Flies," Circular No. 315, University of California (1929).

(11) Smith, Gordon L., "California Cotton Insects," Bulletin No. 660, University of California (1942).

RECORDS AND DESCRIPTIONS IN THE MEGACHILID SUBGENUS ARGYROPILE

(Hymenoptera, Megachilidae)[1]

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Four species of *Megachile* have been included in the subgenus *Argyropile*, *parallela* (the genotype), *townsendiana*, *nebraskana* and *sabinensis*. Both *parallela* and *townsendiana* are known in both sexes and the close affinity of the two has been established, but the others are known only in the female sex and their relationship to the first two species is not so clearly evident. Recently two more species have been discovered which seem to be related to members of this group. However, since the males of these also are not known, their inclusion in the subgenus is open to question, just as with *nebraskana* and *sabinensis*, and a positive opinion concerning their affinities will not be justified until the males have been discovered. Descriptions of these two species, as well as new locality records for the other species of *Argyropile* follow. This group of species may be separated from the other subgeneric groups by use of the key to subgenera of *Megachile* (Trans. Am. Ent. Soc. LIX, p. 306, 1934), and the subgeneric characters are given in Part VI of the Revision of Megachile (Trans. Am. Ent. Soc. LXIII, p. 46, 1937).

MEGACHILE (ARGYROPILE) PARALLELA Smith

This species apparently has not been recorded previously from the states in the following list of records.

Arkansas: 1 ♀, Eureka Springs, Ouachita Mountains, September 4, 1939 (E. C. Van Dyke). Georgia: 1 ♀, Perry, August 12, 1939 (E. G. Wegenek). Iowa: 1 ♀, Sioux City (C. W. Ainslie). Mexico: 1 ♂, 1 ♀, Torreon, Chir., June 17, 1937 (Mead); 1 ♀, Estrella District, Alamos, Sonora, October 2, 1933 (R. M. and G. E. Bohart). Missouri: 1 ♂, 8 ♀, Branson, September 9-17, 1937; 8 ♀, Ozark Lake, September 23-24, 1939 (both E. C. Van Dyke). Oklahoma: 1 ♀, Strang, June 18, 1939; 1 ♂, Tahlequah, June 17, 1939 (Kaiser-Nailon).

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MEGACHILE (ARGYROPILE) TOWNSENDIANA Cockerell

Since this species, which was described from Arizona, has been recorded previously from only one eastern locality, Miami, Florida, the Florida and North Carolina records in the following list are of especial interest.

Arizona: 1 ♀, Continental, July 15, 1940 (E. E. Kenaga); 1 ♂, 1 ♀, Tombstone, August 13, 1940 (E. S. Ross). California: 1 ♂, Imperial County, June, 1912 (J. C. Bridwell). Florida: 1 ♀, St. Augustine, October 12, 1929 (H. T. Fernald). New Mexico: 1 ♀, Santa Rosa, June 23, 1940 (E. E. Kenaga). North Carolina: 2 ♂, mouth of Cape Fear River, July 25, 1941 (T. B. Mitchell). Texas: 1 ♀, Austin, April 27, 1902; 1 ♀, Galveston, June, 1900 (both A. L. Melander); 1 ♀, College Station, May 30, 1938; 1 ♂, El Paso, August 18, 1908 (F. C. Pratt).

MEGACHILE (ARGYROPILE) NEBRASKANA Mitchell

Colorado: 1 ♀, Hygene, July 11, 1936. Nebraska: 1 ♀, Harrison, July 18, 1936 (J. Player). Wyoming: 12 ♀, Wheatland, July 14, 1937 (R. H. Beamer).

MEGACHILE (ARGYROPILE) SABINENSIS Mitchell

Arizona: 1 ♀, 10 miles west of Bisbee, August 10, 1940; 1 ♀, Turner, August 9, 1940; 1 ♀, 10 miles east of Douglas, August 11, 1940 (all E. S. Ross); 1 ♀, Texas Canyon, Chiricahua Mountains, Cochise County, 5000-6000 feet, September 16, 1927 (J. A. Kusche). Texas: 1 ♀, Alpine, June 10, 1930 (E. G. Linsley); 1 ♀, Sanderson, June 10, 1930 (J. O. Martin); 1 ♀, Sheffield, June 14, 1940 (T. B. Mitchell).

Megachile (Argyropile) asterae Mitchell, new species

This species is nearest to *M. nebraskana* and *M. sabinensis*. The rather coarsely rugoso-punctate surface of the vertex and mesonotum will readily serve to separate it from *nebraskana*, while in *sabinensis* there is a minute median denticle on the clypeal margin which is lacking in *asterae*, and the puncturation in general is finer and more definitely separated in *sabinensis* than in this new species.

Female. Size: Length, 15 mm.; breadth of abdomen, 5 mm.; anterior wing, 10 mm.

Structure: Face slightly broader than long, eyes parallel; clypeal margin with a short incurved area medially, the rim of which

is impunctate; mandible 4-dentate, a cutting edge between third and fourth teeth; second joint of flagellum subequal to pedicel, shorter than first joint; lateral ocelli very slightly nearer eyes than to edge of vertex, the vertex broad and flat, its margin nearly straight; cheeks broader than eyes; mid and hind metatarsi equalling their tibiae in length and nearly so in width, the anterior and posterior apical angles of mid-tarsal joints produced, but not spine-like as in *parallela*; apical margin of fourth and fifth abdominal terga depressed, that of the third only laterally; sixth tergum straight in profile, with a few basal erect hairs visible at that angle; sixth sternum largely bare over apical half, the rim reflexed, thickened or "rolled" (as in *nebraskana*).

Puncturation: Shallow on clypeus, rather coarse and irregular medially, becoming very fine, close and indistinct laterally and above; supraclypeal area with a few relatively coarse close punctures, otherwise they are minute and densely crowded; very fine and close on cheeks; more coarse and deep, but crowded over entire vertex; crowded over entire thorax, rather coarse on mesonotum medially and on pleura below, otherwise about as fine as on vertex; very fine and close on abdomen basally, becoming more deep and distinct to fifth tergum, separated by more than their width on apical portion of disc on this segment, fine and crowded over entire sixth tergum.

Color: Black; tegulae and spurs ferruginous; wing nervures black or piceous, the wing lightly infuscated, more so apically.

Pubescence: Whitish on head, thorax and legs, some dark hairs intermixed on vertex and mesonotum, hairs covering outer surface of mid metatarsi more yellowish; white on basal segment of abdomen and on basal portions of discs of second and third terga, these with dark pubescence apically and fourth and fifth covered with dark hairs, the sixth with some dark basal hairs laterally, intermixed with whitish suberect hairs, the apical half covered with pale tomentum, this becoming brownish at tip; segments 1-5 with entire white apical fasciae, these rather thin on first and second segments; scopa white, with no dark hairs at all evident, that on sixth sternum more brownish.

Type, female, No. 5233, California Academy of Sciences, Ent., KAIBAB FOREST, UTAH, September 21, 1938 (I. McCracken, on blue *Aster*).

Megachile (Argyropile) rossi Mitchell, new species

The following characters will serve to distinguish this apparently distinct form from *M. parallela* Smith, its nearest ally: the sixth tergum is definitely concave in profile; the clypeal margin lacks the median tubercle characteristic of *parallela*, being represented by the merest trace; the clypeal punctures are considerably finer than in *parallela*; and the apical posterior

angles of the mid tarsal segments are not produced as in *parallela*, although the anterior apical angles are much elongated. In other structural details, and in puncturation and pubescence, little if any difference in comparison with *parallela* can be detected. Positive proof that this is a distinct species, rather than a marked variant of *parallela*, awaits the discovery of the male and the collection of a considerable series of females.

Female. Size: Length, 15 mm.; breadth of abdomen, 4.3 mm.; anterior wing, 9.5 mm.

Structure: Face distinctly broader than long; eyes slightly convergent below; median half of clypeal margin with a polished impunctate rim in the center of which is a bare trace of a denticle; mandible 4-dentate, third tooth acute, about mid way between inner and outer teeth; apical joint of antenna longer than the others which are about equal to each other, the basal joint not quite twice the length of the pedicel; lateral ocelli subequally distant from eyes and edge of vertex, very slightly nearer to each other; vertex rather flat, hind margin nearly straight; joints of mid tarsi with anterior apical angles produced into slender finger-like projections, the posterior angles very short; hind metatarsi very broad and long, not quite twice the length of the remaining joints combined; segments 2-4 of abdomen with rather deep transverse basal grooves, apical margins of segments 3-5 deeply depressed, that of segment 2 depressed only toward sides; sixth tergum slightly but distinctly concave in profile, showing no erect hairs; apical bare rim of sixth sternum but very slightly reflexed.

Puncturation: Rather fine and sparse on the polished clypeus, more close on the cheeks and upper face, becoming minute and crowded on cheeks above, more coarse and distinctly separated on vertex where the surface is tessellated; close and rather fine on scutellum and on mesonotum laterally, distinctly separated medially, the surface tessellated, the pleura more coarsely rugoso-punctate; close and fine on abdomen basally, becoming more distinct apically, sparse and rather coarse toward the apical depressed margin of segment 5, fine close and distinct on segment 6.

Color: Black; wings subhyaline; tegulae and wing nervures ferruginous; spurs yellow.

Pubescence: Entirely white; short and thin on vertex and mesonotum, very short on discs of segments 3-6 of abdomen, longer and more dense at sides of face, on cheeks below, on pleura, propodeum and basal segments of abdomen; scutello-mesothoracic suture white fasciate, and a dense white fringe above tegulae; abdominal segments white fasciate, but the more apical ones obscured (due apparently to condition of the specimen), sixth tergum largely covered with silvery appressed tomentum, becoming brownish toward the tip; scopa white, with no dark hairs in evidence.

Type, female, No. 5234, California Academy of Sciences, Ent., TOMBSTONE, ARIZONA, August 13, 1940 (E. S. Ross). Paratype: 1 female, 10 miles west of DOUGLAS, ARIZONA, August 11, 1940 (E. S. Ross).

The following key separates the females of all of the species and varieties that have been placed in *Argyropile* up to this time. One of these, *flavihirsuta* Mitchell, is Mexican, and has not been found north of the Mexican border.

KEY TO FEMALES OF ARGYROPILE

1. Sixth tergum distinctly concave in profile, covered with short, dense, appressed tomentum 2
–. Sixth tergum straight in profile 3
2. Apical rim of sixth sternum reflexed sharply upward; clypeal margin with a minute but distinct median denticle; punctures of clypeus close and rather coarse ..... *townsendiana*
–. Apical rim of sixth sternum not reflexed upward; median denticle of clypeal margin reduced to the barest trace; punctures of clypeus rather sparse, the surface shining ..... *rossi*
3. Clypeal margin with at least a slight median denticle 4
–. Clypeal margin with no trace of a median denticle 8
4. Inner angle of mandible incised, resulting in a 5-dentate condition; pubescence entirely bright fulvous ..... *flavihirsuta*
–. Mandible distinctly 4-dentate, the inner angle acute 5
5. Apical rim of sixth sternum reduced, sharply reflexed, not at all protuberant; punctures of clypeus very close; pubescence of sixth tergum subappressed, not densely tomentose ..... *sabinensis*
–. Apical rim of sixth sternum protuberant; clypeus shining, the punctures well separated; sixth tergum densely pale tomentose medially and apically 6
6. Scopa on sixth sternum black ..... *parallela* var. *reta*
–. Scopa entirely pale 7
7. Lateral ocelli slightly nearer edge of vertex than to eyes ..... *parallela* var. *tulariana*
–. Lateral ocelli equidistant from eyes and edge of vertex ..... *parallela*
8. Apical margin of clypeus straight medially, clypeal punctures well separated, the surface shining; mesonotum tessellated, with sparse and very minute punctures ..... *nebraskana*
–. Clypeal margin incurved medially, the surface densely and irregularly punctate, dull; vertex and dorsum of thorax very densely punctate throughout ..... *asterae*

NEW SPECIES AND SUBSPECIES OF NORTH AMERICAN CARABIDAE

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During the last few years, quite a number of species of Carabidae have been received which have been found to be new. These are now described and at the same time a few notes made concerning others.

Calosoma lariversi Van Dyke, new species

Rather small, short, black, smooth and shining. Head: smooth, at most with a few fine punctures and minute wrinkles, frontal impressions well marked; eyes only moderately convex; mandibles feebly striate and punctate; antennae with first five segments glabrous, the following more or less smooth on upper and lower faces, elsewhere finely pubescent. Prothorax relatively small, three-fifths as long as broad and about two-fifths broader than head, emarginate in front with anterior angles narrowly rounded, front margined and with elevated beading which is sometimes bleached or rufous, sides moderately arcuate in front, gradually narrowing and oblique behind middle, side margin well beaded, hind angles subangulate and extending backward to a moderate degree, the base feebly emarginate and sometimes finely margined laterally; disk slightly convex, almost smooth, with median longitudinal line finely impressed, lateral sulcus gradually broader posteriorly and rather coarsely punctured as is to a slight degree the area in front of basal margin. Wingless, elytra cordiform, humeral angles broadly rounded, sides moderately arcuate and gradually narrowing posteriorly to subacute apex, side margin narrow and well reflexed; disk quite convex and fairly smooth in front with striae finely and obscurely impressed and finely punctured, the apical area and declivity sometimes more coarsely sculptured, finely or even coarsely scabrous or rugose. Length 13-15 mm., breadth 6-8 mm.

Males with first three tarsal segments on front feet broadly dilated and papillose beneath.

Holotype, male, allotype, female (Nos. 5294 and 5295, C. A. S., Ent.) and four paratypes, all collected in an isolated locality near Lamoille, Nevada, June 25, 1941, by Mr. Ira La Rivers. The paratypes will all be returned to Mr. La Rivers, after whom I take great pleasure in naming this fine species.

The species superficially looks very much like smaller specimens of *Calosoma latipenne* Horn because of its more or less smooth and shining appearance. It is, however, quite distinct, having eyes that are far less convex, not prominent as in *lati-*

penne; a prothorax that is proportionately smaller, with sides almost straight and oblique behind, the hind angles subacute and projecting well posteriorly, not broadly rounded and feebly projecting, the disk not broadly deplanate toward hind angles and with the head quite smooth, not more or less coarsely punctured and rugose as is generally the case in the other; and the elytra without serrations at the humeral margin. It is really more closely related to *luxatum* Say, sharing with that species and its variations the less convex eyes and less prominent hind prothoracic angles. Its distribution also lends support to that relationship.

In this connection, I wish to state that our wingless, stubby species of *Calosoma* do not belong at all in the Old World genus *Callisthenes.* The latter are in general more powerfully constructed, with large heads, a large prothorax, robust legs and with the outer segments of the antennae uniformly pubescent. I believe that our species are derived entirely from American stock, originating as offshoots from certain West American *Calosoma.* Some of these may later have to be placed in new subgenera but that should not be done until the entire group is carefully revised.

Calosoma zimmermanni tahoensis Van Dyke, new subspecies

Rather small and more or less gracefully formed, black, feebly shining. Head rugose, punctate, with eyes moderately convex, not hemispherical and projecting, frontal impressions distinct, antennae with outer segments more or less smooth on upper and lower faces. Prothorax rather small, 4.5-5 mm. wide, three-fifths as long as broad, two-fifths broader than head, apex emarginate, distinctly margined and with beading smooth, sides moderately arcuate in front, straight or feebly sinuate posteriorly and converging, side margin narrowly reflexed, hind angles sharply rounded and distinctly projecting beyond the almost straight basal margin; disk feebly convex, punctate, rugose, with median line finely impressed and apex and base finely and distinctly margined. Elytra elliptical, one-fourth longer than broad, humeral angles broadly rounded, sides arcuate, side margin narrowly reflexed; disk feebly convex, stria well defined and with intervals well elevated and more or less regularly interrupted to form rows of somewhat elongate tubercles. Length 13-14 mm., breadth 6-7 mm.

Males with first three tarsal segments of front feet broadly dilated and papillose. Females generally larger than males.

Holotype, male, allotype, female (Nos. 5296 and 5297, C. A. S., Ent.) and numerous designated paratypes from a series of forty-one specimens in the collection of the California Academy of Sciences. The holotype was collected by me high up on

the slopes of Mt. Tallac, near Lake Tahoe, California, during June, 1899. The allotype was also collected by me, but near Fallen Leaf Lake, July 27, 1915. Most of the other specimens were also collected in the Lake Tahoe region at the higher altitudes such as the slopes of Mt. Tallac, Heather Lake, Glen Alpine (Blaisdell, Van Dyke, Fenyes), Summit (Koebele), but other specimens from high altitudes in other parts of the Sierra Nevada mountains were also found to be of the typical pygmy type, *e.g.*, one from Donahue Pass, Yosemite National Park (V. Duran), two from Cow Creek, Tuolumne County (Van Dyke), and one from Mammouth, Mono County (Ross).

This subspecies is a pygmy phase of *zimmermani* which is only found at high altitudes in the middle Sierras. Most specimens have been taken in the Lake Tahoe region. It closely resembles in sculpture some of the more typical *zimmermani* from farther north such as those of the Mount Shasta region. These are of course larger and more robust, also have the head and pronotum more coarsely sculptured, rugose-sinuose, and the elytral tubercles more scale-like. The relatives found in the gold belt or foothill region to the west of Lake Tahoe have an entirely different type of sculpturing which places them as *exaratus* Csy. while those found in the Great Basin to the east, as at Verdi, Reno and Winnemucca, Nevada, are more definitely striate with the intervals less interrupted, the *monticola* of Casey.

Nebria coloradensis Van Dyke, new species

Large, robust, black, the elytra metallic and of a deep violet color, almost black, two spots on front, outer segments of antennae, tarsi and median portion of body beneath somewhat rufous. Head three-fourths breadth of prothorax, eyes moderately convex and prominent, antennae long and delicate, extending beyond middle of elytra, the frontal impressions flattening out laterally into feebly rugose triangular areas. Prothorax slightly less than three-fourths as long as broad, four-fifths as broad as elytra, apex feebly bi-sinuate at middle and with anterior angles sharply rounded and extending forward; sides broadly arcuate in front, sinuate posteriorly and straight and parallel to base, forming right-angled hind angles, the reflexed margin fairly wide, of even width, and more acutely elevated posteriorly, base feebly bi-emarginate; disk moderately convex and smooth, the median longitudinal line rather finely and feebly impressed, anterior and posterior transverse impressions rather deep, the anterior and basal areas punctate, rugose. Scutellum smooth and arcuate posteriorly. Elytra elongate-elliptical, about three times as long as prothorax and four-ninths longer than broad, humeri not prominent, the humeral angles arcuate, sides almost straight or very feebly arcuate and gradually

diverging to posterior third, thence rounded to apex; the disk slightly convex, flattened at middle, the striae finely and rather deeply impressed and very finely, closely punctured, intervals definitely convex, narrowed and crowded near base, broader and flatter behind, the third and seventh irregularly interrupted and catenate behind, the ninth interrupted throughout, the lateral margin finely reflexed. Legs long and delicate. Length 14 mm., breadth 5.5 mm.

Holotype, male (No. 5298, C. A. S., Ent.), a unique collected by myself near the Twin Lakes, Lake County, Colorado, June 28, 1935.

This feebly metallic species belongs very near *metallica* Fisch. It is, however, longer, proportionately narrower as regards head, prothorax and elytra, the prothorax more gradually narrowed behind, the elytra definitely elliptical, not square shouldered, and the intervals as the result of the narrowed basal area narrower, more convex and crowded together toward the base, the striae also more evidently impressed. This species, though more robust, also has somewhat the facies of *purpurata* Lec. but its prothorax is larger and broader and the elytra more elliptical, less narrowed and spatulate than in *purpurata*.

Nebria zioni Van Dyke, new species

Elongate, somewhat narrow, brown, head, prothorax, epipleurae and often elytral suture more or less rufous, antennae, palpi and legs testaceous, the elytra generally with a feeble, metallic green lustre. Head about one-third breadth of prothorax, eyes moderately convex, antennae long and delicate, extending to middle of elytra, the two rufous frontal spots generally coalescent or the entire forehead rufous. Prothorax two-thirds as long as broad, three-fourths as broad as elytra, apex feebly bi-emarginate, apical angles sharply rounded and extending well forward, sides arcuate in front, narrowing posteriorly, sinuate well in front of hind angles and parallel to base forming prominent right-angled hind angles, very acute at apex, base feebly bi-emarginate; disk convex, anterior transverse impression feebly to well impressed, the posterior transverse and basal impressions deep and more or less punctured, the lateral margin rather wide, broader near hind angles and with a narrow reflexed margin. Elytra elongate-elliptical, or feebly spatulate, three times as long as prothorax, two-thirds as broad as long; the disk slightly convex, stria deeply impressed and very finely, closely punctured, the intervals entire and narrowed and crowded toward base, broader posteriorly, several small punctures in third interval and generally near third stria, the humeral angles obliquely rounded, lateral margins narrowly reflexed. Legs long and delicate. Length 10 mm., breadth 4 mm.

Holotype, male, allotype, female (Nos. 5299 and 5300, C. A. S., Ent.), and several designated paratypes from a series of twenty-one specimens, nineteen collected in the canyon of Zion National Park, Utah, by myself on May 29, 1935, and two collected in the same area by Dr. A. M. Woodbury.

This species is very similar to *Nebria eschscholtzi* Mén. and probably derived from the same stock. It differs from it by being generally narrower, the prothorax narrower, the sides sinuate farther forward in front of the hind angles and the hind angles themselves more prominent; and the elytra elliptical or feebly spatulate, with the base much narrowed, the humeral area reduced, the elytral intervals much narrowed and crowded at base, and the elytra themselves with a feeble yet definite metallic lustre. The true wings are so much reduced or aborted that they are less than half the length of those in normal *eschscholtzi* which themselves are considerably aborted and the result of this is indicated in the basal area of the elytra which are very much narrowed as compared with those in the other species.

Nebria eschscholtzi Mén. is a species found commonly along the streams flowing into the Pacific ocean from Alaska to southern California but except in the north where it follows the branches of the Columbia and other streams inland, it does not extend much east of the Cascades or Sierra Nevada mountains. I have seen a typical specimen from Pyramid Lake, Nevada, a remnant of the ancient Lake La Hontine, which formerly had an outlet to the northwest, but I have seen no true *eschscholtzi* from the southern part of the Great Basin. The ancestors of *Nebria zioni* were probably isolated and left as relicts as a result of the gradual drying up of most of this inter-mountain region and their physical degenerative processes accelerated.

Pasimachus velutinus Van Dyke, new species

Large, robust, black, the males shining, the females dull or opaque and generally with a feeble violaceous tint to pronotum, the elytra smooth or even, without sulci or striae. Head large, front smooth or feebly wrinkled, especially forwards in females, frontal impressions deep, eyes large but feebly convex, antennae robust, extending beyond middle of prothorax, segments 2-4 not carinate, feebly compressed toward base at most, labrum broadly and feebly trilobed, conspicuously strigate, mandibles robust and strigate. Prothorax robust, apex broadly emarginate, apical angles subacute and slightly produced forwards, sides broadly arcuate from apical angles to close to base, then narrowed and sinuate to small, feebly everted, acute angles, the base broadly emarginate,

basal marginal line fine and deep; disk slightly convex, almost smooth, median longitudinal line finely impressed, anterior transverse impression in general poorly defined, posterior transverse impression quite evident in the male, vague in females. Elytra cordiform, humeral area broadly rounded, sides slightly arcuate and narrowed and oblique to subacute apex, margins finely reflexed, humeral carina very short but with a small tooth at its base on the margin; disk evenly arched and smooth, the general surface as also of head and pronotum minutely alutaceous under high power of magnification, a double row of minute punctures can sometimes be seen, surface shining in males and dull in females. Legs quite robust, spine of middle tibiae slender and acute, hind tibiae of males not densely pubescent on inner side and tarsi long and slender. Beneath more or less smooth and shining. Length 35 mm., breadth, 13 mm.

Holotype, male, allotype, female (Nos. 5301 and 5302, C. A. S., Ent.) and five female paratypes, the holotype collected at Venedio, Sinaloa, Mexico, July 23, 1918, by J. August Kusche; the allotype at the same locality, June 28, 1918, four paratypes also collected at Venedio while the fifth was taken at San Bernardino, Rio Mayo. Sonora, Mexico, July 15, 1935, by H. S. Gentry.

This fine species might at first sight be confused with *Pasimachus californicus* Chd. It is in general somewhat longer, the males and females differ in appearance to a greater degree, and it has the distinctive characters such as the non-carinate basal segments of the antennae and the non-pubescent inner surface of the male hind tibiae. I cannot find any other species listed from Mexico other than *californicus* that at all resembles it and it differs greatly from any of those found in our own country.

Dyschirius arizonicus Van Dyke, new species

Medium sized, narrow and elongate, entirely rufous to rufotestaceous. Head smooth with an inverted V-shaped impression between antennae, clypeus tridentate with median tooth prominent. Prothorax globose, smooth and shining, median longitudinal line finely impressed and anterior transverse impression distinct. Elytra elongate, base subtransverse and with basal striae distinct, humeral angles well rounded, all striae present and complete, well impressed and finely punctured to posterior third, third interval tripunctate. Anterior tibiae not dentate. Length 3 mm., breadth 1.25 mm.

Holotype (No. 5303, C. A. S., Ent.) and five paratypes collected at Holbrook, Arizona, and coming to me from the C. W. Leng collection.

This rufous species, in size, color and general appearance, looks very much like *Dyschirius salivagans* Lec. but the margined base of elytra and tripunctate elytral intervals separate it widely. The well marked tridentate clypeus would place it very close to *Dyschirius tridentatus* Lec.

Feronia (Feronina) humidula Van Dyke, new name

In January, 1926, I described a new species of *Feronia* as *Pterostichus pacificus* (Pan-Pacif. Ent., II, No. 3, p. 114). The specific name, I find, is preoccupied by *P. pacificus* Poppius (Acta. Soc. Fauna Flora Fenn., XXVIII, 1906, nr. 5, pp. 25, 184). I therefore take this opportunity to change the name of my species to *humidula* Van Dyke. The generic name *Pterostichus* Bon. will also have to be replaced by *Feronia* Latr. for, according to H. E. Andrewes, an authority on the Carabidae, Bonelli never properly published the description of the genus, merely sending a leaflet with the description to a few friends. The species of Poppius is in the subgenus *Cryobius*. I formerly placed my species in that subgenus but I find upon reexamination and with the help of additional specimens, that it does not belong there but in the subgenus *Feronina* Csy. along with *lanei* Van Dyke, described at the same time. As a result, I find that there are three species in the subgenus and their distribution is interesting in that it corresponds with the three relict tertiary faunas of northern origin in North America: the Vancouveran, the Idahoan and the Alleghaenian. I have defined these in various papers, the first published in 1919 (Ann. Ent. Soc. Am., XII, pp. 1-12, 1919). The following synopsis will aid in the separation of the members of the subgenus *Feronina*.

Synopsis of the Species of Feronina

1. Larger species, 11 mm. or over in length, black or dark castaneous (immature), elytra about twice as long as broad.....2
–. Smaller species, 8-9 mm. long, piceous to black, legs quite rufous, elytra barely a third longer than broad; eyes moderately convex; sides of prothorax arcuate in front, sinuate behind and straight and parallel for a short distance to the right-angled hind angles, the basal impressions broad and deep and more or less coarsely punctured; elytral intervals somewhat flattened. Prosternum rounded and deflexed at apex, not margined. Grays Harbor, Wash. (type, Hoquim) and northern Coast of Oregon, Cannon Beach and Columbia County..... .....*humidula* Van Dyke

2. Eyes not prominent, feebly convex; sides of prothorax arcuate in front and straight or feebly sinuate and convergent to obtuse-angled hind angles, basal impressions sharply linear and lunate, without punctures; elytral intervals more or less flattened. Prosternum horizontal and margined at apex. Length 11-12 mm., breadth 3.4 mm. Mount Mitchell and Black Mts. of North Carolina ..... *palmi* Schaeffer

–. Eyes quite prominent and convex; sides of prothorax arcuate in front, almost straight or very feebly sinuate and convergent to obtuse hind angles, basal impressions sharply linear and lunate in front, broadly and deeply expanded toward hind angles behind; elytral intervals convex throughout. Prosternum rounded and declivous behind, not margined. Length 12 mm., breadth 4-5 mm. Wawari, Wash., and adjacent parts of Idaho ..... *lanei* Van Dyke

These three species are all rare in collections. They all dwell in very wet or boggy regions. Of *humidula*, I now have five specimens including the type, all from the wet belt of coastal Washington and Oregon, in the true Vancouveran faunal area. This species is also the most distinct of the three. Of the second, *palmi*, intermediate in size between the other two, I have twenty-nine specimens, all collected by myself in the Black mountains of North Carolina, in the heart of the true Alleghanian faunal area. This series also shows a great deal of variation as to the shape of the prothorax. The much flattened eyes and horizontal and margined prosternum will readily separate this species from the others though it superficially very much resembles the following. Of this last species, *lanei*, I have only the type though I have seen others. It is the largest of the three.

Feronia (Cryobius) blaisdelli Van Dyke, new species

Small, narrow and elongate, gracefully formed, black and shining, antennae and legs rufous, in one specimen piceous. Head about as broad as long, as wide as apex of prothorax, front smooth, frontal grooves lunate and well impressed; mandibles prominent, porrect; eyes moderately arcuate and prominent; antennae long and delicate, extending beyond base of elytra. Prothorax as broad as long, apex feebly emarginate, sides arcuate in front, narrowed and sinuate at posterior fourth, thence straight and parallel to acute right-angled hind angles; disk with median longitudinal line finely impressed, anterior transverse impression well defined, posterior evident, basal impressions lunate, linear, extending forward almost to middle, basal area somewhat rugose, hind angles broadly and obliquely flattened and gradually elevated outwardly, without well marked carinae, base feebly emarginate and without margin. Elytra elongate-elliptical, two-fifths longer than head and prothorax combined, humeral angles obliquely rounded, sides feebly

arcuate at middle, broadly rounded and somewhat sinuate to apex; disk slightly convex, more or less flattened at middle, stria finely impressed, less well defined at sides and apex and finely somewhat obscurely punctured. Legs long and delicate. Prosternum with broadly reflexed margin. Males with well dilated front tarsi. Length 7.5 mm., breadth 2.75 mm.

Holotype, male, allotype, female (Nos. 5304 and 5305, C. A. S., Ent) and three paratypes, all collected by Dr. F. E. Blaisdell at Nome, Alaska, during July, 1900.

This graceful and distinct member of the subgenus *Cryobius* is more like an elongated *Trechus* than like its relatives, though some of the species like *hudsonicus* Lec. resemble it somewhat but are far more robust in every regard. I have checked this species against the descriptions of Sahlberg and Poppius but cannot find any that would apply to it.

Evarthrus (Ferestria) taurus Van Dyke, new species

Rather small, short and robust, smooth and shining, black, femora piceous and tibiae, tarsi, antennae, and generally much of front part of head, especially clypeus, rufous. Head almost as broad as long, front smooth, frontal impressions distinct; eyes rather large, moderately convex; antennae robust, extending to posterior fourth of prothorax; mandibles robust and striate, terminal segment of labial palpi longer than preceding, the latter generally with two setae. Prothorax somewhat lunate, over one-fourth broader than long, front margin feebly emarginate, sides broadly arcuate to behind middle, thence narrowed and convergent to base, side margin absent and hind angles eliminated; disk feebly convex and shining, median longitudinal line finely impressed, anterior transverse impression sharply impressed, posterior transverse impression generally obsolete, basal impressions elongate-punctiform and deeply impressed. Elytra cordiform, humeral angles well rounded, sides arcuate, narrowed posteriorly, oblique and slightly sinuate before apex, margin narrowly reflexed; disk convex, striae at most finely impressed though generally more or less obsolete, the single dorsal puncture about at middle of third interval close to second stria. Beneath quite smooth. Legs rather robust, the male front tarsi feebly dilated. Prosternum sulcate behind. Length 11 mm., breadth 4 mm.

Holotype, male, allotype, female (Nos. 5306 and 5307, C. A. S., Ent) and fourteen paratypes, all collected by myself near Punta Gorda, Florida, February 5-10, 1940. Besides these I have before me three slightly smaller and narrower specimens, two collected by me near Brooksville, Harnando County, Florida, January 20-30, 1940, the third in the Fenyes collection of the Academy, merely labeled "Fla., Bowditch."

This bull-like species superficially resembles *Evarthrus* (*Ferestria*) *morio* (Dej.) especially the smaller specimens of the former, but it can always be definitely separated by the absence of the side margin to the prothorax which is so evident in *morio*. It is also generally larger, the type series, and more powerfully built.

Evarthrus (Ferestria) hernandensis Van Dyke, new species

Rather small, short, and robust like the previously described species, smooth and shining, black, antennae, palpi and legs rufous. Head 5 mm. narrower than long, front smooth, fronto-clypeal suture fine, frontal impressions distinct; eyes rather large and convex; antennae robust, extending to posterior fourth of prothorax; mandibles robust, terminal segment of labial palpi longer than preceding, the latter bisetose. Prothorax transverse, almost twice as broad as long, front margin feebly emarginate, sides arcuate to behind middle, thence obliquely convergent to obtuse and somewhat rounded hind angles, side margin complete and slightly reflexed; disk feebly convex and very shining, median longitudinal line finely impressed, anterior transverse impression vague, the posterior also vague, basal impressions short, linear, moderately impressed. Elytra elongate, cordiform, humeral angles well rounded, sides feebly arcuate, almost straight at middle, gradually narrowed behind and sinuate before apex, the side margin narrowly reflexed; disk convex with six deeply impressed, finely punctured striae, obliterated toward apex, intervals quite convex, the single elytral fovea slightly behind middle on third interval. Beneath smooth and shining. Legs fairly robust, anterior male tarsi feebly dilated as in the former species and its close relatives. Prosternum sulcate behind. Length 11 mm., breadth 3.75 mm.

Holotype, male, and allotype, female (Nos. 5308 and 5309, C. A. S., Ent.), collected by myself, near Brooksville, Hernando County, Florida, January 20-30, 1940.

This species is in size and shape much like the preceding species but is readily separated by possessing a margin to the prothorax and having deeply striate elytra. It also somewhat suggests the larger specimens of *Feronia* (*Gastrosticta*) *tumescens* (Lec.) because of its stocky form and deeply striate elytra.

Evarthrus (Anaferonia) constrictus ovipennis Le Conte

In the *Biologia Centrali-American*, H. W. Bates describes one species of *Evarthrus* as *constrictus* and Csiki, in the *Coleopterorum Catalogus*, changes the name to "*Batesellus*" as the name *constrictus* had been previously used by Say. Csiki placed the species in the subgenus *Cyclotrachelus* where it no doubt be-

longs. I have a series of seven specimens of another species, from Mexico, collected at 9,300 feet, near El Salto, Durango, by M. A. Embury. These specimens cannot be separated from specimens of *ovipennis* Lec., collected in various places in the mountains of New Mexico. It is, of course, nothing but a smooth variety or subspecies at the most of the true *constrictus* Say now placed in the subgenus *Anaferonia.*

In this connection, I wish to state that I believe all of the Feronians in this country with a single dorsal elytral fovea should be included in the single genus *Evarthrus* Lec. That would include *Anaferonia* Csy., *Cyclotrachelus* Chd., *Eumolops* Csy. and *Ferestria* Leng as subgenera. *Megasteropus gigas* Csy. is a synonym of *Eumolops heros* (Say). The labial palpal characters are not always reliable because they are variable, and the variations in general shape upon which many of the so-called genera have been founded are not fundamental, merely divergencies. *Evarthrus*, as first conceived by Le Conte, is a genus whose species other than having the single elytral fovea, all have a common facies which unites them. Its main center of distribution is in the southeastern part of the United States and it is undoubtedly a genus of American origin. It is a definite unit, even though at times hard to properly define, and stands well apart from all other Feronians in America. I also most certainly do not agree with Csiki, the European cataloguer, in placing it as a subgenus or series of subgenera under *Pterostichus* Bon. or more properly *Feronia* Latr.

Amara (Cyrtonotus) durangensis Van Dyke, new species

Of moderate size, elongate, moderately convex, smooth and shining, black to piceous or brown, antennae, palpi and legs lighter, piceous to rufous. Head five-sevenths as wide as prothorax, smooth, frontal impressions rather deep, eyes quite prominent, antennae reaching behind base of prothorax. Prothorax about one-fourth wider than long, base definitely wider than apex, apex emarginate, margined toward sides, sides arcuate in front, sinuate and narrowed slightly in front of base to right-angled hind angles, base feebly arcuate; disk smooth with median longitudinal line finely impressed, anterior transverse impression absent or vague at the most and apical area without punctures, basal area generally with a limited number of punctures, mostly confined to basal impressions which are well impressed, distinctly bifoveate, and with a moderately acute carina as their outer boundary. Elytra somewhat elliptical, more than three-sevenths longer than broad, considerably narrowed basally, basal angles well rounded, sides arcuate, broadly rounded and sinuate before apex; disk with striae

complete, finely impressed and generally finely, vaguely punctured though often impunctate. Middle tibiae with two well marked spines. Length 11 mm., breadth 4 mm.

Holotype, male, allotype, female (Nos. 5310 and 5311, C. A. S., Ent.) and numerous designated paratypes from a series of forty-four specimens in my collection, collected at Juan Manuel, El Salto, Durango, Mexico, alt. 9,300 feet, by M. A. Embury.

H. W. Bates, in the *Biologia Centrali-Americana*, mentions two species of the subgenus *Cyrtonotus* as being found in Mexico: *putzeysi* Bates and *deparcus* (Say). The former, of which I have a specimen before me (Koebele Coll.), is much larger in every regard, besides is distinctly punctured over the apical portion of the pronotum, has the elytral striae distinctly punctured, the intervals much broader and flatter and the elytra at base somewhat square shouldered. Say states that *deparcus* has the pronotum "deeply punctured" in front as well as behind and that the elytral striae are obsolete before the tip, neither of which conditions fits this species. This species also differs considerably from any of the species found north of the Mexican boundary. A striking feature of *durangensis* is not alone its general smoothness and reduced punctuation, but its somewhat elliptical afterbody which is due to the evident atrophy of certain structures near the base. As indicated in the description given above, there is considerable variation among the specimens of the series which I possess.

Agra aethiops Van Dyke, new species

Rather large, jet black and shining throughout. Head about one-fourth longer than broad across eyes, postocular area feebly narrowed and broadly rounded before constricted neck, front smooth and shining, frontal impressions deeply impressed; antennae reaching beyond base of elytra; eyes prominent. Prothorax one-third longer than broad, narrowed and parallel-sided at apex, feebly arcuate and gradually wider to posterior third, thence sinuate and narrowed to base; disk feebly convex, smooth and shining, median longitudinal line finely impressed, area on either side finely, transversely wrinkled, a few small punctures in a row on sides and marginal groove rather deep and somewhat coarsely, irregularly punctured. Elytra less than twice as long as broad, humeral angles prominent, base margined, sides sinuate, gradually wider to posterior fourth, apex obliquely truncate with sutural angle acute and an acute spine at outer angle; disk with all striae complete, well impressed and finely, closely punctured, intervals at middle twice as broad as striae, narrowed laterally, third, fifth and seventh with a limited number of small foveate punctures generally along their inner margin. Beneath smooth and shining, a few punctures

on metaepisterna and abdominal sclerites, feebly aciculate at sides and near hind margins. Median lobe of prementum not greatly prolonged and rounded apically. Legs long and slender, anterior tarsi of males broadly dilated, 2-4 transverse, the fourth deeply bilobed as usual. Length 22 mm., breadth 5.5 mm.

Holotype, male (No. 5312, C. A. S., Ent.) and four paratypes, all collected at Venedio, Sinaloa, Mexico, July 16-30, 1918, by J. August Kusche.

This species is apparently near *Agra eurypelma* Bates but differs by being entirely of an inky black color, antennae and legs included by having the postocular part of the head broadly rounded, slightly narrowed posteriorly, not "gradatim angustato" and the pronotum not grossly punctate. It does not appear to agree with any of the other known species of the genus.

Stenomorphus rossi Van Dyke, new species

Very elongate, narrow, considerably flattened above, dark rufous, legs rufotestaceous. Head narrow and long, 2.5 mm. broad, 3 mm. long, neck long, 1 mm., and cylindrical, eyes moderately convex and prominent, antennae delicate, reaching to posterior quarter of prothorax, upper surface of head smooth and shining behind, sparsely punctured in front, especially on clypeus, labrum finely punctured and alutaceous. Prothorax long and elliptical, length 5.5 mm., breadth 2.5 mm. at apex, 3.5 mm. at middle and 2.25 mm. at base. Sides evenly arcuate from apex to posterior third, thence narrowed and feebly sinuate to base; disk much flattened, shining, median longitudinal line finely, not sharply impressed, anterior transverse impression obliterated, basal impressions well impressed. Elytra 8 mm. long, 4 mm. broad slightly behind the transverse base, thence gradually narrowing to posterior fourth and arcuate and feebly sinuate to apex; disk feebly convex, somewhat less flattened than pronotum, striae well impressed, intervals feebly flattened. Legs long and delicate.

Male. Front femora subangulate below near apex, middle femora with distinct rectangular and acute tooth below near apex, middle tibia feebly arcuate and densely pubescent from beyond middle to apex on inner side, first segment of anterior tarsus feebly dilated.

Female. Similar in general to male except slightly shorter and with prothorax a bit broader proportionately at base. Length 16 mm, breadth 4 mm.

Holotype, male, and allotype, female (Nos. 5313 and 5314, C. A. S., Ent.), collected near the railroad station at Chiricahua, Arizona, August 11, 1940, by Dr. E. S. Ross.

This species is proportionately the most elongate and delicately formed species that we have in our fauna. At first glance

it somewhat suggests *manni* Darl. from Haiti. Its small and long head, especially long neck, and elongate-elliptical and much flattened prothorax will readily separate it from any of our other species. It is less robust than *convexior* Notm., *californicus*, Mén. or *penicillatus* Darl. Its middle tibiae are suggestive of *sinaloe* Darl. as shown by Darlington's plate (Pan-Pacif. Ent., XII, p. 42, 1936), but its prothorax is very different. The first segment of front tarsus in the male is also much less dilated than is the case in our other species.

Pseudomorpha parallela Van Dyke, new species

Rather small, narrow, elongate, subcylindrical, with parallel sides, rufopiceous and alutaceous. Head more than two-thirds as wide as prothorax, smooth, with a very few, minute punctures, chiefly a row across vertex, preocular lobes not prominent. Prothorax transverse, three-fifths as long as broad, as broad as elytra, moderately convex, with a few minute punctures at sides, apex bisinuate and finely margined, base transverse, sides straight and parallel behind, forming a continuous line with sides of elytra, arcuate and feebly convergent to apex in front, lateral margin finely reflexed. Elytra 4 mm. long by 2.5 mm. wide, with straight and parallel sides, finely margined, apex truncate, outer angles well rounded, the sutural narrowly rounded, disk with seven rows of coarse punctures, obsolete at base, each row with a limited number of punctures and each bearing an erect fulvous hair. Third and fourth ventrals with a small, transverse patch of short, golden pile at middle. Length 6.5 mm., breadth 2.5 mm.

Holotype (No. 5315, C. A. S., Ent.), a unique male, collected by Dr. F. E. Blaisdell at Warners, San Diego County, California, July 13, 1925.

This small, cylindrical species, would run close to *cylindrica* Csy. and *angustata* Horn in Notman's Key (Proc. U. S. Nat. Mus., Vol. 67, Art. 14, No. 2586, pp. 14-15), but it is considerably smaller than either, finely alutaceous, not smooth, and different as regards the punctation.

SYSTEMATIC NOTES CONCERNING AMERICAN ACRAEINAE

(Lepidoptera: Nymphalidae)

BY ROBERT W. L. POTTS
University of California, Berkeley

All members of the subfamily *Acraeinae* have heretofore been placed in a single genus, *Actinote*. Within this genus there is a marked natural division into two well-defined groups. Dr. K. Jordan (in Seitz, Gross-Schmett.) and others have noted this, but without according the groups a status above the section. It now appears that they merit generic standing.

ACTINOTE Hübner, s. str.

Forewing underneath between costal and subcostal veins not entirely scaled, but bearing bristles, at least in distal portion. Usually without a central row of bristles on disco-cellular fold of hindwing. Lowland tropics.

Type species: *Papilio* (*Heliconius*) *thalia* Linnaeus.

Altinote Potts, new genus

Forewing underneath scaled between costal and subcostal veins in distal portion, not normally bearing bristles; hindwing beneath always with a central row of bristles on disco-cellular fold. Mountainous tropics.

Type species: *Heliconius neleus* Latreille.

In general *Altinote* may be distinguished from *Actinote* by color pattern and distribution. *Actinote* contains only species with patterns on both wings, being normally more or less transparent and thinly scaled, yellowish or whitish in tone with dull or rarely dark markings. *Altinote* normally show patterns on the forewing or underside only, these being bright red, orange, yellow or white against a consistently dark ground often showing irridescence, only a few species exhibiting any hindwing pattern and only one becoming dull; all being rather densely scaled. The *Altinote* are typically confined to the Andes and its outriders, while the *Actinote* center in the Amazon basin and are commonest near tidewater, although there is a considerable overlapping.

Within the genus *Altinote* two sections, herewith raised to the status of subgenera, may be recognized:

Subgenus **Abananote** Potts, n. subg.

Hindwing underneath with long scattered bristles between the veins in the discal cell, above and below it, and usually also on disc.

Type species: *Acraea abana* Hewitson.

Subgenus ALTINOTE, s. str.

Hindwing underneath without scattered bristles in the discal cell, above it, or on disc; rarely with a few scattered bristles below cell not on reduced postcubital vein.

Type species: *Heliconius neleus* Latreille.

The subgenus *Abananote* contains the species *radiata, erinome, abana, hylonome* and *euryleuca.* In general the pattern of these is confined to the disco-apical portion of the forewing, occasionally extended inwardly toward the base. The subgenus *Altinote,* containing the numerous remaining species, has the pattern characteristically basal, often with an apical band in addition. Underneath, the striping of *Abanote* is normally strong and even, whereas in *Altinote* it is irregular, parti-colored, and in bands or areas.

Altinote (Altinote) brownorum Potts, new species

Male black and red-orange, belonging to *eresia*-group. Forewing with red-orange transverse band of elongate spots, nearly straight; dark discal band much widened inwardly becoming triangular, reaching almost to base posteriorly, leaving only basal half of discal cell and subcostal cell colored, with colored basal spot in costal cell and some color below discal cell. Hindwing with curved color band mostly outside discal cell, halfmoon shaped across disc, extending basally at inner and costal margins, distally notched at veins and intervenal stripes; red-orange at end of discal cell fading to orange, yellow and finally whitish at both margins. Underneath similar to *eresia,* except that forewing repeats dark discal band reduced, a wide transverse colored band being formed, narrowly margined white distally; ground darker, thus stripings and lunules, as well as white discal band of hindwing much more prominent. Forewing, 24.0 mm.

Female very similar; ground color somewhat duller, red-orange not so bright. Underneath a tendency to white in costo-basal portion of dark area within white discal band. Forewing, 28.0 mm.

Holotype ♂ and allotype ♀ taken in copula, YUNGUILLA, 1700 M, ECUADOR, with 2 ♂ paratypes, one from Yunguilla, one from Rio Blanco, 1700 M, Ecuador, collected in May by F. Martin and Hazel Brown for whom the author wishes to express his sincere admiration with this dedication. In addition one ♀ paratype from Baños, 1800 M, Ecuador, also collected in May by Clarke McIntyre. All in the author's collection.

Variation in the paratypes illustrates a tendency for the distinctive dark discal band of the forewing to become larger, while the color pattern of the hindwing tends toward reduction, and may become partially obscured.

A NEW LEAFHOPPER FROM OCEANIA
(Homoptera Cicadellidae)

BY P. W. OMAN

Bureau of Entomology and Plant Quarantine
United States Department of Agriculture
Washington, D. C.

The abundant material upon which the following description is based was received for determination from C. E. Pemberton of the Experiment Station of the Hawaiian Sugar Planters' Association and from Norman W. Frazier of the University of California. Few insects are known to occur on Canton Island, and this is said to be the only representative of the Cicadellidae thus far established there. According to Dr. Pemberton the species has also been collected in Fiji, but material from that locality has not been available for examination.

Nesaloha Oman, new genus

Rather small, relatively robust leafhoppers resembling *Deltocephalus* Burmeister in general appearance but forewing with inner anteapical cell open basally and claval veins confluent on disk of clavus.

Head slightly wider than pronotum, anterior margin rounded; lateral margins of genae slightly sinuated; clypellus parallel-sided; crown convex, but little longer medially than next the eye; ocellus comparatively large, distant from the eye, about its own diameter. Lateral margins of pronotum short. Forewing short, barely reaching tip of abdomen, clavus with veins confluent on disk and with a cross-vein to claval suture basad of juncture of veins, inner anteapical cell open basally, central anteapical cell constricted but not divided, appendix comparatively large. Hind wing with four apical cells. Aedeagus and ejaculatory duct of male bifurcate.

Type of the genus: *Nesaloha cantonis* Oman, new species.

Nesaloha cantonis Oman, new species

Length of male 2.5 mm., of female 3 mm. Ground color yellowish white, intensity of markings extremely variable, ranging from pale brownish yellow to fuscous. Color pattern as follows: facial sutures, antennal pits, arcs on clypeus, a pair of large indefinite spots on crown each with an anterior extension bordering an apical white spot and a lateral extension behind the ocellus, a small spot on posterior margin of crown near each eye; an arc of sub-basal spots on pronotum; irregular and indefinite lines on disk of pronotum; basal triangles, a pair of discal spots, and a quadrangle

with base formed by transverse suture on scutellum. Forewing usually with irregular brown lines in cells and along veins, especially distally. Thoracic venter usually brown. Abdominal tergites usually brown to fuscous, abdominal sternites usually margined with brown. Legs pale or lightly banded with brown.

Sternite VII of female about one and one-half times as long as sternite VI, posterior margin slightly produced and rounded or faintly sinuate and with a very shallow, flaring, median incision. Male plates broad basally, tapering abruptly to form rather long, slender, digitate extensions. Pygofer with a triangular sclerotized process dorsally. Style, aedeagus, and connective as illustrated.

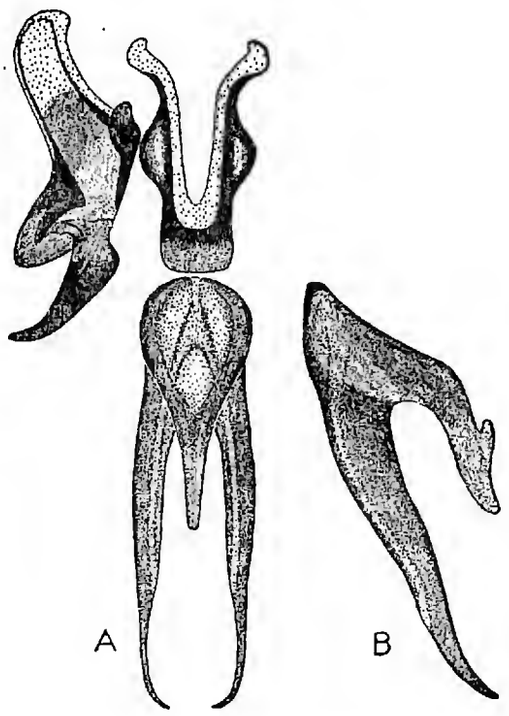

Fig. 1. A, Dorsal view of style, connective and aedeagus. B, Lateral view of aedeagus.

Nymphs of the usual deltocephaloid type, apex of head subangular; later stages with face brown or fuscous except laterally, head, thorax, and abdomen rather heavily marked with brown and occasionally partially or wholly suffused with red; early stages without markings.

Holotype male, allotype female, and numerous paratypes from Canton Island, August 1, 1940, collected from the foliage of *Boerhaavia diffusa* L. by R. H. Van Zwaluwenburg. Other paratypes from the same locality collected from *Boerhaavia tetranda* Forst., August 26, 1940, by R. Danner. Types in the collection of the U. S. National Museum, paratypes in the collection of the Experiment Station of the Hawaiian Sugar Planters' Association, the California Academy of Sciences, and the Bernice P. Bishop Museum.

PACIFIC COAST ENTOMOLOGICAL SOCIETY

H. H. KEIFER	H. M. ARMITAGE	E. G. LINSLEY
Vice-President	*President*	*Secretary*

PROCEEDINGS

One Hundred and Seventy-second Meeting.

The one hundred and seventy-second meeting of the Pacific Coast Entomological Society was held at 2 p.m. on January 24, 1942, in the entomological laboratories of the California Academy of Sciences. President Armitage in the chair. The following members were present: H. M. Armitage, E. G. Linsley, H. L. McKenzie, E. R. Leach, E. S. Ross, A. E. Michelbacher, E. O. Essig, W. W. Sampson, H. P. Chandler, R. C. Miller, E. C. Zimmerman, C. D. Duncan, E. C. Van Dyke. Visitors were present as follows: Gordon F. Smith, B. Prendergast.

The minutes of the previous meeting were read and approved.

The membership committee proposed Mr. G. F. Smith, Mr. E. Jones and Mr. T. Aarons for membership. They were duly elected.

The president then called for a report from the committee on nomenclature. Dr. Linsley reported that the plan submitted by the Pacific Coast Entomological Society for the formation of an American Committee on Scientific Nomenclature in Entomology had been accepted by the Entomological Society of America and the American Association of Economic Entomologists and that such a committee was now in the process of formation. Dr. Ross moved that the Society's committee on nomenclature (G. F. Ferris, chairman; E. G. Linsley, R. L. Usinger) be made permanent in order that it might co-operate with the national committee. The motion was seconded and passed.

The president announced that the annual spring field trip was near at hand and appointed a committee consisting of C. D. Duncan, A. E. Michelbacher, and R. F. Smith to determine the date and place of the trip and report to the Society at its next meeting.

Mr. E. C. Zimmerman, Entomologist of the Bishop Museum in Honolulu, spoke of his recent sojourn on the mainland. He stated that he had visited most of the museums and entomological institutions in the country in search of data for a forthcoming work on the "Insects of Hawaii" as well as to study museum methods.

Dr. Ross exhibited a portion of the Riddel collection of *Zerene* butterflies. Of particular interest were a gynandromorph and unusually fine series of color variations in *Z. eurydice* Bdv., commonly known as the dog-face or flying pansy butterfly.

The President presented Mr. Howard L. McKenzie who gave an illustrated talk on the "Biology, Systematics and Economic Importance of some species of *Matsucoccus*."

Mr. McKenzie stated that fourteen species of *Matsucoccus* have been described to date, and of this number thirteen occur on various species of *Pinus* in the New World. Many yet remain to be described.

Seasonal history records of several species of *Matsucoccus* indicate that there is a motile adult female and a winged male emerging in early spring from an over-wintering, intermediate, or preadult stage larva. After copulation the adult females either settle on the stems, in needle fascicles, in deep bark crevices on the main bole of mature trees, or under the bark scales on the stems of twigs, where they secrete wax and lay eggs. The first stage larvae transform during midsummer into an apodous, intermediate, or preadult stage, in which no trace of legs or antennae is evident. They overwinter in this stage and thus require a year to complete their life cycle.

Field experiments have proven that the so-called "twig blight" in various forests in Arizona and New Mexico is caused by the margarodid, *Matsucoccus vexillorum* Morrison. The larvae of this scale insect produce a necrotic condition on the stems of branches which ultimately becomes infiltrated with resin. This resined lesion is responsible for final death of the infested branch.

In California *Matsucoccus bisetosus* Morrison appears to play a major role as a weakener of mature ponderosa and Jeffrey pine. The larvae of this scale apparently prefer to settle in the axils of twigs, although many are also found under the bark scales on the stems. Infestations in twig axils causes a necrosis, and finally a resined condition of the cortical tissue. Girdling lesions are ultimately produced and these appear to cause death to the twig.

After a discussion of Mr. McKenzie's paper, the meeting was adjourned.—E. G. LINSLEY, Secretary.

One Hundred and Seventy-third Meeting.

The one hundred and seventy-third meeting of the Pacific Coast Entomological Society was held at 2:15 p.m. on Saturday, February 28, 1942, in the entomological laboratories of the California Academy of Sciences. Professor G. F. Ferris in the chair. The following members were present: G. F. Ferris, E. G. Linsley, E. S. Ross, W. W. Sampson, R. L. Usinger, E. C. Van Dyke, A. C. Smith, J. W. Johnson, E. A. Smith, C. D. Michener, W. Y. Chong, C. B. Eaton, D. DeLeon, A. P. McKinstry, E. R. Leach, R. C. Miller, C. D. Duncan, J. W. Tilden. Visitors were present as follows: J. R. Walker, John T. Medler, Mary H. Michener.

The membership committee proposed the name of Mr. John R. Walker. He was duly elected to membership.

Upon the recommendation of the program committee it was moved, seconded and passed that during the present emergency our meeting frequency be limited to four regular meetings (September, November, January, and March) and one annual field trip each year. The date of the 1942 field trip was set for April 26.

Dr. Van Dyke proposed the compiling of a list of classical col-

lecting localities on the Pacific Coast of North Amercia. Considerable discussion followed, all favorable to the suggestion.

Dr. Usinger exhibited specimens of the remarkable heteropterous family Termitaphididae, which are related to Aradidae but have been confused with Homoptera. He mentioned that they are listed as aphids in Patch's host list of world aphididae. The present examples were received from Adamson in Trinidad, where they live with *Heterotermes tenuis*, the only known host out of approximately 150 species occurring on the island. Dr. Usinger also mentioned that he and Dr. Linsley had repeatedly found the aradid, *Mezira reducta* Van D., in nests of *Zootermopsis* in California.

Dr. Ross exhibited a painting of H. H. Behr, former curator of insects at the Academy (approx. 1867-1877).

Dr. DeLeon remarked that he was compiling a list of insects attacking *Sequoia*. He mentioned that he had been unable to find authentic records of *Vespamina sequoiae* H. Edw.

Professor Ferris reviewed the recent movement for an American Commission on Scientific Nomenclature in Entomology. He read the proposal of the Pacific Coast Entomological Society which had been accepted by the Entomological Society of America and the American Association of Economic Entomologists. He stated that the commission had now been formed and would be ready soon to receive questions. He commented that among the problems which had been suggested by various systematists were the questions of priority in names of higher categories, primary and secondary homonyms, and misidentified genotypes. In connection with the last problem he read a recent article by Riley (1941) on the subject.

Dr. Miller discussed the subject of types: He stated that the California Academy of Sciences now had 10,933 primary types, of which 8,935 were holotypes, 3,526 of insects. The types have recently been moved to a safer place for the duration, can be moved again if necessary at a moment's notice. He emphasized the advisability of depositing types in an institution, remarking that the International Rules recommend that types be deposited in a museum and given a type number.—E. G. LINSLEY, Secretary.

One Hundred and Seventy-fourth Meeting.

The one hundred and seventy-fourth meeting of the Pacific Coast Entomological Society was the annual field trip held at Russelman Park, Contra Costa County, California, April 26, 1942. The following members were present: H. M. Armitage, E. G. Linsley, A. E. Michelbacher, W. F. Barr, J. W. Tilden, C. D. Duncan, J. W. MacSwain, E. C. Van Dyke, T. F. Kelley, G. F. Smith, H. P. Chandler, K. S. Hagen. Visitors were present as follows: Mrs. A. E. Michelbacher, Mrs. E. G. Linsley, Mrs. C. D. Duncan, Mr. Ellsworth Hagen, Mr. Donald de Coss, Mr. Jack Corbett, Mr. Harold Madres, Miss Catherine Reed, Mr. W. E. Ferguson, Miss Doris Dow, and Miss Maxine White.

The group assembled at the picnic grounds at 10:00 a.m. and

spent the day collecting or visiting. Flowers were abundant and collecting of Hymenoptera and Diptera was especially profitable.—E. G. LINSLEY, Secretary.

One Hundred and Seventy-fifth Meeting.

The one hundred and seventy-fifth meeting of the Pacific Coast Entomological Society was held at 2:30 p.m. on September 5, 1942, in the entomological laboratories of the California Academy of Sciences. Vice-president Keifer in the chair. The following members were present: H. H. Keifer, E. G. Linsley, R. W. L. Potts, A. J. Walz, K. S. Hagen, G. F. Smith, E. C. Van Dyke, G. F. Ferris, R. L. Usinger, R. C. Miller, P. A. Harvey. Visitors were present as follows: C. E. Kennett, T. F. Evernden, C. Golden, B. E. Sagal, D. L. Dow, P. Moorhead, W. R. Cobb, E. Goldsworthy, W. Allen, W. F. Chamberlain, and B. Prendergast.

The membership committee proposed the name of Mr. Peter Moorhead. He was duly elected.

The chairman announced that the next meeting would be devoted to the annual address of the retiring president and to the election of officers for the coming year. He appointed a nominating committee consisting of C. D. Duncan, P. C. Ting, and R. L. Usinger, chairman.

The chairman called on Professor Ferris to report on the progress of the American Commission for Scientific Nomenclature in Entomology. Professor Ferris reported that 14 acceptances had been received to invitations to serve on the Commission, that public notices of the organization of the Commission had been sent to *Science* and the various American entomological journals, and that several problems had already been submitted for consideration. He stated that probably the first question which would be considered was that of primary and secondary homonyns.

Dr. Van Dyke reported on his recent trip through the southwestern United States in the company of H. A. Scullen. He stated that they had gone to northern Arizona in early June and although collecting was moderately good around Prescott, that the region in general was the driest it had been in 40 years. They proceeded through New Mexico to the Davis Mountains, Texas, an isolated uplift with good roads and an interesting fauna. This region had first been fairly well collected by Wenzel, more recently by Knull. Among the interesting captures was a long series of *Plusiotus woodi* Horn, a brilliant scarab which flies at dusk and in the early morning, resting during the day on foliage of walnut. From the Davis Mountains they went to Alpine, then south to the Big Bend Country and Chisos Mountains, returning through New Mexico to southern Arizona. In the Chiricahua Mountains, large congregations of a meloid, *Epicauta pardalis* Lec., were found.

Mrs. Prendergast spoke of her work with *Blissus mixtus* Barber which breeds in the sand dune areas of San Francisco. She said that in spite of difficulties in rearing she had now worked out the various developmental stages.

Mr. Hagen mentioned recent collecting trips into southern California. He particularly called attention to the success of night beating in desert areas, suggesting that desert insects are active at night in order to avoid birds. He stated that by this method he had collected six new species of *Coenonycha*.

Dr. Linsley spoke of the work of the University of California summer course in Entomology at Miami Forest Insect Station of the Division of Forest Insects, Bureau of Entomology and Plant Quarantine, near Fish Camp, Madera County, California. He mentioned particularly finding the remains of hundreds of males of *Pleocoma hoppingi* Fall in coyote feces under conditions suggesting that this species has a spring rather than a fall flight period. Of particular interest also was the finding of the phycitid moth, *Vitula serratilineella* Rag., breeding in the nests of *Xylocopa orpifex* Smith and *X. californica* Cresson along with the tenebrionid, *Aphanotus brevicornis* (Lec.), a species of *Cryptophagus* and dermestids of the genera *Attagenus* and *Trogoderma*. All of these belong to groups of insects which are household or stored food products pests.

Mr. Moorhead spoke of the extermination of *Ceanothus*, important for browsing cattle, in many parts of the Sierra Nevada Mountains, by the oyster shell scale, *Lepidosaphes ulmi* (Linn.). Dr. Linsley commented that the same insect had killed large areas of *Ceanothus*, *Salix*, *Populus*, and even *Ribes* in Madera County and had practically exterminated a beautiful grove of aspen at Miguel Meadows in Yosemite National Park. Dr. Usinger and Miss Sagal both commented further on the latter infestation, tracing its history over a period of years.

Mr. Keifer spoke of the increasing importance of the grape leaf skeletonizer, *Harrisiana brillians* B. & McD. Originally described from Yuma, California, in 1910, it belongs to a Neotropical group of about 46 species (7 in United States) all of which breed on grape or its relatives (Vitaceae). Little is known of the extent of the distribution of the species. It has been known in San Diego County about two years.

Dr. Usinger stated that the mystery as to where the black grass bugs (*Irbisia*) breed may have been solved. He has found that they apparently imbed their eggs in the stalks of *Artemesia vulgaris*, where they overwinter.

Professor Ferris stated that the first part of his *Atlas of Scale Insects*, covering the family Diaspididae, was complete and that he was now planning to undertake a study of the Pseudococcidae. He stated thta he had approximately 175 specific names to consider in the United States alone and about 75 generic names.

The meeting adjourned at 4:35 p.m.—E. G. LINSLEY, Secretary.

One Hundred and Seventy-sixth Meeting.

The one hundred and seventy-sixth meeting of the Pacific Coast Entomological Society was held at 2:30 p.m. on December 5, 1942, in the entomological laboratories of the California Academy of

Sciences. President Armitage in the chair. The following members were present: H. M. Armitage, E. G. Linsley, M. A. Stewart, R. L. Usinger, T. Aarons, K. S. Hagen, E. O. Essig, H. H. Keifer, E. C. Van Dyke, W. W. Sampson, P. Moorhead, R. W. L. Potts. Visitors were present as follows: Pedro Galindo, Ellsworth Hagen, Lloyd Fowler, Loren Estabrook, and Alvesta Myers.

President Armitage issued a statement on the present status of the Society, calling attention to the fact that of approximately one hundred active members, twenty-one were now known to be serving in the armed forces of the United States. A list of the men so serving was read to the Society.

Dr. Van Dyke regretfully called the attention of the Society to the death of R. W. Doane, a long-time member. It was moved, seconded and passed that the secretary write a letter of condolence to Mrs. Doane on behalf of the Society.

Dr. Usinger reported receiving a recent letter from Lieutenant E. S. Ross, stationed in Texas, and exhibited the first few pages of an Atlas of Mosquitoes which Ross is now preparing. Usinger also exhibited specimens of *Metrobates trux* Bueno?, a relative of *Halobates*, which lives in swift running streams. The specimens were found in Putah Creek, near Davis, and constitute the first California record for the genus.

Mr. Keifer called attention to the series of articles on problems of Entomological Systematics in the most recent number of the Journal of Economic Entomology. He interpreted the series of articles and the amount of space devoted to them in the Journal, as an indication of increased interest on the part of applied entomologists in the problems of the systematist.

Mr. Keifer also spoke of the recent discovery of the oriental fruit moth, *Graphtholitha molesta* (Busck), in Orange County, California. Mr. Armitage commented that this was a good example of the role of the taxonomist in economic work and pointed out how much relied upon proper identification in problems of this type.

The nominating committee announced with regret the resignation of Mr. E. R. Leach who had served the Society as treasurer for a long time and at great personal sacrifice. The following names were proposed as officers for the coming year: H. H. Keifer, president; M. A. Stewart, vice-president; E. G. Linsley, secretary; R. C. Miller, treasurer; H. M. Armitage, member at large, Board of Directors. They were unanimously elected.

Mr. Armitage then turned the gavel over to the new president, Mr. Keifer. Mr. Keifer presented the new officers and then presided during the annual address of the retiring president entitled, "Possible economic relations of the Hawaiian insect fauna to California agriculture," (see p. 1).—E. G. LINSLEY, Secretary.

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NEW SPECIES OF WEST AMERICAN COLEOPTERA

BY EDWIN C. VAN DYKE
California Academy of Sciences

This paper contains the descriptions of a number of new species of Coleoptera which have been acquired by the California Academy of Sciences, during the last few years, together with comments on other species.

Family Cleridae

Trichodes basalis Van Dyke, new species

Rather small and narrow; head, prothorax, base of elytra and legs clothed with long, stiff hairs as usual in the genus, the posterior portion of elytra with denser, shorter, semi-erect hairs, and the abdomen sparsely clothed with more or less recumbent pile; the greater part of head, prothorax and scutellum a metallic green, the elytra yellow at base, with a moderately narrow, transverse yellow bar at center, and oblique yellow stripes, diverging backwards and outwards and not quite meeting at suture, half way between median transverse band and apex, elsewhere a deep blue, the bluish patches in front and behind the median yellow bar faintly rufous at their centers and the apical patch somewhat rufous toward the apex, the front of head, antennae, legs and underside of after-body rufo-castaneous. Head coarsely, not closely punctured, clypeus smooth and shining, an inverted V-like impression between eyes, eyes of moderate size and quite prominent, the antennae with the usual triangular club and not quite twice as long as broad. Prothorax but little longer than broad, broadest in front, gradually narrower to posterior third, then constricted before base; the disk shining, rather coarsely, not cribrately punctured and with a small, smooth area in front of the scutellum. Elytra two-fifths as broad as long, with sides straight and parallel in front, feebly arcuate and narrowed toward the truncate apices; the disk rather coarsely, closely punctured, the punctures anteriorly arranged in more or less approximate rows, more irregular toward apex. Length, 8 mm.; breadth, 2 mm.

Male with antepenultimate ventral segment deeply emarginate posteriorly, the penultimate feebly emarginate and the apical somewhat arcuate at apex.

Holotype male (No. 5327, Mus. C. A. S. Ent.), collected in

IMPERIAL COUNTY, CALIFORNIA, in 1911, by J. C. Bridwell and by him kindly presented to me.

This very distinctively marked species, both in sculpturing and coloration, shows that it is more closely related to *horni* Woll. and Chap. than to any of the *ornatus* group. From *horni*, it is not only definitely separated by its color pattern but by being much less coarsely punctured above, with more prominent though smaller eyes, shorter antennal club and smaller size.

FAMILY ELATERIDAE

SUBFAMILY PLASTOCERINAE

Euthysanius wagneri Van Dyke, new species

Elongate, subparallel, rufotestaceous, somewhat shining, head, pronotum and ventral surface of entire thorax rather densely clothed with long, silky, fulvous pile, elytra rather densely clothed with shorter, semi-erect pile which, however, does not conceal the sculpturing, and the ventral segments with sparser, finer and more depressed pile. Head triangularly impressed in front, rather coarsely, closely punctured, the clypeal margin more or less lobed and slightly truncate at middle; eyes prominent, hemispherical; antennae reaching hind angles of prothorax, outer segments pectinate, the appendages long, about four times the length of the segments and terminal appendage fully as long as preceding one. Prothorax subcampanulate, length three-fourths breadth at middle and less than three-fifths width between apices of hind angles, front margin very feebly arcuate, sides slightly arcuate in front and oblique and divergent posteriorly to the long, sharp and widely everted hind angles which are carinate within; disk moderately convex, finely, not closely punctured, median line distinctly impressed. Scutellum elongate, depressed at middle and somewhat transverse behind. Elytra slightly less than three times as long as broad, sides gradually narrowing posteriorly; the disk convex, the striae well impressed and rather coarsely, closely punctured, the intervals convex and finely, irregularly punctured. Beneath, the propleurae rather coarsely, closely, punctured, prosternum finely rather closely punctured and sulcate between the coxae, ventral segments finely, rather densely punctured. Hind tibiae somewhat sinuate. Length, 22 mm.; breadth, 5.5 mm.

Holotype male (No. 5328, Mus. C. A. S. Ent.) and two male paratypes, collected at light, at MORRO, SAN LUIS OBISPO COUNTY, CALIFORNIA, July 4, 1931, by Mr. Roy L. Wagner, and kindly sent to me some years ago.

This species at first sight looks like a light colored *lautus*, seeing that it is of similar size and proportions. It differs from

this by having a finer, less dense pronotal punctuation, and from this as well as other species by having the basal angles of prothorax widely separated, divergent and acute, the clypeus more lobed in front, the forebody clothed with long, silky pile, and the terminal appendage of the antennae as long as the preceding appendages.

Aplastus piceus Van Dyke, new species

Elongate, stout, piceous, sparsely clothed above and beneath with short, closely appressed, gray pile. Head with triangular impression in front, coarsely, densely punctured; eyes prominent; antennae long, seventh segment reaching hind angles of prothorax, second and third segments short, the third but little longer than second, together about two-thirds length of fourth segment, segments 4-10 gradually wider from base to apex, the outer angle extended as a cylindrical appendage which is fully one-half the length of the segment, the eleventh segment long and cylindrical, slightly longer than the tenth and with a short appendage continuous with itself. Prothorax as long as broad, not including hind angles, apex arcuate, sides almost straight and slightly divergent to hind angles which are triangular, acute, carinated and generally continued straight backward and outward in line with the sides though frequently slightly everted, lateral margin generally well defined and complete though often obscure; disk rather coarsely, closely punctured, the median longitudinal line as a rule well impressed. Elytra three times as long as broad, sides almost straight, gradually narrowing backwards, and arcuate to apex; the disk with striae all distinctly impressed, the intervals feebly convex, the general surface finely punctured and rugous. Beneath, prothorax coarsely, closely punctured, the prosternum carinate in front and sulcate between the coxae, the ventral segments rather finely, discretely punctured. Length, 15 mm.; breadth, 4 mm.

Holotype male (No. 5329, Mus. C. A. S. Ent.), and numerous designated paratypes from a series of forty-nine specimens, collected by myself, in MORONGO VALLEY, RIVERSIDE COUNTY, CALIFORNIA, from May 23-26, 1941.

This species of the semi-arid hills to the east of the San Bernardino Range, is very similar in size and general appearance to *speratus* Lec. which is to be found in the more humid areas to the west of the mountains. The latter species is in general more rufous and has the outer segments of the antennae more definitely triangular and with the outer angle but little produced while *piceus* has the segments more narrowed basally and the outer angles extended in the form of an appendage. The

latter species also has the pronotum coarsely and closely punctured.

Larger series of *Aplastus speratus* Lec. than I formerly had, show that the lateral marginal line of the prothorax is well indicated in the larger, better developed specimens, and that it is only in the atypical or more poorly formed specimens that it is reduced. This would thus change the placement in my key (Proc. Calif. Acad. Sci., XX, 1932, pp. 459-460). *Aplastus piceus* would have to be placed near it.

Subfamily Elaterinae

Adelocera mexicana Candeze

In 1932, Dr. H. C. Fall described specimens of this species from Arizona as *A. nobilis*. This is an absolute synonym. While in Europe in the same year, I carefully examined the Candeze type in Brussels, also the specimen in the British Museum from which the illustration for the Biologio-Centrali Americana, was made. They were both from Mexico and both the same species and in agreement with the specimens from Arizona as well as Mexico that I have studied. If the specimen from Florida which Fall and Horn considered the true *mexicana* is different, then it is undescribed.

Conoderes bicarinatus Van Dyke

The specific name of this species, *bicarinatus*, is preoccupied by a species from Turkestan, *Conoderes* (*Heteroderes*) *bicarinatus* Reitter. I, therefore, now substitute the name ***duplicatus*** Van Dyke, new name, for my species.

Conoderus (Heteroderes) amplicollis (Gyllenhal)

The specimens of *Conoderes* from Alabama which I formerly determined as the above, are really *laurentii* Guer. (*attenuatus* Cand.), according to specimens in the British Museum. In the Brussels Museum where much of the Candeze collection still is, there is considerable confusion. Specimens of the above are labelled *amplicollis* as well as *laurentii*.

Limonius cribriceps Van Dyke, new species

Rather short and robust, black, elytra and legs piceous, and clothed wtih a short and sparse yet conspicuous gray pile. Head flattened in front, coarsely, cribrately punctured, the clypeal front margin transverse and feebly reflexed; eyes of moderate size; an-

tennae rather short, extending but slightly beyond hind angles of prothorax, second and third antennal segments each about twice as long as broad, subcylindrical, together somewhat longer than fourth segment, 4-10 moderately serrate, gradually narrower, the terminal segment fusiform. Prothorax about as long as broad, apex feebly emarginate, base biemarginate, sides sinuate in front of hind angles, arcuate and gradually narrowed to apex, hind angles robust, projecting slightly backwards, truncate at apices and finely carinate; disk with median longitudinal line well impressed posteriorly, coarsely, deeply, rather closely punctured medially, approximately and cribrately at sides. Elytra fully 1 mm. more than twice as long as broad, sides subparallel in front, feebly arcuate posteriorly and gradually narrowed to apex; disk with striae well impressed and rather coarsely punctured, the intervals flattened, irregularly punctured and very rugose. Beneath coarsely and deeply punctured in front and less coarsely and densely on anterior ventral segments, the last ventral very densely punctured. Length, 10 mm.; breadth, 2.5 mm.

Holotype (No. 5230, Mus. C. A. S. Ent.), a unique, probably a female, collected by myself on the GREENHORN MOUNTAINS of TULARE COUNTY, CALIFORNIA, May 7, 1931.

In my synoptic table for *Limonius*, this species would come just before *confusus* Lec. and *plebejus* Say and following *kuschei* Van Dyke. In size and general appearance, it suggests *clypeatus* Mots. most but has a transverse clypeal margin. It is most notable because of its very coarse punctuation.

Limonius arizonicus Van Dyke, new species

Narrow, elongate, castaneous, antennae, legs, underside and epipleurae lighter, and sparsely clothed with short fulvous pile, longer on metasternum. Head rather coarsely, densely punctured, depressed at center in front, clypeus with sharply defined transverse margin; antennae long, the ninth segment reaching apex of hind angles of prothorax, second and third segments short though each longer than broad and together slightly longer than fourth, 4-10 moderately serrate, gradually narrowed outwardly, eleventh elongate-elliptical; eyes convex. Prothorax as long as broad at hind angles, sides gradually narrowed and feebly arcuate forwards, apex transverse, base bisinuate, hind angles rather short, slightly divergent, truncate at apices and with a fine carina which diverges forwards to a slight degree from the lateral margin; disk without definitely impressed median longitudinal impression, coarsely, approximately punctured at sides, more finely and sparsely punctured at center. Elytra about 1 mm. more than twice as long as broad and less than three times as long as prothorax, sides almost parallel in front, gradually arcuate and narrowed posteriorly;

disk feebly convex with striae finely impressed and finely, closely punctured, intervals flattened or feebly convex laterally and finely, irregularly punctured and rugose. Beneath, moderately punctured in front, the propleurae more coarsely and densely, the ventral segments moderately punctured, the apical more densely so; the prosternal sutures well separated in front and the prosternal lobe well developed. Length, 10 mm.; breadth, 2.75 mm.

Holotype (No. 5331, Mus. C. A. S. Ent.) and seven paratypes, all apparently males, collected in BEARFOOT PARK, alt. 8-9000 feet, CHIRICAHUA MOUNTAINS, ARIZONA, the type, July 15, 1937, the others July 9, 29, or 30, by J. A. Kusche.

This species though a true *Limonius*, in size and general appearance, looks more like an *Athous* such as *discrepans* Reitt. (*discors* Fall). In my synoptic table, it would run close to *confusus* Lec., to which it bears little resemblance. It is probably somewhat related to *rectangularis* Fall.

LIMONIUS DISCOIDEUS LEC.

I am still quite positive that *discoideus* is but the female of *canus*, occurring most commonly in the more northern areas of distribution. I have a pair mounted on the same pin, taken along Putah Creek, Solano County, California. The male is a typical male *canus* and the female a true *discoideus*. The usual female *canus* of the more southern areas of distribution is generally darker than typical *discoideus*. The latter is also not restricted to the north and intermediate color phases are not uncommon. I have *discoideus* from Trinity County, Tehama County, Humboldt County, Santa Cruz County, Monterey County, Calaveras County and Ventura County, California. Dr. Fall speaks of specimens of *canus* found on the sand dunes of San Francisco and Carmel and wondered whether it ranges farther north along the coast. I have taken it at numerous places, on the sand dunes along the coast from Redondo, California, to the State of Washington, as well as along numerous sandy washes of inland streams from southern California to Washington. Dr. Fall was not very familiar with field conditions in the more northern parts of the Pacific Coast. He also speaks of the possibility of *discoideus* being another species because certain males found with them had longer antennae than certain males found farther south. From my very long series, I find that the length of the antennae varies in the males, some from the south having long as well as short antennae while others from the north vary to

the same degree. *Limonius canus* Lec. is a species of wide distribution along the Pacific Coast, quite variable in many regards yet having a more or less definite biological habitat, that is the sandy wastes, whether of the seacoast sand dunes or the sandy margins of the various inland streams.

Limonius infuscatus Motschulsky

This species is, perhaps, even more widely distributed on the Pacific Coast than *canus* and more variable. Dr. Fall questioned my figures. My smallest *infuscatus* are 8 mm. long and I have many close to that figure. In fact the greater number of those to be found in middle California, as along the Russian River, presumably the type locality for Motschulsky's species (8.4 mm. long vid. Fall) are moderately small specimens. The average of the great majority is 10 or 11 mm. My excess figure was 14 mm. for *pilosulus* Caud. which I consider but a subspecies. I have in fact one *pilosulus* 16 mm. long while my smallest *pilosulus* is but 11 mm. long. Of *vernalis* Fall which I still consider but the lighter, more southern phase, I have twenty specimens before me, the smallest 8 mm., the largest 12 mm., average 10 mm. In my high school days, I collected them in quantities along the Los Angeles River channel. This is the phase which is common and widespread throughout the lowlands of southern California. In the mountains as at Keen Camp, Riverside County, the darker, more typical *infuscatus* is to be found. The average of specimens to be found in northern California, Oregon and Washington, is slightly greater than the Russian River specimens. As to *pilosulus* Cand. (*pilosus* Lec.) which is rare in collections, I will state that I have ten specimens before me, one of which I have carefully compared with the Le Conte type. It is 14 mm. long, larger than the type which is 10.5 mm., but it agrees with it in every regard except size. I also have two others of similar size and appearance. Five specimens are either 11 or 12 mm. long. Four of these are females like the largest specimens but one is a male. This last, from Los Angeles, has the antennae extending back to the hind prothoracic angles and the fourth and fifth segments are broadly triangular, not transverse as in the largest female and several of the smaller ones. All of the specimens have the same color and facies and I think are undoubtedly the same thing. Only one of these is from southern California, the male. The type was supposedly from Yuma. All

the others are from northern California: Sonoma County, Humboldt County, Santa Cruz County, Contra Costa County and Oroville. My largest specimen, 16 mm. long, is perhaps a different species for it is almost black, dull without metallic lustre, very hairy, and with the pronotum coarsely, densely punctured.

Ludius truculentus (Candeze)

This species, the type of which I examined in the Brussels Museum, is not what I judged as such from the description. Either my *shastensis* or *blaisdelli*, probably the latter, is more in agreement with the type of *truculentus*. Unfortunately I had no specimens of either *shastensis* or *blaisdelli* with me for purposes of comparison when abroad and comparison would be absolutely necessary to be certain of the determination. What I took to be *truculentus*, is without a name, so will be described.

Ludius sierrae Van Dyke, new species

Elongate, robust, moderately convex, rufo-castaneous, generally with a broad, black, longitudinal stripe down the center of the pronotum, though this is often vague and sometimes absent, the base of head also sometimes black and the prosternum and underside of entire after body more or less piceous, and both upper and lower surfaces clothed with a sparse, short, closely appressed though quite evident pubescence. Head feebly convex, sometimes with two shallow impressions between the eyes and densely closely punctured, antenna piceous, extending several segments beyond hind angles of prothorax in males and one or two in female, second segment short, slightly longer than broad, third almost twice as long and but little shorter than fourth, 5-10 gradually shorter and narrower and 4-10 all feebly serrate. Prothorax as broad as long, not counting hind angles, sides arcuate from apex to base of hind angles, hind angles prominent, acute, divergent, with sharply defined carinae and fully 1.5 mm. long; disk broadly convex, slightly deplanate laterally, with median longitudinal impression generally vague, and finely, rather densely punctured, especially at sides, and lateral margin very narrow. Elytra over twice as long as broad and less than three times as long as prothorax, sides almost straight and parallel at basal third, thence feebly arcuate and gradually narrowed toward apex; the disk with striae finely but well impressed and finely somewhat obscurely punctured, the intervals broad, feebly convex and finely punctured and rugose. Beneath finely closely punctured, denser on prothorax. Length, 12-20 mm.; breadth, 4-6 mm.

Holotype male, allotype female (Nos. 5332 and 5333, Mus. C. A. S. Ent.) and four paratypes, the first from Meadow Val-

LEY, PLUMAS COUNTY, CALIFORNIA, 3500-4000 feet alt., June 6, 1924; the second from FALLEN LEAF LAKE, near LAKE TAHOE, CALIFORNIA, July 12, 1915; and the others from Quincy, California, July, 1922; Yosemite Valley, California, June 3, 1921; and El Dorado County, California; all collected by myself. There is also an additional specimen from Glen Alpine, near Lake Tahoe, California, collected in July, in the Fenyes collection of the Academy.

This species which has long confused me, looks very much like some of the bicolored specimens of *volitans* Esch. from Alaska and the northern Cascade Mountains, but it is in general more robust, with a shorter and broader prothorax, less sagittate, smaller prothoracic hind angles, and above all with the third antennal segment not quite as long as fourth whereas it is always fully as long or longer in *volitans*. True *volitans* are to be found in the same general region as *sierrae*, the mid Sierra Nevada Mountains.

LUDIUS CRIBROSUS (LE CONTE) AND RELATIVES

In my paper of 1932, I was too hasty in placing *cribrosus*, *maurus* and *colossus* as phases of one species. They are, of course related, the two first very closely so and often difficult to separate. The male genitalia of these are so similar that they cannot be relied upon for purposes of diagnosis. The antennae of atypical smaller females, likewise, cannot be depended upon. The two species are also to be found in the same regions. Typical *cribrosus* have the pronotal punctures generally deep and well separated on the disk, the third segment of the antennae almost as long as fourth and quite triangular, and are as a rule more shining. Typical *maurus* Lec. are usually broader, flatter, have the pronotal punctures close together, more approximate, the third segment of the antennae more cylindrical, feebly triangular, and as a rule shorter though many have it practically as long as the fourth, and are duller in appearance. The male genitalia of *colossus* Lec. are different from either of the others, the lateral blades of the aedeagus narrower and knobbed apically; the antennae are more like those of *maurus* but have the outer segments more transverse and broader basally; the pronotal punctation much like that of *cribrosus*; and the elytra with striae very finely, often obscurely impressed and the intervals flat and rather densely punctured. It is the elytra in the smaller

specimens which are no larger than many *maurus*, which have to be used to enable these to be definitely separated from *maurus*. At first only very large female specimens of *colossus* were known or at least recognized but more recently more specimens have been found, including many smaller specimens and both males and females, though the males are still quite rare. As stated previously, I find that this species is restricted to the southern Sierras.

LUDIUS NIGRICANS (FALL)

A restudy has convinced me that the above species is a good species not a subspecies of *rotundicollis* (Say) as I at first thought and stated. In general it is larger. I have, however, specimens that are no larger than average examples of *rotundicollis* and specimens of *diversicolor* Esch. which are fully as large as minor sized specimens of *nigricans*. The pronotal punctuation is variable and so unreliable as an index. In typical *nigricans*, it is moderately coarse and dense, in other specimens fine and less dense, approaching that of *rotundicollis*. The more reliable diagnostic characters are the somewhat flattened pronotum, rather broadly sinuate sides in front of the moderately robust hind angles which may be either slightly or conspicuously divergent, and the fairly wide side margin of the prothorax, especially posteriorly. In *rotundicollis*, the pronotum is more convex, with the sides narrowly and sharply sinuate just in front of the short, acute and divergent hind angles, and the side margin of the prothorax very fine and narrow throughout. I have a color phase of *nigricans* with broad red margins to the prothorax, from Olympia, Washington.

LUDIUS ROTUNDICOLLIS (SAY)

The typical phase of this according to Fall, and Say's original description which I neglected to consult at first, has a more or less rufous pronotum, I would call it a dark cherry red. I now have before me several specimens of this typical phase from the Fenyes collection, as well as all black specimens, one from the Pacific Coast, Olympia, Washington. The *diversicolor* of Eschscholtz is not the same as *rotundicollis*, therefore not a synonym as stated by Fall but a good subspecies as formerly stated by me. In fact, I very much doubt whether Dr. Fall had ever seen a true *diversicolor*. Outside of having a brilliant orange pronotum, it has the elytra a more pronounced, shining black and the fine, close punctuation of the elytral striae quite evident

whereas it is more or less obsolete in typical *rotundicollis*. This subspecies is generally to be found in the middle, coastal region of California and as far as I have found, breeds in the old rotting wood in the holes of injured live oak trees. There is also a color phase of this, characterized by having a longitudinal black area of variable size down the middle of the pronotum. This phase, so far, only has been found about Monterey Bay in California.

ELATER STURMII GERMAR

The type of the above-mentioned species is in the British Museum and is a true *Megapenthes*.

MELANOTUS LONGULUS LE CONTE

In my previously-mentioned paper, I sunk *M. oregonus* Lec. as a subspecies of the above. I was in error. *M. oregonus* Lec. is a good species with different male genitalia. The other forms which I included under *longulus*, belong as placed.

FAMILY MELASIDAE

Hylus (Hypocoelus) robustus Van Dyke, new species

Form robust, moderately elongate; piceous, antennae, legs, generally the abdomen and sometimes the entire underside rufous; sparsely clothed with fine, fulvous pile. Head convex, flattened in front, sulcate between the antennae, clypeus narrowed at base, transversely concave, the entire head coarsely, densely umbilicately punctured; antennae with the seventh segment reaching hind angles of prothorax, second segment small, transverse apically, segments three and four feebly triangular and twice as long as broad, the following cylindrical and slightly more than twice as long as broad, the terminal segment slightly longer than tenth and acute at apex. Prothorax barely wider than long, apex feebly lobed, sides arcuate from hind angles and gradually narrowed to apex, base broadly emarginate on either side and with a short transverse area between; disk convex, with median longitudinal line barely impressed near base, the surface coarsely umbilicately punctured. Elytra finely striate, the strial punctures more or less vague, the intervals flat and finely, irregularly and somewhat densely punctured and finely rugose. Beneath, prosternum rather coarsely, densely punctured. The abdomen more finely and less densely punctured. Hind coxal plates triangular, gradually dilated inwardly, the hind margin straight. Length, 8 mm.; breadth, 3 mm.

Male: terminal segment of antennae evidently but very little longer than tenth; female, terminal segment of antennae equal to tenth.

Holotype male, allotype female (Nos. 5334 and 5335, Mus. C. A. S. Ent.) and three paratypes; the holotype male from near

KAWEAH, TULARE COUNTY, CALIFORNIA, August 11, 1939; the allotype female, same locality, August 2, 1937; two paratypes, same locality, August 11, 1939 and August 3, 1937; all collected by F. T. Scott; the third paratype collected by A. T. McClay at Palloch Pines, California, May 6, 1937.

This species as indicated by its name is very robust. In the tables, it would run close to *frontosus* (Say), but differs by being larger and more robust with the head and pronotum very coarsely, cribrately and umbilicately punctured and the head much flattened in front. In one specimen, the one from Pollock Pines, there is a small, rudimentary, longitudinal crista on the front of head. The species is the fourth in the genus to be described from North America: *frontosus* (Say) from eastern Canada and adjacent areas of the United States; *terminalis* (Lec.) from the same localities and on the Pacific Coast from British Columbia, Washington and northern California; and *californicus* (Van Dyke) and *robustus* Van Dyke, both restricted to California; thus, showing that northwestern North America is the center of distribution for this continent.

ZUPHIUM AMERICANUM DEJ. IN OREGON

On April 29, 1942, a series of ten specimens of this tiny Carabid was taken as Spencer's Butte, 5 miles south of Eugene, in an open meadow at the altitude of 900 feet.

The beetles were found clinging to an overturned stone in somewhat Cucuid manner, but when disturbed by light they became very active and rapidly descended to the ground where some succeeded in hiding themselves under particles of soil and escaped collector's hand.

The state of Louisiana is cited in Leng's catalogue as the habitat of the species, but Dr. Hatch, who has kindly determined the beetles, has informed me that there is in his collection a specimen from Ann Harbor, Michigan. Apparently the distribution of the *Zuphium americanum* is quite extended[1] although it is rarely found in collections.

Out of the total ten, two specimens are placed in the collection of Mr. and Mrs. Kenneth Fender of McMinnville, Oregon, four in Dr. Hatch's collection, and the remainder in my own.—BORYS MALKIN.

[1] Four examples from Kansas in the Field Museum of Natural History, Chicago, have been examined since the above was written.

FIVE NEW SPECIES OF DICYPHUS FROM WESTERN NORTH AMERICA AND ONE NEW CYRTOPELTIS

(Hemiptera, Miridae)

BY HARRY H. KNIGHT
Iowa State College, Ames, Iowa

Dicyphus brachypterus Knight, new species

Male. Length 2.55 mm., width .75 mm. Head: width .48 mm., vertex .23 mm.; black, shining, a pale lunule extending from postero-dorsal angle of eye to near middle of vertex. Rostrum, length 1.04 mm., extending to tips of middle coxae, pale yellowish, apex fuscous. Antennae: segment I, length .26 mm., pale, fuscous on base; II, .86 mm., cylindrical, pale, base and more broadly on apex, blackish; III, 1.0 mm., pale, apical half fuscous; IV, .49 mm., fuscous. Pronotum: length .47 mm., width at base .60 mm.; calli convex, posterior margins moderately impressed; basal margin of disk concavely arcuate, basal angles moderately rounded, black, shining, collar white. Scutellum slightly convex, transversely rugulose, mesoscutum moderately exposed, black. Hemelytra abbreviated, reaching to middle of abdomen, membrane reduced, scarcely extending beyond tip of cuneus, pale; pallid, subtranslucent, a fuscous cloud covering tip of clavus and apical half of corium. Body black, moderately shining, clothed with fine pale to yellowish pubescence. Legs pale, base of coxae blackish, apical half of femora slightly dusky, tibial knees and tips of tarsi fuscous.

Female. Length 3.11 mm., width .92 mm. Head: width .58 mm., vertex .32 mm. Antennae: segment I, length .26 mm.; II, .71 mm., less than one and one-half times the width of head; III, .82 mm.; IV, .39 mm. Pronotum: length .57 mm. width at base .74 mm. Hemelytra short, membrane extending slightly beyond tip of cuneus, pallid, subtranslucent, a fuscous cloud covering apical half of corium and apical one-fourth of clavus. Color very similar to the male, but with a pale spot between calli and extending slightly on pronotal disk.

Holotype: male, August 14, 1931, Mt. Rainier, Washington (H. H. Knight); author's collection. *Allotype:* same data as the type. *Paratypes:* 2 males and 6 females, taken with the types on *Polemonium humile* R. & S. This species was found on the same plants with *Macrotylus polemonii* Kngt.

Dicyphus usingeri Knight, new species

Distinguished from allied species by the large size, green to yellowish coloration, with first antennal segment black.

Male. Length 5 mm., width 1.2 mm. Head, width .60 mm., vertex .32 mm.; frons strongly convex, tylus prominent; eyes rather small, width .19 mm., height .28 mm.; yellowish green. Rostrum, length 1.90 mm., reaching to middle of hind coxae, greenish yellow, apex blackish. Antennae: segment I, length .47 mm., blackish, apex and narrow base yellowish; II, 1.82 mm., slender, slightly thicker apically, thickly clothed with suberect, fuscous pubescence, yellowish, base and apex fuscous to black; III, 1.90 mm., slender, blackish; IV, .60 mm., blackish. Pronotum: length .65 mm., width at base .99 mm.; calli moderately convex, posterior margins not deeply impressed, posterior half of disk rather flat, basal margin straight; yellowish green, basal edge of disk infuscated. Scutellum moderately convex, greenish yellow, apex dusky; mesoscutum moderately exposed. Hemelytra subtranslucent, pale to yellowish, apex of corium with a small fuscous cloud; cuneus clear, tinged greenish, apex dark fuscous to blackish; membrane nearly clear, venis pale fuscous. Dorsum clothed with suberect, moderately close-set, dusky to fuscous pubescence. Ventral surface yellowish to green, fading in old specimens. Legs greenish yellow, tarsi and tibial knees fuscous to black; tibial spines blackish. Left genital clasper subtriangular on basal half, convex on lateral aspect, apical half flattened, blade-like, directed vertically, apex acuminate; right clasper not visible externally.

Female. Length 4.5 mm., width 1.17 mm. Head: width .58 mm., vertex .34 mm. Antennae: segment I, length .43 mm.; II, 1.43 mm.; III, 1.34 mm.; IV, .56 mm. Very similar to the male in general form, color and pubescence.

Holotype: male, June 20, 1926, Fresno, California (C. J. Drake); author's collection. *Allotype*: taken with the type. *Paratypes:* female, taken with the types. CALIFORNIA: 10 males and 14 females, July 20, 1928, Oakland Rec. Camp, Tuolumne County; 4 males and 14 females, July 23, 1932, nr. Camino, El Dorado County (R. L. Usinger). One male, May 21, 1930, Mokelumne Hill, Calaveras County; a male and a female, July 20, 1931, Coffee Creek, Trinity County (R. L. Usinger). Breeds on Mountain Misery (*Chamaebatia foliosa* Benth.) according to Dr. Usinger.

Dicyphus rivalis Knight, new species

Allied to *usingeri* but differs in having smaller eyes, the calli more strongly convex, and first antennal segment greenish.

Female. Length 5.5 mm., width 1.5 mm. Head: width .64 mm., vertex .39 mm.; frons strongly convex, higher than base of head; eyes small, width .173 mm., height .25 mm.; color greenish yellow. Rostrum, length 2 mm., extending to middle of hind coxae, yellow-

ish, apex fuscous. Antennae: segment I, length .50 mm., greenish yellow, fuscous beneath on basal half; II, 1.73 mm., slender, cylindrical, yellowish, blackish at base, infuscated just before apex; thickly clothed with suberect, yellowish pubescence; III, 1.78 mm., yellowish, dusky to fuscous apically; IV, .64 mm., fuscous. Pronotum: length .78 mm., width at base 1.08 mm., calli strongly convex, posterior margin moderately impressed; posterior half of disk moderately convex, basal margin moderately concavely arcuate, posterior angles broadly rounded. Scutellum moderately convex, mesocutum rather broadly exposed, both uniformly greenish yellow. Hemelytra subtranslucent, pale yellowish, tip of cuneus fuscous; membrane nearly clear, veins greenish, infuscated at apex of cells. Dorsum clothed with suberect, moderately close set, yellowish pubescence. Ventral surface uniformly greenish yellow. Legs greenish yellow, tibial knees black, tips of tarsi fuscous, tibial spines yellowish.

Holotype: female, June 16, 1930, Forest Grove, Oregon (Joe Schuh); author's collection. *Paratype*: female, September 16, Kaslo, British Columbia. CALIFORNIA: female, July 28, 1931, Coffee Creek, Trinity County (R. L. Usinger), on *Ribes.*

Dicyphus tinctus Knight, new species

Allied to *rufescens* Van D., but distinguished by the red pronotum and scutellum, cuneus clear without black apex, tibiae and abdomen pallid.

Female. Length 4.33 mm., width 1.2 mm. Head; width .62 mm., vertex .35 mm.; fuscous to black, a pale spot above each eye on vertex. Rostrum, length 1.47 mm., reaching to near apex of middle coxae, pale, apex fuscous. Antennae: segment I, length .32 mm., pale to dusky; II, 1.05 mm., cylindrical, pale to dusky, fuscous at base; III, 1.12 mm., pale to dusky, apical one-third fuscous; IV, .47 mm., pale to dusky. Pronotum: length .65 mm., width at base .99 mm.; basal margin rather deeply and broadly concave, calli rather strongly convex; color bright red, coxal cleft surrounded by fuscous. Scutellum and mesonotum bright red, the latter rather broadly exposed. Hemelytra pale translucent, apical half of clavus, inner and apical margins of corium, bright red. Cuneus uniformly clear, inner edge by smaller areole with a streak of red. Membrane nearly clear, tinged with brownish, veins light fuscous. Dorsum clothed with fine, rather short, suberect pale pubescence. Venter pale, a series of dark spots on lateral margins; mesosternum, metapleura and ostiolar peritreme, dark fuscous to black. Legs pale to yellowish, spot on base of front coxae, a series of obsolete spots on anterior face of hind femora, and tips of tarsi, fuscous.

Holotype: female, August 10, 1932, Lodgepole Camp, Rainier National Forest, Washington (A. R. Rolfs); author's collection. *Paratypes:* 4 females, taken with the types.

Dicyphus hesperus Knight, new species

Allied to *discrepans* Kngt., but the male differs in structure of the left genital clasper; lateral aspect of clasper triangular in outline and without a notch on dorsal margin near base; female distinguished by the black first antennal segment.

Male. Length 3.55 mm,, width 1.03 mm. Head: width .52 mm., vertex .23 mm.; black, shining, vertex bordering eyes and dorsal aspect of neck except median line, pallid. Rostrum, length 1.47 mm., extending beyond posterior coxae or to base of fourth ventral segment, pale yellowish, apex fuscous. Antennae: segment I, length .26 mm., reddish brown to black, shining, yellow pubescent; II, .86 mm., yellowish, apical one-third dark reddish to black, basal half more slender, pale yellowish pubescent; III, .52 mm., dark fuscous, pale at base; IV, .34 mm., fuscous. Pronotum: length .49 mm., width at base .82 mm.; collar flat, broad, sinuate above, pale; calli convex, smooth, shining, basal margin delimited by an impressed line; disk flaring upward over mesonotum, basal margin broadly, concavely arcuate, basal angles widely rounded; propleura fuscous to black, calli brownish, disk dusky brown, median line pale. Mesoscutum broadly exposed, fuscous, pale spot at each side; scutellum pallid, broad median line reddish brown to black. Dorsum clothed with yellowish to fuscous pubescence, with more erect fuscous hairs on pronotum and scutellum. Hemelytra subtranslucent, in part dusky brown, tinged with reddish along claval suture, sometimes more broadly; spot on tip of embolium and one on corium bordering cuneus, fuscous to black. Cuneus clear, apex fuscous to blackish, often tinged reddish. Membrane clear, apical half lightly infuscated, veins fuscous. Venter and thorax brownish black. Legs pale to yellowish, coxae fuscous on base; femora with a few fuscous dots arranged in rows, front femora with spots on posterior aspect while hind femora have spots on front and posterior aspects; tibiae with yellowish hairs only, tips of tarsi fuscous. Left genital clasper triangular as viewed from the side, without notch above, apical half slender, apex flattened and curved; right clasper apparently absent.

Female. Length 3.5 mm., width 1.0 mm. Head: width .56 mm., vertex .22 mm. Antennae: segment I, length .26 mm.; II, .73 mm.; III, .58 mm.; IV, .30 mm. Very similar to the male in form and coloration.

Holotype: male, April 19, 1933, Moscow, Idaho (T. A. Brindley); author's collection. *Allotype:* same data as the type. *Paratypes:* 2 males and 3 females, taken with the types in mullein (*Verbascum*) where this insect may hibernate. CALIFORNIA: 2 males, and 2 females, July 4, Arbolado, on *Stachys albens*; 2 males and 2 females, May 7, San Gabriel River; male and 3 females, May 16, 1935, Whittier, on *Verbascum virgatum* (E. L. Paddock). One female, June 12, 1918, San Diego (C. L. Hubbs). Two males and 2 females, June 1, 1940, Dark Canyon, Riverside County (R. L. Usinger), "on thimbleberry"; 2 males and 2 females, June 2, 1915, Mission Canyon, Santa Barbara (Harold Morrison). Eight males and females, August 15, 1914, Ramona (J. C. Bradley). COLORADO: 2 females, July 16, 1898, Little Beaver; female, June 18, 1901, Palmer Lake (E. D. Ball). IDAHO: 5 females, Nov. 17, 1933, Boise (C. Wakeland). Six males and females, May 23, 1936, Genesee (T. A. Brindley). Male and female, April 22, male and female, May 30, 1933, Lewiston (T. A. Brindley). Five males and females, July 10, 1936, Lewiston (F. B. Conn). Male, March 31, male and female, April 4, male and female, April 18, 5 males and females, April 14, male and female, May 7, female, Oct. 20, 1932-1938, Moscow (T. A. Brindley). Five males and females, Mar. 17, 1934, Moscow (H. G. Bergen). Seven males and females, Mar. 18, 1934, Moscow (H. Shipman). Male, May 10, 1936, Moscow (R. E. Miller). Male July 10, male July 24, 2 females August 8, 1936 Moscow (B. F. Conn). Male May 17, male and female June 18, 1936, Moscow Mountain (T. A. Brindley). Nine males and females, Aug. 4, 1936, Moscow Mountain (Shull and Coon). MONTANA: Male, August 1, 1920, Missoula (A. A. Nichol). NORTH DAKOTA: female, Bottineau, Turtle Mountains (C. N. Ainslie). OREGON: female, May 27, 1930, Corvallis (H. A. Scullen). Male, July 3, 1926, Le Grande (E. W. Davis). UTAH: female, June 13, 1940, Mt. Timpanogos, alt. 6,800 ft. (C. L. Hayward). WASHINGTON: male and female, April 18, 1930, Clarkston (H. Woods), on tomato. Two females, July 9, 1937, Dayton (R. E. Miller). Five males and females, Nov. 21, 11 males and females, Dec. 11, 1925, Toppenish (E. W. Davis). Two males May 4, 1 male Aug. 29, 1 male Sept. 20, 1932, Yakima (A. R. Rolfs).

Cyrtopeltis bakeri Knight, new species

Distinguished from allied species by the black prothorax, short second antennal segment, and by the anteapical black spot on cuneus.

Female. Length 3.7 mm., width 1.2 mm. Head: width .57 mm., vertex .28 mm.; rather short, eyes large (width .22 mm., height .30 mm.), black, a triangular pale spot at top of eye on vertex. Rostrum, length 1.35 mm., extending to tips of middle coxae, pale, apex blackish. Antennae: segment I, length .25 mm., black, narrow apex pale; II, .69 mm., cylindrical, slightly more slender toward base, clothed with fine yellowish pubescence, pale yellowish, base blackish, apex fuscous; III, .68 mm., pale to dusky; IV, .38 mm., dusky. Pronotum: length .58 mm., width at base .95 mm.; black, basal margin broadly, concavely sinuate, lateral margins slightly sinuate, rounding over to the propleura; calli very slightly convex, margins not impressed, on a level with the broad basal half of disk; collar flat to slightly convex. Dorsum clothed with short, suberect, pale pubescence. Mesonotum moderately exposed, black, brownish at each side; scutellum moderately convex, black. Hemelytra subtranslucent in pale areas; clavus except basal angles, and inner apical area of corium uniformly dark fuscous; cuneus clear, apical half with a central, triangular black spot which leaves the apex broadly and narrow lateral margins clear. Membrane uniformly pale fuscous, basal half darker, a small clear spot by apex of cuneus. Thorax and venter black, legs yellowish, bases of coxae and tips of tarsi blackish; pubescence yellowish, tibial spines fuscous.

Male. Length 3.64 mm., width 1.04 mm. Head: width .56 mm., vertex .26 mm. Antennae: segment I, length .21 mm., fuscous, apical half paler; II, .69 mm., fuscous, becoming pale on apical half. Pronotum: length .54 mm., width at base .90 mm. Color and pubescence very similar to that of female. Genital segment twisted to the left side so that left genital clasper appears to arise on median ventral line of segment; left clasper sickle-shaped, the apex slightly broader and pointing to the left side; right clasper minute or absent.

Holotype: female, September 10, 1931, Sunrise, alt. 6,380 ft., Mt. Rainier, Washington (Wm. W. Baker); author's collection. *Allotype:* male, May 5, 1935, Alsea Mountain, Oregon. *Paratypes:* OREGON: male, April 21, 1935, Tidewater (Joe Schuh). WASHINGTON: female, July 9, 1930, "Wen. Mts."; female, Aug. 31, 1930, Yakima; female, Aug. 15, 1932, Tampico (A. R. Rolfs). BRITISH COLUMBIA: 2 males and 1 female, Aug. 9, 1905, Downie Creek, Selkirk Mts. (J. C. Bradley).

OBSERVATIONS ON THE SAND DUNE CHINCH BUG *BLISSUS MIXTUS* BARBER

(Lygaeidae Hemiptera)

BY BARBARA PRENDERGAST
California Academy of Sciences

According to early reports on the true chinch bug, *Blissus leucopterus* Say, this notorious insect occurred scantily in the Pacific States, although it has never been reported as destructive west of the Rocky Mountains. Webster ("The Chinch Bug," U.S.D.A. Cir. no. 113, 1909) reports the chinch bug from the coast and the central valleys of California, but no specimens from the Sacramento or San Joaquin valleys are available in western collections, and the experience of collectors would indicate that *Blissus* is limited to sand dune areas along the coast, at least in northern California.

In 1939, Barber clarified the taxonomic status of the various forms of *Blissus* occurring in the United States. He described the coastal California species as new (Proc. Ent. Soc. of Wash., v. 39, No. 4, 1937, p. 85), basing it upon a small series of brachypterous specimens only.

Blissus mixtus Barber appears to be very abundant in the sand dune areas along the Pacific Coast of the San Francisco peninsula. Colonies were observed at weekly intervals during a year's time. The host plant is *Ammophila arenarius* (determined by Alice Eastwood), a beach grass which grows abundantly in this vicinity. The grass was introduced by seed from Europe to prevent the sand from shifting.

The bugs are gregarious, occurring in large numbers on particular plants, and appearing to skip other clumps of the same grass entirely. They live near the roots and among the sheaths of the stems and seem to occur only on rather dry plants. It is difficult to distinguish the bugs from debris and sand, especially beneath the roots, since the adults are nearly identical in color with damp sand. In addition, they have a tendency to feign death when disturbed. It is only when they wriggle into activity that they may be readily detected and captured. During all seasons of the year bugs were found abundantly.

It was interesting to note the presence of first instar nymphs in the sand dunes early in January. Since the egg stage lasts

about a month under laboratory conditions, a field generation must begin about the first of December.

Several attempts to culture the species in the laboratory failed, although the technique described by Janes (Ann. Ent. Soc. of Amer., v. 28, No. 1, pp. 109-120) for the true chinch bug was followed. Colonies were established on the host plant but not on wheat and barley, although cultures were maintained on these plants long enough to indicate that the bugs are probably not of economic importance to them.

Couplating pairs were closely observed in vials. After an interval of one month, a single egg was laid in each case. After the lapse of another month, the eggs hatched. The first instar nymphs were pale pinkish, changing to red. With each successive moult the color became darker and more brownish, finally attaining the drab infuscation of the adult.

The most significant biological facts observed were: 1) that the ratio of brachypterous to macropterous forms was about equal; 2) that *Blissus mixtus* does not migrate, nor does it hibernate during the winter months; 3) that there are three generations each year in contrast to the two generations so typical of *Blissus leucopterus* Say.

In conclusion the writer suggests as a possible explanation for the absence of a migration and hibernation period in the life of *Blissus mixtus*, the ecological uniformity and an abundance of the host plant in the area in which this species occurs. In view of the fact that this period is not taken up by such a process, production of an additional generation is probably induced at this time.

TYPES OF APTEROUS ARADIDAE

Dr. Oscar Monte of the Instituto Biologico de Sao Paulo, Brazil, sent a valuable collection of Brazilian Aradidae for study with the understanding that the types of new species would be deposited in the collection of the Instituto Biologico.

In my recent paper on apterous Aradidae (Pan-Pac. Ent. 17: 169-181, 1941) the types of *Notoplocoris montei* and *Emydocoris testudinatus* were inadvertently given type numbers in the collection of the California Academy of Sciences. These types have now been returned to the Instituto Biologico de Sao Paulo.—R. L. USINGER.

BEROSUS EXILIS LECONTE A HEMIOSUS[1]
(Coleoptera, Hydrophilidae)

BY HUGH B. LEECH
Vernon, British Columbia

An examination of specimens of Le Conte's *Berosus exilis* shows that the species belongs in the genus *Hemiosus* Sharp, 1882 (Biol. Centr.-Americana, Coleopt., 1 (2):84-85). Sharp proposed *Hemiosus* for his *H. maculatus* from Guatemala, Panama and Mexico; since then at least four Brazilian species have been added to the genus. Several of the characters which Sharp relied upon to distinguish *Hemiosus* from *Berosus* are specific rather than generic, but differences in the forms of the mesosternal protuberance and the male genitalia are reliable.

In *Berosus* the mesosternal process varies in its degree of prominence, but is always thin and blade-like, usually falcate anteriorly (hooded in *B. rugulosus* Horn); the aedeagus and parameres are in great part sheathed in a large trough-shaped basal piece. In *Hemiosus* the mesosternal process broadens anteriorly from just in front of the mesocoxae, then narrows again to a blunt point, and this broadened area is deeply excavated; the aedeagus and parameres are only partially enclosed at the foot by a small basal piece.

The rare *Hemiosus exilis* (Leconte) 1852, is 2.5-3 mm. long, and has the pronotum largely metallic green, with the front and side margins broadly and the base narrowly, pale. These distinctive characters have confused it with a small *Berosus*, previously unrecorded from north of Mexico. The two may be separated as follows:

Mesosternal protuberance broadened anteriorly and deeply excavated; form oblong oval; elytra pale yellowish-white with indistinct brown maculations, punctures of intervals much smaller than those of striae; pronotum with large and small punctures intermixed; emargination of fifth abdominal sternite with a single tooth at middle.....*Hemiosus exilis* (Leconte)

Mesosternal protuberance thin, blade-like; form broadly oval; elytra yellowish-brown, each elytron with distinct black spots: one at humerus, one near suture just before middle and usually one just behind middle, and one laterally just behind middle; punctures of elytral intervals almost as large as those of striae; pronotum without small punctures between the large

[1] Contribution No. 2196, Division of Entomology, Science Service Department of Agriculture, Ottawa, Ontario.

ones; emargination of fifth sternite with two small teeth at middle.....*Berosus moerens* Sharp

The type locality of *H. exilis* (Leconte) 1852, is the Gila River at Pima, Arizona (see Leconte, 1855, Proc. Acad. Nat. Sci., Philadelphia, 7:366); my specimens are from Phoenix, Arizona, collected May 7, 1918, by J. Chester Bradley. *B. moerens* Sharp, 1882, was described as from Oaxaca, Mexico, and Guatemala; I have examples from 1 mile north of Ft. Davis, Davis Mountains, Texas, July 16, 1941 (B. E. White), and have seen one from the Huachuca Mountains, Arizona, July (D. K. Duncan). It also occurs in Lower California.

College Entomology

College Entomology. By E. O. Essig. The Macmillan Company, N. Y. vii + 900, 308 figures. 1942. Price $5.00.

College Entomology sets forth in Professor Essig's marvelously detailed style the fundamental features of insects. The opening chapters deal with the basic subjects, metamorphosis and anatomy. A tabular arrangement and a key to the orders of insects follow. These introduce the systematic section of the book, which consists of thirty-three chapters. These chapters vary in length with the size and importance of the various orders. Each order is treated according to a consistent plan including such noteworthy features as the etymology and priority of ordinal names and a tabular arrangement of ordinal characteristics. The latter are divided into columns on external and internal characters and further segregated into special features. Important families are characterized and outstanding species occurring throughout the world are mentioned. Synoptic keys are provided for superfamilies and families. Selected references are conveniently grouped at the end of each chapter and general references are placed at the end of the book.

A characteristic feature of any Essig book is the exhaustive index. A five-page "Index of Authors" and a sixty-three-page subject index, both arranged in three columns, carry on this feature and are models of clarity and detail. Here, as elsewhere, it is evident that author and publisher have cooperated closely in choice of type faces to differentiate names of genera, species, and higher groups. The frequent use of bold-face type is in keeping with the thoroughly modern format and gives a clear and pleasing appearance. One of the outstanding features of the book is the series of entirely original anatomical illustrations. These, as a group, are without equal in any other text book of general entomology known to me.

College Entomology has already taken its place as a refreshingly modern manual for the study of insects and as another of the fine contributions of E. O. Essig to Entomology.—R. L. USINGER.

STUDIES IN THE CANTHARIDAE
(Coleoptera)

BY KENNETH FENDER
McMinnville, Oregon

In the course of revisional studies of the genera of the Cantharidae, exclusive of the genus *Cantharis*, a number of new species have come into my possession, a few of which are herein described. It is hoped that these studies, along with those of Mrs. Dorothy Fender and Mr. J. W. Green[1] in the genus *Cantharis*, will give a better understanding of this neglected group. To facilitate comparisons with previous descriptions, I have tried to follow the style and terminology of previous students of the family.

Chauliognathus texanus Fender, new species

Yellow: tibiae, tarsi, apical fourth to half of femora and apical third of elytra black; tibiae sometimes yellowish. Antennae piceous to yellowish, basal segment piceous in all specimens examined; third segment a little shorter than the fourth; the apex of each segment with a ring of long fine hairs, setaceous in *profundus*; scattered long hairs on the body of each segment. Head elongate oval, shining, finely punctured and sparsely pubescent. Thorax opaque, wider than head; nearly as long as wide in the male; wider in the female; sides evenly arcuate and shallowly reflexed; disc usually with an elongate black spot on each side, sometimes absent. Elytra slightly wider than thorax, parallel, moderately punctate and sparsely pubescent. Terminal segments of abdomen pale, with black markings in *profundus* and *ineptus*. Length, 13 to 17 mm.

Holotype, male, DAVIS MOUNTAINS, TEXAS, August 2, 1937; allotype, female, CHISOS MOUNTAINS, TEXAS, July 9, 1936; three paratypes, same data as allotype; three other paratypes from DAVIS MOUNTAINS, TEXAS, July 2, 1940; three paratypes from CHISOS MOUNTAINS, TEXAS, June 9, 1939. All these specimens were collected by D. J. and J. N. Knull. With these I associate six specimens from the Leng Collection, no data. The types will be deposited in the United States National Museum. Paratypes are in the following collections: California Academy of Sciences (2); M. C. Z. (1); Knull (3); author's collection (3).

[1] Green, J. W., Ent. Am. vol. XX (new series), no. 4, pp. 159-217, 1941.

This species is near *Ch. profundus* Lec. and *Ch. ineptus* Horn and is probably placed in some collections as *profundus*. It can be easily separated from either of these species by the following key:

Species with apical third of elytra black; third antennal segment equal or nearly equal to fourth. (*profundus* group.)
A. Head black.....*ineptus* Horn
AA. Head pale.
B. Larger, 17 to 22 mm.; reddish orange, basal third or less of femora pale; long hairs at apex of antennal segments setaceous .....*profundus* Lec.
BB. Smaller, 13 to 17 mm.; yellowish, basal half or more of femora pale; long hairs at apex of antennal segments fine and silky.....*texanus*, n. sp.

Podabrus cascadensis Fender, new species

Black; head in front of eyes and sides of prothorax rufotestaceous. Head shining; feebly sparsely punctate in front, coarsely punctate behind; slightly wider than the thorax. Eyes small and inconspicuous. Antennae piceous with the exception of the basal segment which is paler; long, reaching to the apical third of the elytra in the male, slightly shorter in the female. Prothorax shining, finely sparsely punctate, more noticeably so just to the rear of the convexities; subrectangular, anterior angles rounded, sides arcuate to hind angles which are prominent; median line slightly impressed, not eroded. Elytra shallowly rugulose basally becoming more deeply so apically; pubescence pale cinereous. Front tibiae curved and apically dilated in male, simple in female. Posterior coxae of male with an apical process of yellowish hairs. Tarsal claws armed with a long acute tooth causing them to appear broadly cleft. Length, 11 to 12 mm.

Holotype, male, allotype, female, and one paratype, July 1, 1941, CLACKAMAS LAKE, OREGON; two paratypes, CLEAR LAKE, ORE., same date; one paratype, HOOD RIVER MEADOWS, ORE., same date. Holotype and allotype in California Academy of Sciences, paratypes in author's collection.

The ungual characters place this species in Mr. Fall's[2] first group. The small, not prominent eyes would place it with *P. latimanus* (Mots.) and *P. ambiguus* Fall. It can be separated from *latimanus* by the formation of the front tibiae, dilated inwardly into a thin plate in *latimanus*, apically dilated in *cascadensis*; from *ambiguus* by its color, ground color yellow in

[2] H. C. Fall, Ent. Am. Vol. VIII (new series), No. 2, pp. 65-103, 1928.

amgibuus, black in *cascadensis*. In reality *cascadensis* is much nearer *P. frater* Lec. and should follow that species in arrangement. In *frater* the eyes are large and prominent; the clypeus is pale basally and dark brunneous apically; the median line of the prothorax is deeply impressed and the elytral costae are prominent. In comparison, *cascadensis* has small, not prominent eyes, the clypeus pale, the median line of the prothorax shallowly impressed and the elytral costae feeble.

Podabrus brunneus Fender, new species

Brunneous; head, basal two segments of maxillary palpi, under side of basal two segments of antennae and basal half of femora rufo-brunneous; prothorax rufo-brunneous with a large hexagonal discal spot which is piceous. Head shining; finely, sparsely punctate in front of antennae; coarsely, closely punctate behind; as wide as thorax in the male, narrower than the thorax in the female. Antennae narrowly annulated, moderately stout; intermediate segments three times as long as wide; second segment four-fifths as long as third. Prothorax shining; finely, sparsely punctate, coarsely so anteriorly; front angles rounded, sides evenly arcuate to hind angles which are feebly prominent; median line shallow, not eroded, extending only for the length of the convexities. Elytra feebly rugose basally, becoming more evidently rugose apically; each with two evident costae. Anterior tibiae feebly bent and dilated apically. Hind coxae with an apical process of long hairs. Tarsal claws armed with a long acute tooth. Length: male, 15 mm.; female, 16 mm.

Holotype, male, and allotype, female, July 20, 1937, collected by D. J. and J. N. Knull in the HUACHUCA MOUNTAINS, ARIZONA. Holotype temporarily in the author's collection, allotype in the Knull Collection.

This fine species would run, in Fall's key, to *P. diadema* Fab. in the first group; claws with acute tooth causing them to appear broadly cleft. The protibiae of the males are too feebly bent and apically dilated to be placed in that division occupied by *rugulosus* Lec., *frater* Lec., etc. *Brunneus* can easily be separated from *diadema* by its large size and color; *diadema*, ground color black, length 9 to 10 mm.

Podabrus danielsi Fender, new species

Black, luster dull; head in front of eyes, basal three segments of antennae and sides of prothorax pale; apices of coxae, bases of trochanters, bases and apices of femora and tibiae narrowly pale. Head finely punctate in front; scabrose punctate behind. Anten-

nae stout, second segment one-third longer than wide, three-fourths as long as third; intermediate joints two and a half times as long as wide. Thorax two-thirds as long as wide; slightly narrower than head in male, as wide as head in female; front angles obliquely subtruncate; sides a little sinuate and convergent to hind angles which are prominent; surface finely, closely punctate, becoming nearly rugose punctate anteriorly; convexities less closely punctate; median impressed line deep and eroded. Elytra finely, closely rugose basally, becoming more noticeably so apically; pubescense pale cinereous. Claws of male cleft in front feet; anterior claws of middle and hind feet each with a short acute tooth; posterior claws of middle and hind feet cleft. Each of the claws of the female with a short acute tooth. Length, 6.5 to 7 mm.

Holotype, male, allotype, female, and three paratypes, July 18, 1941, BREITENBUSH LAKE, MT. HOOD NAT. FOREST, OREGON, collected by H. and F. Daniels for whom it is named. Holotype and allotype in California Academy of Sciences; one paratype in the Daniels Collection; two paratypes in the author's collection.

Danielsi is unique in the ungual characters of the males. It is similar in shape and coloration to *P. lateralis* Lec. and appears to be near this species. It can at once be separated from any other known species by the formation of the claws of the male. Mr. Fall, in his key, separated the species into seven major groups which are distinguished by the form of the tarsal claws. This species adds another group to those known to Mr. Fall.

Malthodes oregonus Fender, new species

Male. Head black, wider than thorax; labrum, mandibles and first two antennal segments pale testaceous, rest of antennae piceous, as long as the body; segments two and three of equal length. Thorax pale testaceous with a fuscous discal spot which is sometimes divided by the shallow median excavation; rather coarsely punctate; lateral margin sinuate, anterior angles deflexed. Elytra brunneo-piceous, paler at tips. Protibiae and apex of profemora pale; apex of femora and basal half of tibiae of middle and hind legs pale. Length, 3 to 3.5 mm.

Male genital characters as viewed ventrally: sixth ventral deeply emarginate, emargination not truncate at the bottom; seventh ventral deeply notched, forks diverging at basal half of furcation, becoming nearly parallel at tips (fig. 2); seventh ventral sinuate in profile, the upper surface leveling off to form a narrow triangle; last dorsal produced, arched over last ventral, broadened and truncate at tip, strongly carinate ventrally (fig. 1).

Female. Coloration as in male; thorax wider than head; antennae a little over one-half the length of the body. Length, 3 to 4 mm.

Holotype, male, allotype, female, and 69 paratypes, DAYTON, OREGON, May 16, 1940, D. M. and K. M. Fender; eleven other paratypes have been taken by us at McMINNVILLE, AMITY, BOYER and SAND LAKE, ORE., on dates ranging from April 7, to June 13. Holotype, allotype and two paratypes in the California Academy of Sciences. Paratypes as follows: U. S. N. M. (2); M. C. Z. (2); Green (4); Frost (2); Oregon State College (2); Knull (2); Malkin (2); the rest temporarily in the author's collection.

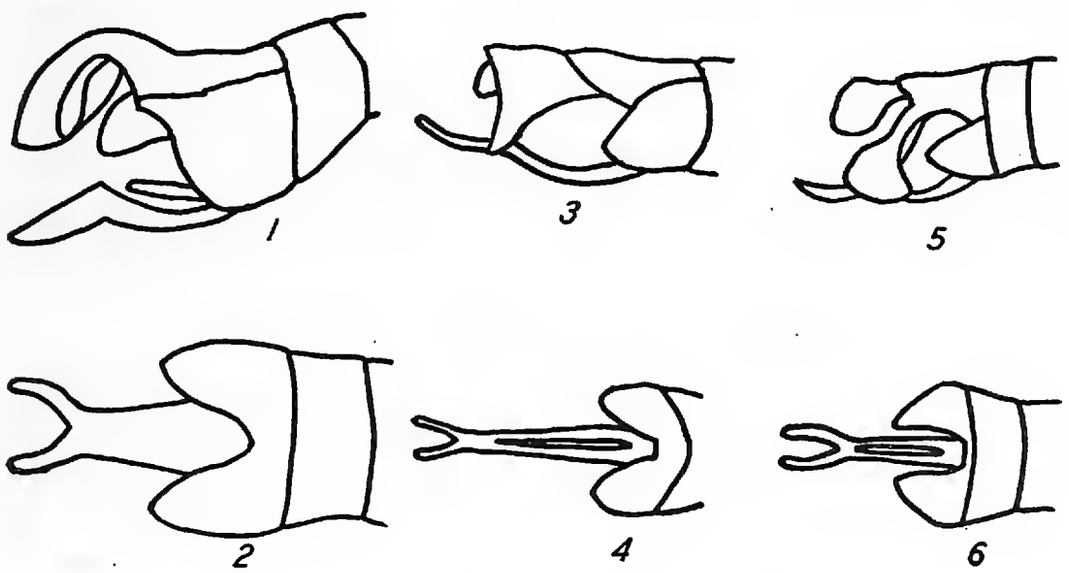

Fig. 1. Lateral view of terminal abdominal segments of *Malthodes oregonus*, n. sp. Fig. 2. Ventral view of terminal ventral abdominal segments of *M. oregonus*, n. sp. Figs. 3 and 4. Same of *Malthodes humidus*, n. sp. Figs. 5 and 6. Same of *Malthodes frosti*, n. sp.

This species is near *M. obductus* Fall but can be separated from that species by its larger size, sinuate thoracic margin and more divergent forks of the male seventh ventral.

Malthodes frosti Fender, new species

Male. Head black, antennae entirely piceous, as long as body; second and third antennal segments about the same length, fourth a little longer, intermediate segments four times as long as wide. Thorax brunneous to rufo-testaceous, transverse, narrower than head; lateral margins sinuate, quite widely margined. Elytra piceous, reaching to apical half of abdomen. Length, 3 to 3.5 mm.

Male genital characters as viewed ventrally: sixth ventral narrowly deeply emarginate, emargination truncate at bottom; seventh ventral elongate, deeply, broadly divided (fig. 6); seventh ventral strongly sinuate in profile; sides of last dorsal projecting downward, thence backward and expanded into large ovate

lateral processes enclosing the last ventral; terminus of last dorsal with a short, narrow median keel projecting downward (fig. 5).

Female. Coloration as in male; thorax wider than head, lateral margins divergent from basal angles for three-fourths of their length, then strongly convergent to the anterior angles. Antennae about one-half the length of the body. Length, 3.5 mm.

Holotype, male, allotype, female, and 21 paratypes, BEAR SPRINGS, WAPINITIA CUTOFF, OREGON, June 6, 1939; eight paratypes, ELK LAKE, ORE., July 9, 1939; two paratypes, MCMINNVILLE, ORE., May 23, 1938, and one paratype, MCMINNVILLE, ORE., July 30, 1939; all collected by D. M. and K. M. Fender. Holotype and allotype in the California Academy of Sciences. Paratypes as follows: U. S. N. M. (2); M. C. Z. (2); Green (2); Frost (2); Malkin (2); the rest in the author's collection.

Malthodes humidus Fender, new species

Color piceous, seventh ventral and sixth dorsal abdominal segments pale. Eyes large; antennae as long as body in male, shorter in female; second antennal joint slightly shorter than third, third slightly shorter than fourth, rest of segments nearly equal in length. Thorax narrower than head in male, wider than head in female; lateral margins convergent from the anterior angles, slightly sinuate in female; lateral margins convergent from the anterior angles, slightly sinuate, anterior angles deflexed. Length, 3 to 3.5 mm.

Male genital characters as follows: sixth ventral narrowly deeply emarginate, emargination faintly truncate at the bottom; seventh ventral slender, elongate, deeply, broadly divided at apex (fig. 4). In profile: seventh ventral sinuate; sides of sixth dorsal curved down and back into finger-like processes; terminus of sixth dorsal with a ventrally and posteriorly directed median lobe (fig. 3).

Holotype, male, allotype, female, and 14 paratypes, BOYER, OREGON, May 28, 1940. The following paratypes all were taken by Professor James A. Macnab at BOYER, ORE., (2) July 19, 1938, (1) July 23, 1934, (1) July 14, 1935, (1) June 28, 1936, and (1) July 23, 1937.

Variation: In some specimens there is a rufo-testaceous spot on each side of the thoracic disc; others have a noticeable tubercle on each side of the disc.

This species keys out to *M. tularensis* Fall but can be distinguished from that species by its piceous color; third anten-

nal segment noticeably longer than second and the produced downcurved side pieces of the sixth dorsal of the male. In *tularensis* the thorax is yellowish, the third antennal segment is scarcely longer than the second and the sixth dorsal is not produced.

Malthodes frosti and *M. humidus* both run to the last couplet in Mr. Fall's study[3]. In this subhead Mr. Fall had already placed *M. tularensis* and *M. visceratus* Fall. A revision of this couplet might be appropriate to include the new species mentioned above.

Emargination of the sixth ventral truncate at bottom.

A. Seventh ventral sinuate in profile, less widely and deeply forked.
  B. Last dorsal not produced.....*tularensis* Fall
  BB. Last dorsal produced, side pieces projecting downwards.
  C. Last dorsal side pieces projecting downwards, forming fingerlike processes.....*humidus*, n. p.
  CC. Last dorsal side pieces projecting downwards and expanding into large ovate lateral processes.....*frosti*, n. p.
AA. Seventh ventral apically bent, more widely and deeply forked .....*visceratus* Fall

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INSECT ENEMIES OF THE SCARABAEID *POLYPHYLLA CRINITA* LEC.

(Coleoptera: Scarabaeidae)

BY ROBERT Y. PRATT
Coupeville, Washington

In western Washington the Scarabaeid June beetle, *Polyphylla crinita* Lec.[1], emerges from its pupal cell in the ground from about the first half of July into August. On Whidbey Island, State of Washington, the larvae of this beetle are present in great numbers in well-drained medium and lighter sandy soils; locally causing damage in commercial strawberry fields and Dutch iris bulb plantings.

While collecting specimens of *Polyphylla crinita* on Whidbey Island July 11, 1939, I saw one of these beetles flying pursued by two robber flies, *Stenopogon inquinatus* Loew. One of these

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[3] H. C. Fall, Ann. Ent. Soc. Am. Vol. XII, No. 1, pp. 31-42, 1919.

[1] According to Essig, on Vancouver Island, British Columbia, and along the Pacific Coast the species of *Polyphylla* is *P. crinita* Lec. See reference, E. O. Essig, Insects of Western North America, The Macmillan Company, p. 443. 1934.

struck the beetle while flying, causing it to fall to the ground, with the robber fly still attached.

The robber fly had bitten into the *Polyphylla crinita* in the V at the base of the elytra just below the pronotum, and sucked the body juices of the beetle for a total period of sixty-five minutes. It shifted position from time to time, but kept its mouth parts in the beetle.

The beetle apparently died some time before the robber fly finished, for it gradually weakened and became entirely motionless some time before the fly flew away. The robber fly was noticeably distended at the time it finished.

Since then I have noticed a distended robber fly resting on a grass stem above a dead *Polyphylla crinita* adult, and am convinced that the robber fly *Stenopogon inquinatus* Loew. is a regular predator on this species.

I have received an authentic record of several of the Carabid beetle, *Carabus* (*Archicarabus*) *taedatus* Fab., attacking and eating a *Polyphylla crinita* larva; while all were confined. This occurred in 1939 on Whidbey Island. The specimens, over seven *Carabus taedatus* and two *Calosoma tepidum* Lec., were confined in a small glass jar of about one pint capacity, with a small amount of earth in the bottom. When the large *Polyphylla crinita* larva was placed in the jar it was attacked and eaten by three or more beetles, while others ran around the jar, taking no interest in the larva. There is a chance that the *Calosoma tepidum* also attacked the larva, but one or more of the *Carabus taedatus* definitely did. This is the *Carabus* (*Archicarabus*) *taedatus* Fab. described from the State of Washington as the subspecies *vancouvericus* Csiki or *bicolor* Walker[2], but this species is actually identical with the typical form *Carabus* (*Archicarabus*) *taedatus* Fab. and is not a subspecies.[3]

Although neither the robber fly *Stenopogon inquinatus* Loew. nor the beetle *Carabus taedatus* Fab. are present, on Whidbey Island at least, in sufficient numbers to control *Polyphylla crinita*, I have presented this information in the hope that it may add to the knowledge of these species and that it may encourage research on whatever natural enemies of *Polyphylla crinita* exist.

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[2] Leng, Charles W., Catalogue of North American Coleoptera, p. 44, 1920. Also Ibidem, Second and Third Supplements, p. 10, section under *Carabus*, 1933.

[3] Pratt, Robert Y., *Carabus taedatus* Fabr. and its subspecies *vancouvericus* Csiki or *bicolor* Walker are identical. Pan-Pac. Ent., 16:95, April, 1940.

A NEW SPECIES OF METAPHYCUS PARASITIC ON PSYLLIDS[1]

BY HAROLD COMPERE[2]

University of California Citrus Experiment Station, Riverside, California

Metaphycus psyllidis, described below, is an encyrtid of more than ordinary interest because it parasitizes the nymphs of the tomato psyllid, *Paratrioza cockerelli* (Sulc.). All other species of *Metaphycus* have been reared from coccids, and for this reason it has been generally assumed that all the species of the genus were coccid-inhabiting parasites. The psyllid-inhabiting species was discovered by Kenneth Sloop, Deputy Agricultural Commissioner of Orange County, California, who noticed adult *Metaphycus* on the leaves and stems of plants of chili pepper (*Capsicum* sp.) in a field near Anaheim. Sloop's interest in this parasite was aroused because of its resemblance to *Metaphycus helvolus* (Comp.), a species recently introduced into Orange County for the control of the black scale, *Saissetia oleae* (Bern.).

Sloop submitted specimens of the parasite to the Citrus Experiment Station for identification, stating that the adult parasites were abundant on pepper plants and that he was unable to find coccids on these plants. On November 7, 1940, Sloop, S. E. Flanders, and the writer began a search for the insect in which the parasites were breeding. The pepper plants were found to be free from coccids but they were lightly infested with the psyllid *Paratrioza cockerelli.* A few of the psyllid nymphs were inhabited by the larvae and pupae of a parasite; others were empty shells containing parasite remains and having exit holes from which the parasites had emerged. The psyllid nymphs containing live pupae and larvae were isolated in a vial, and from these the parasites were reared. The parasites reared from the psyllids are indistinguishable from those captured as adults in the field.

In Timberlake's key to the species, *Metaphycus psyllidis* runs best to *M. flavus* (How.). It is not in entire agreement with

[1] Paper No. 480, University of California Citrus Experiment Station, Riverside, California.

[2] Associate in the Experiment Station.

Timberlake's redescription of *M. flavus*, however, and is clearly different from the Peruvian and Sicilian specimens which Timberlake identified as *M. flavus* when he redescribed the species.

Metaphycus psyllidis belongs to a group of species in which both the maxillary and the labial palpi are clearly three-segmented. This character readily separates it from the great majority of the described species. Only one species in which the maxillary and labial palpi are three-segmented was known to Mercet, namely, *M. insidiosus* (Mercet), and this he considered an anomalous species. Recently the writer described six African species having three-segmented maxillary and labial palpi. The psyllid-inhabiting species from California is different from any of these.

Metaphycus psyllidis Compere, new species

Female. General color lemon yellow; the mesoscutum, axillae, and scutellum slightly orange; body with black or brown markings as follows: center of pronotum and a faint dot on either corner of the collar, apex of postnotal wing process and parts of axillary sclerites, propodeum faintly on posterior aspect mesad of spiracles, fifth and sixth tergites faintly. Antennae yellowish white, with the basal half of club, first three or four funicle joints, base of pedicel, and a longitudinal blotch on outer aspect of scape, black or brown. Distal segments of the tarsi faintly dusky. Fore wings hyaline, uniformly ciliated; speculum interrupted below by two rows of hairs.

Frontovertex one and one-half times as long as wide. Ocelli in an equilateral triangle, or nearly so; posterior ocelli about once their own diameter from the orbits and occipital margin. Scape four and one-half times as long as wide, widest near the middle. Pedicel twice as long as wide and almost as long as the first three funical joints united. First funicle joint slightly wider than long; the second subequal to the first, those that follow plainly increasing in size; the sixth one and one-half times as wide as long. Club two and one-half times as long as wide, about one and one-third times as wide as the sixth funicle joint. Abdomen slightly shorter than the thorax. Ovipositor not exserted beyond apex of abdomen.

Length, 1.1 mm.

Male. Structurally the males closely resemble the females, but in color they have more extensive black or brown markings. Apparently the coloration is quite variable, for the tag-mounted male has the dorsum of the thorax extensively brown to blackish, in contrast to the two slide-mounted specimens, which have the dorsum of the thorax extensively orange yellow with limited, sharply contrasting black markings. In detail, the two slide-

mounted males are marked with black of varying intensities, as follows: occiput at sides of foramen; concealed part of pronotum and a dot on either corner of collar; anterior concealed margin of mesoscutum; scuto-axillary sutures and vertical margins of axillae and scutellum; apical half of tegulae, knob of second axillary sclerite, and apex of postnotal wing process; metanotum and propodeum mesad of spircales; dorsum of abdomen, except widely around margins. Tarsi of fore legs and apical tarsi of middle and hind legs slightly dusky. Color of antennae is similar to that of females.

In the tag-mounted specimen the head has collapsed, and in the balsam-mounted specimens the heads are turned so that the exact proportions of the head cannot be obtained. So far as can be seen, the proportions and positions of the ocelli seem to be similar to those of the female.

Length, 1.0 mm.

Described from five females and three males, holotype, allotype, and paratypes. Of these specimens, two females and one male are on points; one female is cleared, stained, and mounted in balsam on one slide; two females and two males are mounted in balsam under one cover slip, the female and male in the middle position being designated as the holotype and allotype, respectively. The tag-mounted paratypes and the stained balsam-mounted paratype were reared from psyllid nymphs isolated in a vial; the other specimens were collected on the leaves or stems of the infested plants in Orange County, California, November 7, 1940. The types of the new species are to be deposited in the United States National Museum, Washington, D. C.

PETUNIA, AN IMPORTANT WINTER HOST OF THE TOMATO MITE

The tomato mite, *Phyllocoptes destructor* Keifer, a very destructive pest of tomatoes, has been observed over-wintering in large numbers on petunia. Heavy infestations were observed in the vicinity of Woodland, California, on April 29, 1943. In some areas the population was so great that the base of the stems and lower leaves of the plants had a characteristic bronzy appearance resulting from the feeding of the mite. This observation indicates that petunia plantings may furnish an important source of mites for infesting tomatoes both in the beds and in the fields.—A. E. MICHELBACHER.

SOME NEW RECORDS OF OREGON CHRYSOMELIDAE

A recent examination of the collections of Oregon State College in Corvallis, Ore., and of the Forest Insect Station in Portland has revealed several species of *Chrysomelidae* not listed by Dr. Hatch in his catalogue[1] of beetles of this family from Oregon. A few species have also been added from author's own collection bringing the total of the new additions to ten, the list of which is as follows:

15287. *Saxinis saucia* Lec. June 15, 1915, "On flowers of Erigonum. (Port. Ins. Sta.)

15626. *Paria canella* Eab. Freewater October 8, 1914 (O.S.C.)

15626.d. *P. canella quadriguttata* Lec. Same data.

15633.a. *Timarcha cerdo* Stal. Dallas, June 7, 1932. "Feeding on beans." (O.S.C.)

15643. *Leptinotarsa lineolata* Stal. Ontario, July 20. (O.S.C.)

15703. *Gastroidea cyanea* Melsh. Talent, April 1, 1931. L. G. Gentner det. (O.S.C.)

15752.a. *Galerucella tuberculata punctipennis* (Mann.) Eugene, September 5 and 27, 1941; August 7, 1941; April 18, 1942; Spencer's Butte, October 12, 1941; Scott Lake, August 17, 1941. all Malkin.)

15753. *G. decora* (Say). Rickreall, September 5, 1905. (O.S.C.)

15754. *G. xanthomelea* (Schrnk). Grants Pass, May 26, 1935, Portland, September, 1934 (Port. Ins. Sta.); Eugene, August 22, 1941; June 10, 12, 1942, det. by B. E. White (Malkin).

—. *Monoxia guttulata* Lec. Klamath Falls, July 30, 1914.

21318. *Longitarsus waterhousei* Kutch. Albany, August 10, 1936, L. G. Gentner det. (O.S.C.) —BORYS MALKIN.

A NEW NAME FOR A NEW ZEALAND ARADID

Chinamyersia Usinger, n. n. for *Pseudaradus* Myers and China, 1928, Ann. Mag. Nat. Hist. (10) 1:388, not *Pseudaradus* Burmeister, 1834, Revue Entom. 2(1):19. This homonymy was called to the attention of Mr. W. E. China who suggested (*in litt.*) that I rename his genus. I take pleasure in naming it in honor of W. E. China and J. G. Myers, both of whom have contributed greatly to our knowledge of New Zealand Hemiptera.—R. L. USINGER.

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[1] Hatch, M. H. "A preliminary catalogue of the Chrysomelidae of Oregon." Pan-Pac. Ent., Vol. VIII, No. 3, pp. 102-108, 1932.

OBSERVATIONS ON SOME COLEOPTERA FROM THE VICINITY OF MT. LASSEN, CALIFORNIA

BY E. G. LINSLEY AND C. D. MICHENER
University of California

The following observations and records were made in the Mt. Lassen area of northern California between May 19 and June 22, 1941.

Carabidae

Pterosticus ater Le Conte. On three different occasions adults of this species attacked and fed upon workers of *Zootermopsis nevadensis* (Hagen), in logs or stumps of western yellow pine (*Pinus ponderosa*), immediately after exposure during collecting.

Hydrophilidae

Cymbiodyta imbellis Le Conte. The spring dispersal flight of this hydrophilid in the vicinity of Manzanita Lake, Lassen Volcanic National Park, took place on May 21, coinciding with flights of *Dendroctonus valens* Lec., *Hylastes nigrinus* Lec., and *Spondylis upiformis* Mann. The flight began at 6:50 p.m. and lasted until 7:10 p.m. The evening was warm and clear. During this period the beetles swarmed by the thousands around dark-colored automobiles in a manner suggestive of swarming bees. Light-colored automobiles were ignored, as were tents and white sheets which attracted *Dendroctonus* and *Hylastes* in large numbers. That the flight was widespread was indicated by the fact that it was simultaneously observed at a point about three-quarters of a mile away.

Dytiscidae

Agabus lutosus Le Conte. A few individuals of this species were noted in the swarms of hydrophilids recorded above. On the following night (May 22) there was a slightly larger flight but the *Agabus* were never comparable in numbers to the hydrophilid. By means of these flights, several temporary ponds formed by melting snow, became densely populated with water beetles. In these ponds the *Agabus* fed mostly on bibionid flies which fell upon the surface. When disturbed they grasped the

flies and carried them to the bottom of the pool. Several individuals were observed to feed simultaneously on a single fly.

STAPHYLINIDAE

Xenodusa montana Casey. This myrmicophile was found under bark of western yellow pine (*Pinus ponderosa*) in nests of the ant, *Lasius niger* subsp. *neoniger* Emery.

LYCIDAE

Plateros californicus Van Dyke. This species appears to be gregarious or semi-gregarious. Penultimate and ultimate stage larvae as well as pupae were found grouped together under bark of western yellow pine stumps near Viola, Shasta County, and Old Station, Shasta County, on various dates in June.

MELOIDAE

Meloe opacus Le Conte. The primary larva of this species may be briefly characterized as follows: Length 1¾ to 2 mm. Color pale brown; head broadly rounded, second segment of antennae about three times apical width, third segment arising from middle, ocelli visible dorsally, mesad of lateral margin of head, postero-lateral setae absent; pronotum about equally wide at base and apex, thoracic terga devoid of long setae; femora very robust; abdominal terga without long, dorsal setae, ninth tergum with a pair of median terminal setae as long as abdomen, lateral terminal setae as long as width of ninth tergum; sterna two to eight with a transverse row of six setae, the most lateral seta on each side longer, coarser, ventral extensions of terga with a long coarse seta on each side placed in line with the sternal setae.

Twenty-nine primary larvae were found on twenty-two specimens of *Andrena* representing three species. In all cases the larvae were attached to the hairs of the sides of the propodeum and in only one case were they found on a male bee. The latter was a male of *Andrena complexa* Viereck in an area where the females had not yet emerged. The larvae were taken as follows: one each on five females of *Andrena caeruleonitens* Ckll. collecting pollen from *Taraxacum vulgare* at Viola, Shasta County, California, on May 19, 1941, and one each on five females of the same species four miles west of Viola on May 20, 1941; one each on two females of *Andrena* sp. (near *ribifloris* V. & C.),

collecting pollen from *Ribes inerme* at Viola, May 19, 1941 (only 100 feet from the patch of *Taraxacum* visited by infested *Andrena caeruleonitens*) four (three on one bee) found on two females of *Andrena complexa* Vier. collecting pollen from *Ranunculus californicus*, four miles west of Viola, May 20, 1941; twelve (two on one bee, five on another) taken from eight females of *complexa*, two miles west of Viola, May 20, 1941; and one from a male of the same species at Big Spring, Shasta County, May 23, 1911. In each of the above localities the same flowers were visited by numerous other bees, flies, etc., but no other insects were found bearing primary larvae of *Meloe opacus*. Males of *Andrena* were also abundant, but except for the single specimen from Big Spring, no *Meloe* larvae were found on them.

Like many other species of *Meloe* the adults of *opacus* have an early season. Two stragglers were found on May 20, a female, two miles west of Viola, about 500 yards from the area where infested specimens of *Andrena complexa* were collecting pollen, and a male, four miles west of Viola at a point about 300 yards from flowers visited by infested bees. The female was gravid but apparently did not still have her full complement of eggs. The eggs which she contained were of large size and for this reason, in addition to those given above, we have associated these larvae (rather than either of the following small species) with *M. opacus*.

Meloe sp. a. Six primary larvae which appear to belong to the genus *Meloe* were taken on a female of *Andrena* sp. (near *monogonoparia* Vier.) nesting in a roadway in a Manzanita chute at Manzanita Lake, Lassen Volcanic National Park, May 25, 1941. The female was loaded with pollen from *Arctostaphylos* sp. and the meloid larvae were clustered on the propodeum. The larvae were about the same color as those of *opacus* but smaller (length 1 mm.) with the second antennal segment only about twice as long as its apical width, the third segment arising at one side of the apex of the second, and the pronotum widest at the apex. Also, there are two or more additional pairs of setae on the ventral extensions of the abdominal terga, the median apical setae of the ninth segment are perceptibly shorter than the abdomen, and the lateral terminal setae only two-thirds as long as the width of the ninth tergum.

Meloe sp. b. Primary larvae of a third species were swept in large numbers from flowers of *Ranunculus californicus* at

Shingletown, Shasta County, California, on June 2, 1941. These are similar in size (length 1 mm.) to sp. a, but are more slender, black instead of pale brown, and have the two median terminal abdominal setae distinctly shorter than the abdomen and the lateral terminal setae only about one-third as long as the width of the ninth tergum. Although the flowers were being visited by large numbers of bees (mostly *Andrena complexa* Viereck, but also *Panurginus, Halictus,* etc.) several hundred samples were examined without finding any that were bearing primary larvae.

On June 18, the locality was again visited. The larvae found were even more abundant but still none were taken from bees. In two small areas of ground about eight inches in diameter dense concentrations of larvae were found with from ten to twenty-five individuals lying among the stamens of each flower. Only open flowers were occupied although unopened buds were frequently higher on the plant. Occasional individuals were also found scattered through the field, always lying on the filament of the stamen facing the anther. The clustering of individuals in certain areas suggests that the females may have placed their eggs in the ground and the hatching larvae crawled up the plants. In the two areas mentioned the ground at the base of the plants was nearly saturated with moisture probably precluding its use as a nesting site for bees. Higher, more suitable ground, however, was within easy crawling distance for adult *Meloe*.

On June 21, 1941, a last visit was made to the locality. Primary larvae were still abundant but none were found on bees. When larvae were placed in contact with a specimen of *Andrena complexa* they made no attempt to take hold of the hair or climb on to the body. Apparently, if this species is actually a bee parasite, as its presence in flowers suggests, its host was not represented in the bees present through June 21st.

PYROCHROIDAE

Ischalia californica Van Dyke. This recently described species was taken under bark of Douglas fir (*Pseudotsuga taxifolia*) near Manzanita Lake, Lassen Volcanic National Park.

BUPRESTIDAE

Acmaeodera variegata Le Conte and *A. purshiae* Fisher. These two Great Basin species were taken at Hat Creek, Shasta County, California, on June 1, 1941. The former was collected on various

flowers, the latter beaten by A. Walz from *Purshia*. *A. variagata* is widely distributed in the intermountain region and apparently extends into California only as far as Trinity County in the northern part of the State.

PTINIDAE

Ptinus californicus Pic. An adult of this species was taken from a cell series of *Osmia lignaria* (Say) in an old abandoned burrow of a cerambycid in a log of western yellow pine (*Pinus ponderosa*) near Manzanita Lake, Lassen Volcanic National Park.

SCARABAEIDAE

Odonteus obesus Le Conte. Several hundred pupae and a few larvae of this species were excavated from the sandy soil of an old road bed in the midst of a manzanita chute on June 6. One adult female was found at this time. The pupal cells averaged 8x7x15 mm. and were found at a depth of from 3 to 6 inches below the surface.

Valgus californicus Horn. Adults of *V. californicus* were found in several localities in Shasta County in the nests of *Zootermopsis nevadensis* (Hagen).

ATLAS OF SCALE INSECTS

Atlas of the Scale Insects of North America. By G. F. Ferris. Stanford Univeristy Press. Photolith. 8½x11 inches. SI-1 to SIV-448, 1937-1942. Price, unbound, Ser. I, $6.75; II, $7.75; III, $6.75; IV, $5.75. Bound volumes $1.00 extra. Separate folders, $0.06.

This is, in effect a monograph of the Diaspidid scale insects of North and Central America and the West Indies. Considering the importance of this group of insects as pests of agricultural crops and considering the masterful and comprehensive treatment, it is the most important monograph on North American insects to appear in recent years.

Illustrations are given for 345 of the 350 described species of Diaspididae of North America with 28 genera, 2 new names for old genera, and 118 new species. It is estimated that this represents only one-third of the actual number of species occurring in the area. At the rate of one plate per day, a pace that no other entomological artist of my acquaintance could maintain, this represents an epic in original monographic work.

The format has been variously received by a critical public. Each species account is treated as a distinct four-page unit or separate publication, complete with title page, scientific name, synonyms, hosts and distribution, habit, recognition characters, and notes. All essential characters are illustrated according to a standard system, the separate figures being strictly comparable throughout. Absence of literature citations to genera, species and their synonyms is the only shortcoming. Repetition of title page, the numerous blank pages, and the arrangement into four series with separate dates of publication and, in some cases separate binding, are not serious objections and were inherent in the nobly conceived original plan. Specialists in the scale insects will carry out the original plan, binding the separate folios in systematic order, although no such final arrangement has been provided by the author. Librarians and book collectors will prefer the four series as bound and issued in 1937, 1938, 1941, and 1942 respectively. Bibliographers will complain loudly when they attempt to cite the number of pages and number of figures, only to find that these are not numbered consecutively. In his "epilogue" the author states that in future series, if any, the "loose leaf" form will be abandoned.

By far the most important single section is SIV-446, "Classification and keys to the groups." Of these 70 pages, the first 21 are devoted to general systematics of the Diaspididae and the remainder of the section contains complete keys to all forms.

The story of this Atlas is in a sense the story of systematic entomology. Conceived in pure scientific zeal, born in a strictly academic atmosphere completely free from administrative pressure, nurtured at great physical and financial sacrifice, this flower of systematic entomology bloomed in the sunshine of great popular acclaim. Then, despite the continued industry and enthusiasm of the originator, the flower faded for lack of support. It is all the more ironical when one considers that this is perhaps the most important single group of pests of agricultural crops. To quote the last lines of the epilogue, "If the world wants this Atlas of the Scale Insects of North America completed the world must find some way to pay for it."—R. L. USINGER.

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FIG. 1

FIG. 2

FIG. 3

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VOL. XIX, No. 3 JULY, 1943

TRIATOMA PHYLLOSOMA USINGERI, A NEW SUBSPECIES OF TRIATOMA FROM MEXICO*

BY LUIS MAZZOTTI

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In an earlier work (Mazzotti and Osorio, 1942), based principally upon several crossing experiments, we proposed that the Mexican triatomas, *Triatoma pallidipennis* (Stål),), *Triatoma picturata* Usinger, and *Triatoma mazzottii* Usinger, be considered as subspecies of *Triatoma phyllosoma* (Burmeister). The new combinations would be as follows: *Triatoma phyllosoma pallidipennis*, *Triatoma phyllosoma picturata*, and *Triatoma phyllosoma mazzottii*.

In studying specimens of triatomas collected in Autlán, Jalisco, the place where we (Mazzotti, 1940) had indicated the presence of two different species, we found that the specimens which had been identified as *picturata* are similar structurally to those identified as *pallidipennis*.

According to the key and distribution given by Usinger (1941) the specimens from Jalisco and Colima that have the greater part of the corium whitish correspond to the species *pallidipennis* and those that have the greater part of the corium black, to the species *picturata*.

From the examination of numerous specimens and from the results of new crossing experiments it appears that *picturata* of Autlán, Jalisco (Figure 1) and *pallidipennis* of Autlán, Jalisco (Figure 2) are two variations of the new subspecies described below.

Triatoma phyllosoma usingeri, new subspecies

A large, predominantly black subspecies with scant pilosity on the pronotum.

Length of head, excluding neck region, more than double the greatest width at level of eyes. Anteocular portion four times as long as postocular portion. Tylus longer than half the anteocular

* Translated by Dr. Iver Nelson of the University of California, Davis, California.

length, fusiform, and enlarged on its posterior third. Eyes, seen from above, a little more than half as wide as interocular space, 13::22. Ocelli prominent, each ocellus situated at the anterior end of an oblique elevation. Antennae inserted at middle of anteocular region; the first segment slightly surpassing apex of head; proportion of segments 15:45:40:35. Rostrum with short, fine hairs; curved inward at its basal and middle segments and straight at apical segment; proportion of segments 20:33:12.

Pronotum wider than long, 65::50; its length slightly less than that of head, excluding neck region. Antero-lateral tubercles conical, apically obtuse, projecting outward and forward. Anterior inner tubercles smaller, located near mid-line and near anterior margin. Posterior external tubercles near lateral margin small. Posterior lobe of pronotum with obsolescent wrinkles, inner and outer carinae reduced. Scutellum scarcely broader than long, its posterior prolongation cylindrical-conical in form and rounded at apex.

Hemelytra long, reaching anterior end of last abdominal segment. Connexivum broad and semitransparent at the markings. Under surface covered with short hairs, longer toward front of thorax.

Color black, except on the following regions: neck which has an ochraceous transverse margin; corium which is entirely whitish except for black apical portion and black membranous half of clavus; connexivum except for pale ochraceous markings which correspond in size and position on dorsal and ventral sides.

Size: male, length 31 mm., maximum width (pronotum) 6.5 mm., maximum width (abdomen) 14 mm.; female, length 32 mm., maximum width (pronotum) 7 mm., maximum width (abdomen) 15 mm.

Holotype, male, allotype, female, and six paratypes, in the collection of the Institute of Health and Tropical Diseases, collected by the author in Autlán, Jalisco, with the kind collaboration of Dr. L. E. Villaseñor.

Additional specimens are at hand from Purificación, Jalisco, and from Colima, Col.

Two paratypes are deposited in the U. S. National Museum, two in the Instituto Oswaldo Cruz, and two in the California Academy of Sciences.

In several of the paratypes the corium is mostly black with a whitish area basally and a smaller white area subapically, this last being absent in some specimens. A regular proportion of the specimens have ochraceous on the postero-lateral angles of the pronotum.

This subspecies is dedicated to Dr. R. L. Usinger in recognition of his valuable studies on American triatomas.

Observations. This subspecies is differentiated from *Triatoma phyllosoma pallidipennis* in that the latter has abundant long hairs on the pronotum; *usingeri* has scant hairs on the pronotum and varies in color, the pronotum being entirely black or with ochraceous markings on the posterior angles and the corium also varying in distribution and size of markings. *Pallidipennis* does not exhibit these variations in coloration.

It will be recalled that Stål (1872), in describing *pallidipennis*, did not give the exact locality of origin of the specimen or specimens on which he based his description, merely stating that the species came from Mexico. Nevertheless, the fact that he mentioned pilosity and black color as principal characters seems to justify our conclusions that specimens from the State of Guerrero and adjacent regions be considered as typical.

Structurally *usingeri* is similar to *picturata* but it is differentiated biologically as indicated by the experiments presented below. Likewise the variations in coloration are different in these subspecies and the pale color of *usingeri* is white slightly tinged with yellow whereas the pale color of *picturata* is distinctly orange. The subapical pale spots of the corium of the dark form of *usingeri* are smaller than the corresponding spots in *picturata*.

Crossing experiments. The crossing experiments were conducted using the same methods explained in our previous article.

According to the former experiments (Mazzotti and Osorio, 1942) the crossing of *pallidipennis* (collected in Guerrero and adjacent states) and *picturata* (from Nayarit) produced, among other examples, some specimens which have the appearance of both subspecies (Figure 3) and which should be designated as *T. phyllosoma pallidipennis* x *T. phyllosoma picturata* or the reverse when the male of the pair of parents is *picturata*.

These mixed specimens also have been obtained in crossing experiments with specimens from Autlán. To facilitate the presentation we shall designate these mixed examples as pxp. In table I "*picturata*" and "*pallidipennis*" from Autlán are the forms of *usingeri* which resemble *picturata* and *pallidipennis* respectively.

TABLE I

Crossing Experiments between subspecies of *Triatoma phyllosoma.*

NUMBER	SUBSPECIES CROSSED	RESULTS
Experiment 1	♂ *pallidipennis* from Apatzingán, Gro. ♀ *"picturata"* from Autlán, Jal.	Among other specimens are several pxp.
Experiment 2	♂ *"pallidipenns"* from Autlán, Jal. ♀ *picturata* from Trapiche, Nay.	Among other specimens are several pxp.
Experiment 3	♂ *"pallidipennis"* from Autlán, Jal. ♀ *"picturata"* from Autlán, Jal.	There are no pxp specimens among the descendants.
Experiment 4	♂ *picturata* from Trapiche, Nay. ♀ *"picturata"* from Autlán, Jal.	Among other specimens are several pxp.

Results. The result of experiment 1 suggests that the *"picturata"* specimens from Autlán, Jalisco, behave like *picturata* from Trapiche, Nay., since in being crossed with *pallidipennis* of Guerrero, they produced pxp individuals. Experiment 2, in its turn, suggests that *"pallidipennis"* of Autlán behaves like *pallidipennis* from the state of Guerrero, since on being crossed with *picturata* of Nayarit, it produces pxp specimens.

From these two separate experiments it might be concluded that the two subspecies, *pallidipennis* and *picturata*, occur side by side in Autlán, Jalisco.

Nevertheless, experiment No. 3 modifies the above conclusion because the crossing of *"pallidipennis"* and *picturata"* of Autlán does not produce pxp specimens and furthermore such specimens have not been found in repeated collections from Autlán, notwithstanding the fact that these two supposed species occur together in nature.

Finally, experiment No. 4 shows that *"picturata"* from Autlán is different biologically from *picturata* of Nayarit because crosses between these two result in pxp specimens similar to those obtained in crosses between *pallidipennis* of Guerrero and *picturata* of Nayarit.

Although we have made no crossing experiments between *pallidipennis* of Guerrero and *"pallidipennis"* of Autlán, it is pos-

sible to differentiate one from other by some structural details and by the variations in coloration exhibited by "*pallidipennis*" of Autlán but not seen in *pallidipennis* of Guerrero.

In resumé the subspecies *usingeri* (= "*pallidipennis*" and "*picturata*" of Autlán) exhibits two extreme variations which mix with *pallidipennis* and *picturata*." This subspecies is differentiated from the true *pallidipennis* by structural characters and is separated from the true *picturata* by color and biological characters, the crosses with this last subspecies producing pxp specimens which are not found in the offspring of crosses between the two variations of *usingeri*. Crosses between the two variations of *usingeri* result in offspring which look like the parents.

References

Mazzotti, L. 1940. Triatomideos de México y su infección natural por *Trypanosoma cruzi*. Medicina Rev. Mex. XX, No. 358:95 110.

Mazzotti, L. and **M. T. Osorio.** 1942. Cruzamientos experimentales entre varias especies de triatomas. Medicina Rev. Mex. XXII, No. 412:215-220.

Stål, C. 1872. Enumeratio Hemipterorum. 2 Kongl. Svenska Vet.-Akad. Handl. 10, No. 4:110-111.

Usinger, R. L. 1941. Notes and descriptions of Neotropical Triatominae. Pan-Pac. Ent., 17:49-58.

Habits of Amblycheila cylindriformis Say

A colony of these was located near the Denver Municipal Airport, Colorado. The species hides during the day in yucca clumps, the greatest emergence being about the time of the first real dark. By circling the clumps with a flashlight they were taken in considerable numbers. A prairie dog colony is found nearby, but in this instance at least, specimens were rarely found around dog holes, the yucca being much the preferred habitat. While *cylindriformis* is carnivorous it may also consume some vegetable matter. Individuals were commonest when the yucca blooms are falling, and were frequently discovered carefully shredding the dried petals. It appeared they were consuming a portion of this material, although this could not be exactly determined since the flashlight usually interrupted their activity. Incidentally, the shredding process is noisy and specimens were often located by sound at quite a distance.—Robert W. L. Potts.

NEW AND ADDITIONAL LOWER CALIFORNIA MOSQUITO RECORDS

(Diptera, Culicidae)

BY EDWARD S. ROSS

California Academy of Sciences

The following additional records of Lower California mosquitoes are based on material collected by G. E. Bohart and the writer during the 1941 California Academy of Sciences Expedition to Lower California. The three new records: *Aedes varipalpus*, *Psorophora discolor*, and *Psorophora signipennis*, bring the number of species known from the peninsula to twelve.[1]

(1) *Anopheles* (*Anopheles*) *p. pseudopunctipennis* Theobald. Agua Caliente (Cape Region), Oct. 18, 1941, female, at light.

(2) *Aëdes* (*Ochlerotatus*) *taeniorynchus* (Wiedemann). Coyote Cove, Concepcion Bay, October 1, 1941, one female at light.

(3) *Aëdes* (*Finlaya*) *varipalpus* (Coquillett). La Laguna, Sierra Laguna (Cape Region), October 14, 1941, females, biting.

This species was collected in a pine-oak forest at 6,200 feet elevation, a locality characterized by its Upper Sonoran biota isolated by several hundred miles of desert from comparable environments in the San Pedro Martir Mountains of the north.

(4) *Aëdes* (*Kompia*) *purpureipes* Aitken. Three miles south of La Paz, October 7, 1941, two females, at light.

(5) *Psorophora* (*Grabhamia*) *discolor* (Coquillett). Canipole, Sierra Giganta, October 2, 1941, three males at light.

(6) *Psorophora* (*Grabhamia*) *signipennis* (Coquillett). Canipole, October 2, 1941, a pair, at light; 15 miles south of San Domingo, Magdalena Plain, October 4, 1941, one female, at light; 3 miles S. of La Paz, October 7, 1941, female, at light.

The genus *Psorophora* is here recorded from the peninsula for the first time. Both species were collected in localities which had experienced recent rains. Species of the genus appear to be rarer and seldom collected in the southwestern desert regions because their normal breeding places, temporary ground puddles, often dry up too quickly following the sporadic rains to permit complete development.

[1] Aitken, T. H. G., 1942. Contributions toward a knowledge of the insect fauna of Lower California, No. 6, Diptera: Culicidae. Proc. Calif. Acad. Sci. (4) 24:161-170.

CULEX (CULEX) THRIAMBUS DYAR A NEW MOSQUITO RECORD FOR CALIFORNIA

(Diptera, Culicidae)

BY PEDRO GALINDO AND THOMAS F. KELLEY

University of California, Berkeley

Culex thriambus was described by Dyar in 1921 from adults and larvae collected at Kerrville, Texas. A year later, however, he stated: "The species (*thriambus*) is close to *stigmatosoma* and may be an eastern race of it." Finally in view of the similarity of the male terminalia of the two forms, *thriambus* was placed by its describer (1928) as a synonym of *Culex stigmatosoma* Dyar, but in a discussion of the latter species he added: "The Texas form *thriambus* has the hairs single on the air-tube of the larva, and is presumably entitled to subspecific rank."

Aitken (1940) reported several records of *Culex restuans* Theobald (as *territans* Walker) from California, but stated that females and larvae from this state differ in several respects from typical eastern *restuans*. On the other hand, males, females and larval skins collected by one of us (P.G.) in southern California agree well with descriptions of *C. restuans*, except for the presence of very narrow tarsal rings, which, according to Dr. Alan Stone (*in litt.*), are also present in a good number of eastern specimens of this species. Suspecting that Aitken (loc. cit.) had a mixture of two species, the authors reexamined his material and found only two females of *C. restuans* (Riverside, Calif., W. C. Reeves coll.) the rest being all *C. thriambus* Dyar, a mosquito previously unknown outside of Texas.

CULEX (CULEX) THRIAMBUS DYAR

Culex (*Culex*) *thriambus* Dyar, 1921, Ins. Ins. Mens., 9:33. Dyar, 1922, Proc. U. S. Nat. Mus., 62:22.

Culex (*Culex*) *stigmatosoma* var. *thriambus*, Edwards, 1932, Gen. Insect. Fasc. 194:206.

Culex (*Culex*) *stigmatosoma*, Dyar, 1928 (partim), Mosq. of the Amer., p. 368. Aitken, 1942 (partim), Proc. Calif. Acad. Sci., 24:169.

Culex stigmatosoma, Matheson, 1929 (partim), Handbook Mosq. No. Amer., p. 176.

Culex territans, Aitken, 1940 (nec. Walker), Proc. Ent. Soc. Wash., 42:146.

Notes on California Material. Female. As described by Dyar. The white patch on the underside of the proboscis is seen to extend around the sides in some specimens, but a complete ring is never formed. The extent and color of the pale rings on the hind tarsi vary; specimens from Riverside and Orange Counties have very narrow and brownish rings similar to those present in *C. restuans*, while specimens from Kern County show rather broad whitish rings and the fifth tarsal joint is occasionally entirely white as in *C. tarsalis* Coquillett. The markings on the venter are as described by Dyar for Texas specimens, and appear to be rather constant.

Male terminalia. As stated by Dyar (*loc. cit.*) the male terminalia of *thriambus* is very similar to that of *stigmatosoma;* there are, however, some constant differences which justify the separation of these two mosquitoes as distinct species. The subapical lobe of the basistyle is rounded in *stigmatosoma* and there is a long seta between the three rods and the leaf-like appendage; in *thriambus*, on the other hand, the subapical lobe is conically produced, and the seta between the three rods and the leaf-like appendage is absent. Dr. Alan Stone, who has examined Dyar's types of *C. thriambus* and other specimens of this species collected by Lt. E. S. Ross in Texas, informs us that male specimens in this material also lack the long seta between the rods and the leaf.

Larva. The larva of *C. thriambus* undoubtedly offers the best characters for the separation of the species. The air-tube is long; in 38 specimens examined the average siphonal index was 6.2; in the same number of *stigmatosoma* larvae measured the average siphonal index was only 5.0. The tufts on the air-tube are reduced to single hairs in *thriambus*, although some specimens collected in the Kern River Canyon show one and, rarely two, 2-haired tufts; in *stigmatosoma* the tufts on the tube are always multiple. The lateral abdominal hairs of segments III to VI also differ in these two species, being triple in *stigmatosoma* and double in *thriambus*.

Dr. Alan Stone kindly compared some of our larvae with Ross' material from Texas and found them identical.

Discussion of the Species. *Culex thriambus* Dyar has often been confused in California with *Culex restuans* Theobald, due to the reduction of the siphonal tufts of the larva to single hairs,

and to the unbanded proboscis of the female. The species is, however, a closer relative of *C. stigmatosoma* Dyar as evidenced by male terminalia characters. Dyar's opinion that *thriambus* represents an eastern race of *stigmatosoma* is no longer acceptable, since both forms occur in California where they may be separated with certainty on larval, adult, and male terminalia characters. In view of these facts the writers feel justified in elevating *thriambus* to specific rank again.

Following are the known records of *C. thriambus* in California: Marysville, Butte County, (U. S. Pub. Health Service), October, 1942; San Luis Obispo, San Luis Obispo County, (Aitken, Reeves, Dommes), July 31, 1940; Nipannawasee, Madera County, (T. H. G. Aitken), (No date); Kaweah River, Tulare County, (T. H. G. Aitken), May 11, 1939; Bakersfield, Kern County, (F. L. Hayes), February 7, 1941; Kern River Canyon, Kern County, (Galindo, Kelley, Aarons), August 1, 1942; San Juan River, Orange County, (P. Galindo), September 2, 1942; Santa Rosa Summit (elev. 5,000 ft.), Riverside County, (P. Galindo), September 4, 1942.

Key to California Species of Culex with Ringed Tarsi

Females

1. Proboscis ringed with white, tarsal rings broad.....2
   Proboscis with a white patch underneath, not completely ringed; tarsal rings usually narrow.....3
2. With a white line on outside of femora and tibiae; a V-shaped dark marking on venter of each abdominal segment.....*tarsalis*
   Without white line on outside of femora and tibiae; an oval dark spot on venter of each abdominal segment....*stigmatosoma*
3. Tarsal rings brownish and very narrow, venter of abdominal segments II to VI white basally, black apically.....*restuans*
   Tarsal rings usually white, variable in size; venter of abdominal segments II to VI with triangular dark markings.....*thriambus*

Larvae

1. Air-tube with several single hairs, and at most a single pair of 3-haired tufts.....2
   Air-tube with several pairs of multiple hair-tufts.....3
2. Antennae evenly tapered, antennal tufts at or near the middle of antennae; lateral abdominal hairs of segments IV and V single; subdorsal hairs of these segments also single....*restuans*
   Antennae not evenly tapered. antennal tufts distinctly beyond the middle of antennae; lateral abdominal hairs of segments IV and V double; subdorsal hairs of these segments 3- or 4-branched.....*thriambus*

3. Air-tube evenly tapered; all tufts of tube in a line, basal tuft beyond the pecten.....*tarsalis*
   Air-tube not evenly tapered; penultimate tuft moved laterad out of line, basal tuft within the pecten.....*stigmatosoma*

Male Terminalia

1. Leaf of subapical lobe of basistyle modified, club-like; outer spines of paraprocts blunt and broad.....*tarsalis*
   Leaf of subapical lobe of basistyle normal; outer spines of paraprocts pointed 2
2. Subapical lobe of basistyle with three rods, a leaf and a seta.....*thriambus*
   Subapical lobe of basistyle with three rods, a long seta, a leaf and a seta.....3
3. Lobes of the ninth tergite well developed, mound-like. Lateral plate of the phallosome with a curved, spine-like inner arm and a short and blunt outer arm; some small denticles between the two processes.....*restuans*
   Lobes of the ninth tergite rudimentary, represented by rows of long hairs; lateral plate of the phallosome with an erect and pointed inner arm with a slight knob at about the middle; outer arm rounded at tip, with serrated inner border, four hooks on the dorsal aspect and a long, club-like arm from the base. .....*stigmatosoma*

References

Aitken, T. H. G. 1940. On *Aedes nigromaculis* (Ludlow), *Aedes increpitus* Dyar and *Culex territans* Walker from California. Proc. Ent. Soc. Wash., 42:146.

Aitken, T. H. G. 1942. Contributions toward a knowledge of the insect fauna of Lower California. Part VI. Diptera, Culicidae. Proc. Calif. Acad. Sci., 24:168.

Dyar, H. G. 1921. Ring-legged *Culex* in Texas. Ins. Ins. Mens., 9:32-34.

Dyar, H. G. 1922. The Mosquitoes of the United States. U. S. Nat. Mus. Proc., 62:22-23.

Dyar, H. G. 1928. The Mosquitoes of the Americas. Carnegie Inst. Wash. Pub. 387 pp. 368-369.

Edwards, F. W. 1932. Diptera, Fam. Culicidae. Wystman's Genera Insectorum Fasc. 194 p. 206.

Freeborn, S. B. 1926. The Mosquitoes of California. Univ. of Calif. Pub., Tech. Bul., 3:438-442.

Matheson, R. 1929. Handbook of the Mosquitoes of North America. Charles C. Thomas, Publisher, p. 176.

THE CALIFORNIA-LAUREL BORER, *ROSALIA FUNEBRIS* MOTS.

(Coleoptera: Cerambycidae)

BY E. O. ESSIG
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A few days ago I received about 150 specimens of this rather rare and beautiful beetle from F. H. Wymore who collected them in and about a commercial paint shop at Ukiah, California, during the summer of 1939. This is no doubt the most remarkable feat in the collection of this beetle ever noted and the circumstances involved are worthy of recording. For this purpose Mr. Wymore has kindly furnished the following information which I am pleased to quote with slight changes.

"I am sorry I have no definite data at hand relative to just when the beetles were collected. However, as near as I can recollect they were taken during a hot spell the latter part of July and the first part of August, 1939. This idea correlates with temperature records for the period of July 20 to August 6 inclusive. During the six days from July 20-25 inclusive the temperature averaged 104.83° F. with a range of 101° F. to 108° F. Then again from July 31 to August 6 (7 days) the average temperature was 101.57° F. with a range of 100° F. to 106° F. The five days between the hotter periods had an average of 94.4° F. with a range of 92° F. to 97° F. The minimum temperature during this period of 18 days averaged 53.05° F. with a range of 48° F. to 58° F.

"The principal flight of the beetles, of course, was in the heat of the day with a few active about the lights during the warmer evenings. In regard to the beetles showing preferences to materials in the paint shop there was a decided concentration of them in the corner of the shop where the paint vapors were most noticeable and the odor of amylacetate was strongest. In this environment the beetles scampered about in a rather excited manner and copulation was quite common. Once the beetles moved 25-50 feet beyond the area of concentrated paint vapors (which were very strong during this hot period) they became quiet and remained in a given location for periods of a few minutes to one or two hours depending upon the temperature and concentration of the light in the spot in which they came to rest. In some instances the beetles missed the paint shop

entirely, as they flew in, and alighted on buildings across the street and even halfway down the block.

"As to where these beetles emerged from, your guess is as good as mine. I thought at first they might be coming from a stump pile, consisting of several cords of stumps of various kinds of trees for fireplace use directly across the street from the paint shop. I made several observations about the stumps at various times of the day but was never able to find a single beetle in this environment.

"I had never before seen so many of these more or less rare beetles in all my entomological experiences and have observed only an occasional beetle in this locality since that year." (Ukiah, California, March 10, 1943.)

Ukiah is located in the Russian River Valley in the midst of the Coast Range Mountains. In this region there are dense and extensive growths of all the known host plants of this beetle including the California laurel, *Umbellularia californica* Nutt., Oregon ash, *Fraxinus oregona* Nutt., coast live oak, *Quercus agrifolia* Nee., California black oak, *Quercus kelloggii* Newb., the arroyo willow, *Salix lasiolepis* Benth., and the rarer low-land fir, *Abies grandis* Lindl.

This beetle has always been considered a prize by amateur and experienced collectors alike, and large series are rare in collections. I well remember my first specimen—a large female resting with legs and antennae extended on the green moss-covered trunk of a large California laurel tree at Camp Grant near Dyerville, Humboldt County, California, in 1907. Since then I have taken only one other living specimen.

Hibernation of Scaphinotus coloradensis Van Dyke

I have several times discovered this species hibernating in moderately damp regions along stream beds near the eastern foothills of the Colorado Rockies. One February, along the Platte River near Littleton, nine specimens were found in two rotten cottonwood logs. These had deteriorated to the soft stage, and in one or two cases the cychrids had worked themselves some six or eight inches into the punky material. Only one or two specimens were ever located during their more active summer period.—Robert W. L. Potts.

OLD WORLD SEPSIDAE IN NORTH AMERICA, WITH A KEY TO THE AMERICAN GENERA

(Diptera)

BY GEORGE STEYSKAL
Detroit, Michigan

Sepsis simplex Goetghebuer and Bastin

Sepsis simplex Goetghebuer and Bastin, 1925, Bull. et Ann. Soc. ent. Belg., 65:128, 132, pl. 1, f. 7.
S. simplex Frey, 1925, Notulae Ent., 5:71-75, f. 9.

A male specimen captured on Isle Royale, Michigan, August 3-7, 1936, by Curtis W. Sabrosky, was found to agree well with

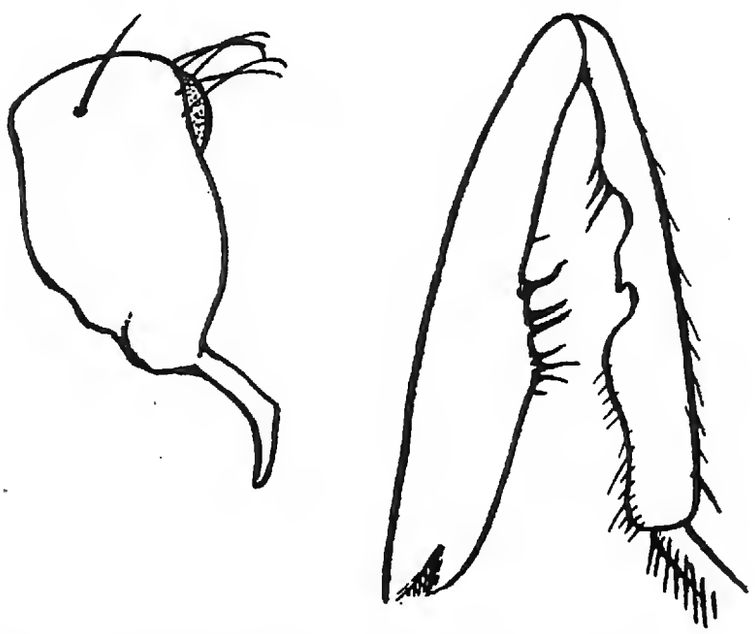


Fig. 1. *Decachaetophora aeneipes* De Meijere, left profile of hypopygium and anterior view of right fore femur and tibia of male.

the original description of *S. simplex* and with Frey's figure of the male hypopygium. The species was described from Belgium and was stated by Frey to occur throughout Finland.

Decachaetophora aeneipes De Meijere

Sepsis aeneipes De Meijere, 1913, Ann. Mus. Nat. Hung., 11:119.
Decachaetophora aeneipes Duda, 1925, Ann. Naturhist. Mus. Wien, 39:27, 40 (Decachaetophora keyed and described); 1926, 1. c., 40:45, pl. 5, f. 54 (species described and figured).

Two male Sepsidae of a species found abundant on Iris plants

in a garden in the vicinity of White Swan, Washington (southeast of Yakima), on October 8, 1941, were kindly submitted by D. Elmo Hardy to the writer for determination. The specimens, in good condition, agree very well with De Meijere's and Duda's descriptions. Duda's figure of the fore leg of the male agrees well with our specimens, but inasmuch as no figure of the male hypopygium has been published figures of both a fore leg and the hypopygium of one of our male specimens is here given to facilitate recognition of the species and a check of its identity with Oriental material. Duda states that the scutellum is twice as long as broad, but this must be erroneous, the reverse being intended. The species has been recorded from Formosa, Japan and northern India.

Enicita annulipes Meigen

Sepsis annulipes Meigen, 1826, Syst. Beschr., 5:292.
Enicita annulipes Johnson, 1925, Occas. Pap. Boston Soc. Nat. Hist., 7:266.
E. annulipes Duda, 1925, Ann. Naturhist. Mus. Wien, 39:70, 142, pl. 1, ff. 3, 4b.
E. elegantipes Ouellet, 1940, Le Naturaliste Canadien, 67:225-228, f. 1 (*new synonym*).

Comparison of paratype material of *E. elegantipes* kindly furnished by Prof. Ouellet with the detailed description and figures of Duda leaves no doubt concerning the synonymy with this European species. Johnson has recorded *E. annulipes* from Fort Kent, Maine.

For the convenience of students who may have difficulty in gaining access to the literature of the Sepsidae the following key to the American genera is given. The rather narrow generic limits of Duda are largely followed and some of the genera included may prove untenable. *Palaeosepsis* has been rejected by Malloch and Curran, but the distinction has proven useful for the separation of neotropical material.

Key to the American Genera of Sepsidae

1. First and second basal cells united.....
.....*Saltella* R.-D. (*Pandora* Hal.)
[One species, *S. scutellaris* Fallen, in North America.]
First and second basal cells separated.....2
2. Postocular and mesopleural bristles lacking (*Themira* group)..3
At least mesopleural bristles always present.....6

3. Humeral bristle long and strong.....*Themira* Rob.-Desv.
Humeral bristle lacking.....4
4. Occiput in profile shallowly rounded, front and occipital tangents crossing at a very obtuse angle; thorax dully shining.....5
Occiput swollen; frontal and occipital tangents crossing at almost a right angle; thoracic dorsum shining black, sometimes more or less lightly brown pruinose.....*Enicomira* Duda
[One species, *E. minor* Haliday.]
5. Abdomen shorter than wings; sternopleura entirely pruinose; fifth abdominal tergite of male with strong marginal bristles. ..... *Enicita* Westwood
Abdomen longer than the short, narrow wings; sternopleura shining black; fifth tergite of male without strong marginal bristles .....*Cheligaster* Macquart
[One species, *C. leachi* Mg. (Europe).]
6. One strong orbital bristle on each side; abdomen of both sexes without macrochaetae 7
Orbital bristle minute or absent; humeral bristle present.....9
7. Humeral bristle lacking; vibrissae duplicate; abdomen not constricted laterally between second and third segments..... .....*Decachaetophora* Duda.
[One species, *D. aeneipes* De Meijere.]
Humeral bristle present 8
8. Only one pair of strong dorsocentral bristles and one pair of strong vibrissae; abdomen without constriction between second and third segments.....*Meroplius* Rondani
[One species, *M. stercorarius* Rob.-Desv.]
Three pairs each of strong dorsocentrals and vibrissae; abdomen constricted between second and third segments..... ..... *Meropliosepsis* Duda
[One species, *M. sexsetosa* Duda (Costa Rica).]
9. Fore femur of both sexes not emarginate, with or without bristles in rows.....10
Fore femur of male more or less cut out below.....11
10. Second longitudinal vein with a large, oval black spot at end; venter and mid and hind femora of male with long, thick hairs ..... *Sepsidimorpha* Frey
[One North American species, *S. secunda* Melander and Spuler.]
Second longitudinal vein not spotted at end..... ..... *Nemopoda* Rob.-Desv.
[One recognized North American species, *N. cylindrica* Fabr.]
11. Abdomen of both sexes without distinct macrochaetae, although sometimes with somewhat longer and stronger hairs on the hind margins of the tergites and strong anal bristles; end of second longitudinal vein not spotted; sternopleura pruinose only on upper border.....*Palaeosepsis* Duda.
Abdomen of the male, often the female also, with distinct macrochaetae; end of second longitudinal vein with a dark spot; sternopleura entirely pruinose.....*Sepsis* Fallen.

SEX ANOMALIES IN THE GENUS ASHMEADIELLA (HYMENOPTERA) WITH NOTES ON THE HOMOLOGIES BETWEEN MALE AND FEMALE GENITAL APPENDAGES

BY CHARLES D. MICHENER
American Museum of Natural History, New York City

Comparable sex anomalies of two different species of the genus *Ashmeadiella* [*A.* (*Ashmeadiella*) *opuntiae* (Cockerell) and *A.* (*Chilosima*) *rhodognatha* Cockerell] were collected in the desert portion of Riverside County, California, during the spring of 1936. Both individuals are bilaterally symeterical and present a blending of male and female characteristics, with, in addition, certain features common to both intersexes but not found in normal specimens of either sex. The two anomalous individuals are primarily female although the mandibles are of a modified male type and the claws are cleft as in males. The sixth abdominal terga show at least suggestions of the dentation found in normal males (figs. 5 and 10). The clypeus of each is abnormally produced, with its anterior margin thickened and crenulate (figs. 2 and 8), in a manner different from normal individuals of either sex. Furthermore, the mandibles are shorter than in either sex and have a large rounded, somewhat irregular thickening or tubercle, not found in either sex, on their outer surfaces immediately basad of the teeth. It is an interesting suggestion that these two similarly anomalous specimens collected in the same area at virtually the same time may have been the result of comparable environmental conditions of some sort.

More complete descriptions of the characteristics which vary intersexually are given below. Unfortunately, from the standpoint of an examination of internal organs, both specimens were pinned and dried before their anomalous features were observed.

Ashmeadiella rhodognatha Cockerell

Facial pubescence as dense as in female; antennae twelve-segmented as in female; clypeus more strongly produced than in either sex, its apical margin thickened, irregularly undulate; mandibles tridentate, strongly thickened just before teeth, shorter than those of normal male; mesocutum rather coarsely punctate as in female; tarsal claws cleft, as in male; sixth tergum (morphological seventh) with posterior margin strongly bilobed medi-

ally and with a small lobe at either side (thus intermediate between male and female); abdominal sterna without scopa, the fourth (morphological fifth) with three small lobes along its posterior margin, which is entire in normal specimens of both sexes; sterna beyond the sixth absent, as in female. The peculiar seventh and eighth terga and genitalia are discussed below.

Five miles west of Indio, Riverside County, California, April 10, 1936, on flowers of *Prosopis chilensis*, collected by the author.

ASHMEADIELLA OPUNTIAE (COCKERELL)

Similar to normal female, antennae being twelve-segmented; clypeus more strongly produced and more broadly truncate than in either sex, its apical margin thickened and irregularly undulate; mandibles slightly shorter than in normal male, thickened and tuberculate just before teeth, apices bidentate, inner tooth small; tarsal claws cleft, as in male; sixth (morphological seventh) tergum similar to that of female but with four feeble lobes, suggesting the characteristic teeth of the male; sternal scopa present, somewhat sparse; sting and associated organs as in female.

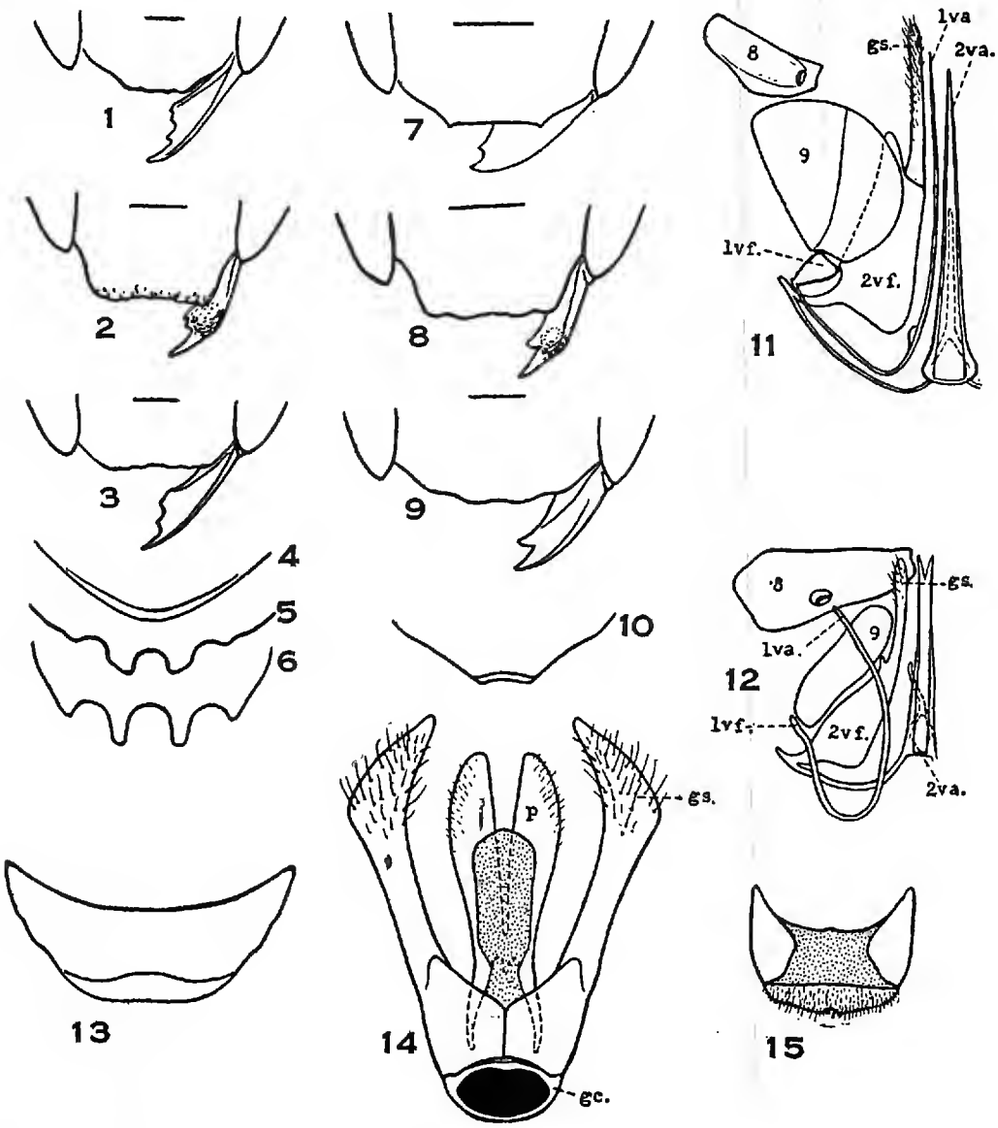
Cathedral City, Riveride County, California, April 9, 1936, on *Echinocactus cylindraceus*, collected by Dr. E. G. Linsley to whom I am indebted for the opportunity to study this specimen.

As may be seen from these descriptions, the specimen of *opuntiae* closely approaches the normal female, while that of *rhodognatha* falls near the midpoint between the two sexes. It may be supposed that each intersex developed as one sex for a part of its life, after which it developed as the opposite sex.

A study of the genital structures of the intersexual individual of *rhodognatha*, in which these parts are involved in the anomaly, is highly interesting and possibly significant in establishing the homologies of these parts. Since many other structures of the insect present a condition intermediate between that of the male and that of the female, it may be assumed that the genital structures, being different from those of the normal female, also approach the condition found in the male.

A superficial examination indicates that this supposition is correct. As will be seen from a study of figures 11 and 12, the eighth (counting the propodeum as first) tergum is larger and its parts more closely approximate in the intersex than in a normal female, while the ninth tergum is smaller than in the normal

female. Both of these are modifications in the direction of maleness. In the intersex the first valvifers are much reduced in size,



Explanation of Figures

1. Lower portion of face of *Ashmeadiella rhodognatha* Cockerell, female. 2, Same, intersex. 3, Same, male.
4. Apex of seventh tergum of *Ashmeadiella rhodognatha* Cockerell, female. 5, Same, intersex. 6, Same, male.
7. Lower portion of face of *Ashmeadiella opuntiae* (Cockerell), female. 8, Same, intersex. 9, Same, male.
10. Apex of seventh tergum of *Ashmeadiella opuntiae* (Cockerell), intersex.
11. Sting and associated structures (omitted on right side) of *Ashmeadiella*, female.

and instead of actually articulating with the ninth tergum and second valvifers, their angles merely approach the points of articulation on these sclerites and are separated from them by small membranous intervals. Furthermore, the first valvulae are blunt and loosely curled anteriorly, not forming stylets in the sting. If these reductions are in the direction of the male, it may be assumed that the first valvifers and valvulae disappear in the male, and it is true that no homologues of these structures are present in that sex, the eighth abdominal segment, as in other male Pterygota, being devoid of appendages. The second valvifers of the intersex lack the usual posterior processes and articulate with the second valvulae directly at their posterior inner angles. The third valvulae are immovably fused at the extreme anterior ends of the second valvifers, although in the female they are articulated subapically. The second valvulae are fused and swollen basally, somewhat as in the female, but are slightly separated at the apices.

The appenadges of the ninth abdominal segment, that is, the second valvifers with the second and third valvulae, in this intersexual individual bear a strong resemblance to the genital armature of the male (figure 14). If this resemblance indicates homology (and from the standpoint of position with regard to adjacent sclerites there is no reason to believe that it does not), the basal ring (cardo) must represent the fused basal parts of the coxopodites (second valvifers) of the ninth abdominal segment. The claspers or lateral portions of the male genital armature, two-segmented in most Hymenoptera but fused into un-

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12. Eighth and ninth terga and appendages of eighth and ninth segments (omitted on right side) of *Ashmeadiella rhodognatha* Cockerell, intersex.
13. Eighth tergum of *Ashmeadiella*, male.
14. Genitalia of *Ashmeadiella*, male, ventral view, apex upward to correspond to positions of genital appendages of female and intersex.
15. Ninth tergum of *Ashmeadiella*, male.

8, eighth hemitergite; 9, ninth hemitergite; *1vf.*, first valvifer; *1va.*, first valvula; *2vf.*, second valvifer; *2va.*, second valvulae; *gs.*, gonostylus; *gc.*, gonocardo; *p.*, penis valve. Abdominal segments are numbered with the propodeum as one, the first metasomal segment as two.

jointed organs in the Megachilidae, represent the remainders of the second valvifers and the third valvulae; the third valvulae of the female are thus the homologues of the styli (or parameres of Snodgrass, 1941, Smithsonian Misc. Coll., 99(14):18) of the male genitalia. Furthermore the penis valves or sclerotizations of the median part of the male genitalia may be homologous to the second valvulae of the female. Thus, in contrast to recent opinions (Snodgrass, 1935, Principles of insect morphology, ix + 667 pp., 319 figs., McGraw-Hill Book Co.; 1941, Smithsonian Misc. Coll., 99(14):1-86, 6 figs., 33 pls.) all these sclerotic organs would be regarded as periphallic and appendicular in origin, and the membranous intromittent organ itself is the only phallic structure in the male genitalia of the Hymenoptera.

Popov (1935, Rev. Ent. U.R.S.S., p. 162) figures the genitalia of a specimen of *Andrena* in which all the female structures were present and in addition the male genital structures of the right side of the body. This suggests that the entire male genital aramture is phallic in origin since the appendage of the right side of the ninth abdominal segment could hardly produce both male and female structures complete. However, too much weight should not be placed on such an asymeterical monstrosity, and indeed Popov (1937, Bull. Acad. Sci. U.R.S.S., pp. 487-498) in another paper gives figures of a gynandromorphic *Halictus* which suggests the same homologies between male and female genital structures as are indicated by the intersexual *Ashmediella*.

These same homologies have also been strongly supported by comparative studies of the structures of other insects which will be reported upon in another paper. They are summarized thus:

FEMALE	MALE
first valvifer	absent
first valvula (gonapophysis)	absent
second valvifer	cardo and gonocoxite (or basal segment of outer clasper)
second valvula (gonapophysis)	penis valve?
third valvula or gonostylus	gonostylus (or distal segment of outer clasper)

ADDITIONAL NEW SPECIES OF WEST AMERICAN COLEOPTERA

BY EDWIN C. VAN DYKE
California Academy of Sciences

Family Buprestidae

Acmaeodera linsleyi Van Dyke, new species

Elongate, subcylindrical, of moderate size; bronzed, the head, pronotum and underside with a greenish tinge, the elytra a bit brownish; head and pronotum somewhat densely clothed with fine, long, fulvous pile, elytra less dense but similarly clothed and the underside moderately clothed with gray, more or less inclined pubescence; the prothorax generally immaculate though often with a small, yellow spot at the sides behind the middle, the elytra with yellow markings of a somewhat stable type as follows: a small spot at the side below the humeral umbone; an oblique band behind the umbone, reaching the third interval where generally expanded both in front and behind and outwardly reaching the margin and continued backwards for a short distance; a second and broad transverse or slightly oblique patch at the middle, reaching from the margin to about the third or fourth interval; a narrower oblique bar between the above and the apex, touching the margin but not the suture, and generally a small spot on the margin in front of it which is sometimes united with it; and a subapical lunate spot, often united along the margin with the preceding or sometimes interrupted. Head coarsely, approximately punctured, feebly longitudinally impressed at middle and transversely impressed at base of clypeus; the antennae reaching middle of prothorax, segments 5-11 serrate. Prothorax almost twice as broad as long, somewhat wider than elytra, apical margin biemarginate, the median lobe quite evident, sides arcuate or subangulate, the margin narrow, not reflexed and scarcely visible posteriorly, as seen from above, the base transverse; the disk rather coarsely, closely, often approximately punctured, the median longitudinal impression well marked and the oblique impressions within the hind angles also quite evident. Elytra about twice as long as broad, sides almost parallel or feebly sinuate from base to behind the middle, thence narrowed to apex; the disk with triangular depression at middle of base, the humeral umbone quite prominent, a small impression just within, the striae shallowly impressed and moderately coarsely, rather deeply and closely punctured, intervals flattened at center, feebly convex at sides and the third sometimes elevated and carinated at base. Beneath, coarsely, densely punctured in front, more finely, less densely punctured on ventral plates. Prosternum broadly, feebly, sinuate on anterior margin.

Last ventral with thin somewhat transverse ventral plate. Length, 6.5-9 mm.; breadth, 2.5-3.5 mm.; average, 8 mm. long by 3 mm. wide.

Holotype (No. 5336, Mus. C. A. S. Ent.) and numerous designated paratypes from a series of over one hundred specimens, collected by E. G. Linsley, E. S. Ross and other at PINON FLAT, SAN JACINTO MOUNTAINS, RIVERSIDE COUNTY, CALIFORNIA, on various days during May, 1939.

This species belongs in the *Acmaeodera sinuatae* group, although the sinuation of the anterior margin of the prosternum is feeble. According to Fall's key, this species would run close to *convicta* Fall but it bears no close resemblance to that or any other member of that group except possibly some specimens of *hepburni* Lec. It is in general more cylindrical, has the prothorax always slightly broader than elytra, and the elytral markings, more sharply outlined, generally somewhat transverse, and suggesting to a certain degree the markings of *flavostica* Horn. Most of the specimens were collected from the blossoms of the salmon colored *Sphaeralcea fendleri* var. *californica* Parish. It is apparently quite local in distribution.

Acmaeodera moronga Van Dyke, new species

Moderately long, robust, cuneiform, of medium size; bronzed and shining, the elytra black or bluish-black; head, and pronotum somewhat densely clothed with fine, long pile, that of the head in great part gray, that of the pronotum fulvous as is also the much sparser erect pile of the elytra, the underside clothed with long gray, much inclined pile, denser at the sides; the prothorax with a lateral yellow patch extending from near the base generally to about the middle, the elytra with the yellow markings about as follows: a narrow yellow marginal line extending from base almost to the median yellow bar, in a few cases not reaching base, a narrow oblique bar behind the humeral umbone, generally connected with the marginal line and expanded inwards, a broad median band, oblique or even arcuate forwards, sometimes united with the anterior band and often with the terminal portion separated as a spot, a short almost transverse bar between median and subapical bar, often broken or even bifurcated at the margin, and the subapical lunate marking, often broken up into two or three spots. Head moderately, coarsely, closely punctured, rather deeply, longitudinally impressed at middle, often with a smooth area at bottom of groove, transversely impressed at base of clypeus; the antennae about reaching middle of prothorax, segments 5-11 broadly serrate. Prothorax over twice as broad as long, broadest

at base, apical margin biemarginate, sides arcuate, gradually narrowed apically, the margin narrow and not visible posteriorly from above; the disk rather coarsely and densely punctured, approximate at sides, the median longitudinal impression well marked, deeply and triangularly impressed at base, and the oblique impressions within hind angles quite evident. Elytra twice as long as broad, sides feebly sinuate before the middle, gradually narrowed from base to posterior third, thence more acutely convergent to apex; the disk with a well-marked triangular depression at middle of base, the humeral umbone prominent, a slight groove at inner side, the striae moderately impressed, rather coarsely, not closely punctured fully their own width apart except near suture and in basal triangle, intervals somewhat flattened inwardly, convex at sides, and minutely, irregularly punctured, the third somewhat elevated and carinated near base. Beneath, rather coarsely, closely punctured in front, finely and sparsely on posterior ventral plates. Prosternum broadly sinuate in front. Last ventral plate with a broad yet feebly developed ventral plate. Length, 10 mm.; breadth, 4 mm.; several specimens but 8 mm long.

Holotype (No. 5337, Mus. C. A. S. Ent.) and five paratypes collected by myself in MORONGA VALLEY, RIVERSIDE COUNTY, CALIFORNIA, May 24, 1941, and various other dates close to that period.

This species, according to the key, would follow *serena* Fall, which it does not at all resemble. It has the general markings of *flavostica* Horn even to a greater degree than *linsleyi*, but differs by having the elytra black or bluish-black, by being less acuminate, less coarsely and more discretely punctured, with the pubescence sparser, as well as by having a different type of prosternal margin. From some specimens of *hepburni* Lec., it differs by being stockier, less elongate, by the coloration of elytra and less concentration of yellow toward the base.

FAMILY SCARABAEIDAE

Polyphylla peninsularis Van Dyke, new species

Rather short and stocky, brown, the prothorax generally quite rufous, the palpi, antennae and legs rufous, the head and pronotum clothed with long, silky, erect, light brown pile; the elytra with the usual sutural, two discal and submarginal white stripes formed by the densely placed white scales, the stripes narrowing posteriorly, with irregular margins and often somewhat interrupted, the humeral stripe a short line at most, and the areas between the stripes peppered with short, light yellowish scales. Head with rather coarse and shallow punctures; clypeus with reflexed

margins, the sides straight and parallel or slightly diverging forwards, the front margin transverse or very feebly biemarginate at most and with outer angles hardly rounded; the antennae with a club that is about 6 mm long, 2 mm longer than head, the outer lamellae decidedly curved and distally averaging 1.5 mm, in width; the terminal segment of labial palpi at least three times as long as broad. Prothorax convex as usual, apical margin emarginate, the sides subangulate, the lateral margin entire or feebly crenulate posteriorly at most, the hind margin broadly lobed; the disk coarsely, shallowly, irregularly punctured, with the usual three scaly vittae, the median complete, the two lateral incomplete in front, the rest of the surface with scattered scales and the long, erect hair, generally longer and denser in front. Elytra over one-third longer than wide, with the surface irregularly, shallowly punctured, rugose and somewhat shining where not covered with scales, the apices broadly rounded and the sutural angles quite obtuse. Pygidium parabolic in shape, with narrow, reflexed margins and rather densely clothed with short, yellowish hair and white scales that are about twice as long as broad. Foretibiae bidentate in the male, the female not seen. Length, 23 mm.; breadth, 11 mm.

Holotype male (No. 5338, Mus. C. A. S. Ent.) and seven paratype males, collected at La Grulla, 7000 feet alt., in the San Pedro Martir Mountains of Baja California, June 19, 1923, by J. R. Slevin.

This rather small and interesting *Polyphylla* belongs in the group characterized by the long pile on the pronotum. According to Casey's key (Mem. Coleopt., V, 1914, pp. 322-353), this species would run close to *diffracta* Casey (*fuscula* Fall), which is of about the same size and general appearance but differs from *diffracta* by being a bit broader, by having the silky pile of the head and pronotum much denser, longer and finer, by having the last labial palpal segment, a bit narrower, the outer angles of the clypeus less acutely angulate, the antennal club about 1 mm. longer, the lateral margins of the prothorax behind not conspicuously crenulate as they are in *diffracta*, the sutural angles of the elytra obtuse, not sharply right angled, the pile of the legs long and silky, not rather short and stiff, and the pygidium less acute and angulate. This species appears to be even more closely related to the recently described *barbata* Cazier, which is somewhat shorter, with the long pile of the pronotum as dense behind as anteriorly, with the clypeus more expanded in front and its angles more rounded, and the scales of both elytra and pygidium longer and narrower, more hair-like.

Thyce aurata Van Dyke, new species

Short and robust, rufous, the scutellum and elytra densely clothed with small, golden brown scales, the head and pronotum also with numerous scales of similar nature and in addition ornamented with rather long erect pile. Head rather finely, closely punctured; clypeus expanded in front, with reflexed margins, transverse apical margin and narrowly rounded outer angles; the antennae with club about as long as funicle and the terminal segment of labial palpi, as long as antennal club, elliptical in shape and with a deep sulcus on upper face running the entire length yet somewhat more widely expanded basally. Prothorax convex, apex emarginate, sides subangulate with margin feebly crenulate posteriorly, the base broadly arcuate; disk finely, closely punctured and with median longitudinal impression feeble. Elytra over one-fourth longer than broad, with the surface finely, closely punctured like the pronotum, and the sutural angles right angled. Pygidium with lateral margins slightly reflexed in front, the surface finely closely punctured and densely clothed with scales that are somewhat longer and narrower than those of the elytra. Beneath the forebody densely clothed with long, light brown pile, the abdomen rather finely punctured and quite well covered with scales which are quite similar to those of the pygidium. First tibiae with the middle and apical teeth well developed, the basal a broad tubercle; the middle tibiae with two short yet well-marked spines on the outer face. Each tarsal claw with a small, erect tooth near its base. Length, 20 mm.; breadth, 9 mm.

Holotype male (No. 5339, Mus. C. A. S. Ent.) and one male paratype, collected at San Diego, California, by Dr. F. E. Blaisdell. Associated with these two specimens is a large female, also collected by Dr. Blaisdell which I presume is the female of this species. It is 24 mm. long by 11 mm. broad, almost naked above, the head, pronotum and scutellum sparsely clothed with suberect, fulvous pile, the elytra with only a few minute fulvous scales scattered over the elytral declivity and carried over onto the pygidium. The head is densely, cribately punctured, with a prominent frontal tubercle, the clypeus quite similar to that of the male but with the margins more reflexed and the outer angles more rounded; the antennal club hardly two-thirds as long as the male club and the last labial palpal segment narrow and about half the length of that of the male. The pronotum is densely, coarsely punctured, with a small, smooth area at center and the side margins behind strongly crenulated. Beneath, the forebody, rather densely clothed with long, fulvous pile, the abdomen quite smooth and sparsely peppered with very small,

hair-like, yellowish scales. Front tibiae distinctly tridentate, the middle tibiae with a pronounced tubercle at middle and a small spine above, on outer face.

This species in Casey's key would run somewhat near *fossiger* Csy. but it is much shorter, has an entirely different type of vestiture and is quite different structurally in many regards. What I take to be the female is also much more like the female of *blaisdelli* Csy. than that of *fossiger* Csy. The subspecies *ochreata* Csy. of *fossiger* approaches *aurata* as regards the color but the scales are less dense and of a different type.

Thyce cinerea Van Dyke, new species

Rather small, reddish brown, the head and pronotum darker, also densely clothed with long, erect, silky, very light yellowish gray pile, and addition with a covering of closely applied long, white, hairlike scales, rather dense on the head, sparser on the pronotum where most evident as a broken, median longitudinal vitta, and dispersed patch at the sides; the scutellum densely clothed with somewhat larger white scales and the elytra clothed with white, hairlike scales, somewhat like those of the head and pronotum, which though closely applied are not approximate, thus do not conceal the surface of the elytra. Head rather coarsely, densely punctured; clypeus moderately expanded in front, with margins well reflexed, the front margin broadly emarginate and the outer angles well rounded; the antennae with club about as long as funicle, and the terminal segment of labial palpi but slightly shorter, somewhat elliptical in shape and with a deep, rather wide groove on the upper side running the entire length. Prothorax convex, apex feebly biemargainate, sides arcuate or feebly subangulate, the outer angle broadly rounded, the margin strongly crenulate behind, the base with prominent median lobe; disk with moderately coarse, rather closely placed variolate punctures, without defined median impression. Elytra over one-fourth longer than broad, the surface rather finely, closely punctured, the apex feebly truncate and the sutural angles right angled. Pygidium subangulate, with narrow, feebly reflexed margins, and punctured and clothed like the elytra. Beneath, the forebody densely clothed with the long, silky, light yellowish gray pile, the abdomen rather densely, finely punctured and moderately closely covered wtih long, hairlike white scales. Front tibiae with the upper tooth very obtuse and low, the middle and terminal, acute and promnient; the middle tibiae with the spines very small, barely indicated. Tarsal claws with basal tooth small and acute. Length, 19 mm.; breadth, 9 mm.

Holotype male (No. 5340, Mus. C. A. S. Ent.), a unique col-

lected at BALBOA, CALIFORNIA, in July by Dr. Harold Bryant and by him kindly presented to me.

This rather small species because of its silvery gray color stands well apart from its fellows. It is evidently a sand dune species like *pistoria* and others, but these are more robust in every regard and clothed with fulvous or yellowish scales and pile.

Thyce clypeata Van Dyke, new species

Of moderate size, robust, brown or reddish-brown, the head and pronotum clothed with fine, erect, rather long fulvous pile and in addition with closely appressed, elongate, yellowish scales, dense on the head, less dense on the pronotum, though rather concentrated in the form of a median longitudinal vitta and a broader, less sharply defined vitta on either side, the scutellum densely clothed with somewhat broader white scales, and the elytra rather uniformly, moderately closely clothed with small, elongate, very light fulvous scales, the vestiture thus only slightly concealing the surface beneath. Head rather closely punctured; clypeus expanded in front, the sides notched or sinuate in front of the lateral angles, the anterior margin feebly emarginate at middle, the margins well reflexed and the anterior angles though blunt, decidedly angulate; the antennae with club fully as long as the funicle, the last labial palpal segment two-thirds as long as antennal club, rather wide and with a moderately wide and deep groove extending the entire length along the upper surface. Prothorax convex, apex feebly biemarginate, sides subangulate, feebly crenulated behind, the base broadly subangulately lobed; the disk rather coarsely, densely punctured, the median longitudinal impression shallow but evident. Elytra less than a third longer than broad, the surface finely, closely punctured, the apex broadly rounded, subtruncate, with sutural angles slightly obtuse. Pygidium subangulate, with feebly reflexed margins, finely, closely, punctured, and moderately densely clothed with narrow, very light colored hairlike scales, much narrower and longer than those of elytra. Beneath, the forebody densely clothed with long, fine, light grayish yellow pile, the abdomen rather finely, densely punctured and clothed with closely adherent long, white hairlike scales. Front tibiae tridentate, the upper tooth broad yet prominent; the middle and hind tibiae both with two well-marked spines on outer margin; middle tarsi longer tahn tibiae. Tarsal claws each with an acute and prominent tooth near base. Length, 23 mm.; breadth, 11 mm.

Holotype male (No. 5341, Mus. C. A. S. Ent.) and two paratype males, collected near PETALUMA, CALIFORNIA, by E. C. Johnston. Two of the specimens are alike and normal, the third has the fore tibiae with the spines all much reduced, the outer margin merely sinuate.

Superficially this northern species looks more like some of the southern species as for instance *fossiger*, which it superficially simulates though is larger and more robust, than it resembles species like *harfordi* or others from the north. Its most distinctive character is its clypeus, with lateral margin sinuate before apex and the angles more prominently angulated as a result.

Family Curculionidae

Pandeleteius viridissimus Van Dyke, new species

Of rather large size for the genus, black, antennae and tarsi rufous, the entire upper and under surface covered with brilliant, circular, green scales. Head medianly sulcate in front, beak short, 1 mm. long, triangularly emarginate at apex, eyes moderately convex, antennae about reaching middle of prothorax, with a fine, sparse pubescence, first segment of funicle stout, almost as long as the second and third segments combined. Prothorax about one-fifth broader than long, apex and base transverse, sides broadly rounded at middle, sinuate in front and behind; disk feebly convex, with well defined anterior and posterior submarginal impressions, and with a few fine obliquely placed hairs as on the head. Elytra transverse at base, sides almost straight, gradually wider to posterior third then rounded to somewhat projecting and acute apex; disk moderately convex, somewhat bulbous laterally behind, the striae complete and finely impressed, the intervals flat and with a single row of fine short and sparse, upright hairs, most evident on the posterior declivity. Beneath with abdomen finely, sparsely pilose and with first ventral suture moderately arcuate at middle. Anterior femora enlarged, fusiform, the tibiae long and strongly denate within. Length, 9 mm.; breadth, 4 mm.

Holotype (No. 5342, Mus. C. A. S. Ent.) and one paratype, collected by myself on the western slope of Montezuma Pass, Huachuca Mountains, Arizona, August 19, 1940. They were apparently feeding on the foliage of *Calliandra eriophylla* Benth., an accacia-like plant wth pink flowers.

This brilliant green species, of rather large size, should be readily separated from its more somber relatives. Some of the scales are apt to be rubbed off, exposing the black epidermis and thus giving the insects the appearance of being peppered.

TWO NEW COCCINELIDAE FROM OREGON[1]

(Coleoptera)

BY BORYS MALKIN

Eugene, Oregon

In the preparation of a check list of Oregon Coccinellidae the writer discovered a species each of *Scymnus* and *Hyperaspis* apparently unknown, the descriptions of which are given below:

Scymnus fenderi Malkin, new species

Oblong oval; black. Head reddish toward the clypeal apex, shining; punctures distinct similar to those on thorax, more closely set toward the eyes. Front and part of clypeus slightly convex. Thorax strongly converging and arcuate in apical half, narrower at the base than elytra; black with sides triangularly yellow. The yellow area covers nearly one-fifth of the apex on each side. Hind angles black. Thoracic punctures as in *caurinus* distinct, sparse, but denser and smaller toward the sides, especially in apical portion. Elytra longer than wide, entirely black. Elytral punctures irregular, very closely set, more shallow toward the sides, especially in apical portion. Undersurface black. Legs bright reddish-yellow, with femora darker in basal half. Labrum and palpi reddish-piceous. Prosternum margined. Prosternal ridges not very strong, distinct, converging in the front. Metasternum coarsely and densely punctured, almost as deeply as elytra, but punctures sparser and more shallow toward the middle where they become transverse. The middle of the metasternum deeply impressed, with a small tubercle on each side of the impression. Epipleura and side pieces of metasternum so closely punctured as to appear tuberculate. The side pieces narrow, sharply pointed, more than three times wider at base than in the front. Prosternal plates reaching the lateral margins of the metasternal episterna, and occupying seven-tenths of the prosternum. First segment of the abdomen flattened between the abdominal plates, with denser punctures toward the front of the flat area. Second segment strongly convex in the middle, the following segments less convex. Second and third segments with a deep, curved impressions on sides. Segments four and five with smaller shallow impressions in some distance from lateral margins. Abdominal plates incomplete, regularly curved, four-fifths as long as the segment. Pubescence on the dorsal side thick, yellow recumbent. Length: 2.5 mm.; width, 1.8 mm.

[1] This paper was prepared at the University of Oregon.

Holotype, female from CAMAS VALLEY, on Roseburg-Coquille Highway, DOUGLAS COUNTY, OREGON, June 15, 1936; in author's collection. This specimen was collected by Mr. K. Fender after whom it is named.

This species runs to *caurinus* in Casey's key, from which it can be easily distinguished by the unusually coarse elytral punctures, coarser punctulation of the abdominal segments and presence of the impressions on the lateral portion of those segments.

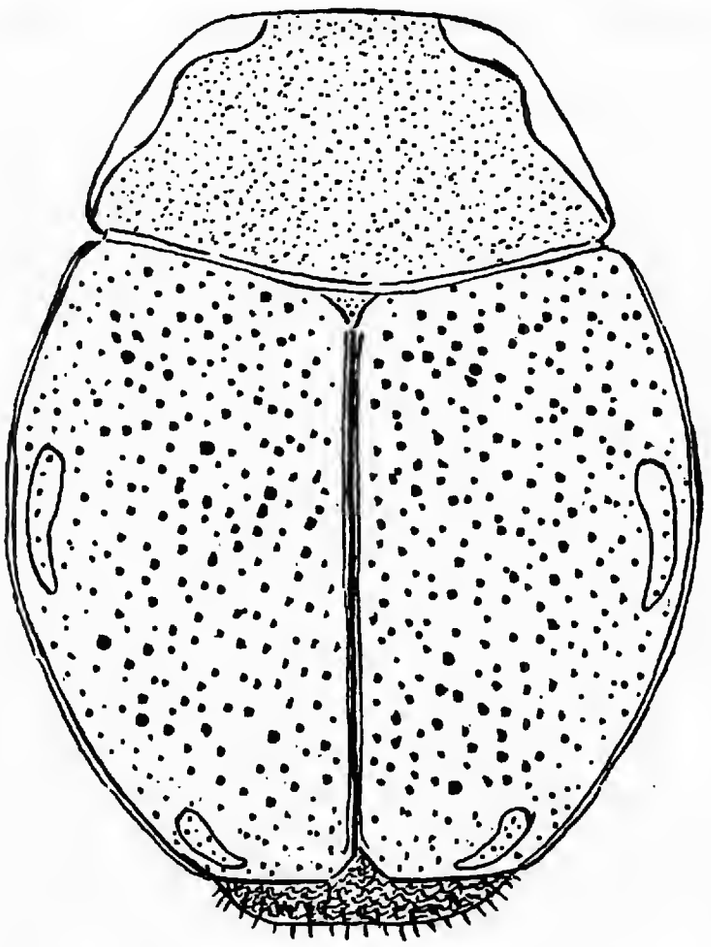

Fig. 1. *Hyperaspis obscura* Malkin, male holotype.

Hyperaspis obscura Malkin, new species

Elongate oval; strongly converging; black; highly polished. Lateral margin of thorax yellow. The vittae broad in front, sinuate from the inside at the apical portion, gradually narrowing toward the base where they occupy the angles only. Elytra, each with two spots. The anterior spot located along the middle of the lateral angle, almost one-fifth as long as elytron. The posterior spot smaller and somewhat indefinite, located in the apical portion of the elytra, not touching the margin. Head black in male, yellow in female; densely and minutely but distinctly punctured. Thorax

as long as wide, with very distinct punctures more closely set toward the sides. Elytra slightly longer than wide, their punctures strong and large although less dense than those on thorax. Interstices very minutely alutaceous. Ventral surfaces closely punctured but punctulation less pronounced than on dorsal side. First two abdominal segments with highly polished median area, and short, sparse, delicate pubescence. Legs; femora reddish-piceous, tibia and tarsi dark reddish testaceous. Length, 2.3 mm.; width, 1.7 mm.

Holotype, male (No. 5292, Calif. Acad. Sci., Ent.), and allotype, female (No. 5293), both collected by Mr. Gentner at LAKE OF THE WOODS, KLAMATH COUNTY, OREGON, June 11, 1939. A male paratype with the same data in author's collection.[2]

This species belongs to the *undulata* group in Dobzhansky's recent revision of the genus, but closer specific affinities cannot be established with certainty until a larger series is available.

The extent of the anterior elytral spot varies within the series. In the female it is only half as long as in the male holotype, and four-fifths as long in the male paratype. The female is slightly larger than either male. Otherwise the specimens show very little variation.

Acknowledgments: The writer is indebted to Mr. and Mrs. Kenneth Fender of McMinnville, Oregon, and Mr. L. G. Gentner of Medford, Oregon, for the loan of material used in present study. To Miss Edith A. Onthank, a University of Oregon student, for the drawing af *Hyperaspis obscura* and to Dr. L. S. Cressman of the Anthropology Department for the permission to use his excellent Leitz-Wetzlar microscope.

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[2] A female specimen has come to my attention since the present paper was submitted for publication. It was collected by Mr. and Mrs. Kenneth Fender at Diamond Lake, Lincoln County, Oregon, in the Cascade Mountains, on June 7 1941. The elytral pattern is intermediate between the type material described above. I have designated this specimen as a metatype and it is deposited in the Fender collection.

THE EFFECT OF LOW STORAGE TEMPERATURE ON REPRODUCTION IN CERTAIN PARASITIC HYMENOPTERA

BY PAUL DE BACH
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In population studies involving the rearing of *Musca domestica* L. and its pupal parasites, *Mormoniella vitripennis* (Walker) and *Muscidifurax raptor* Gir., it was found necessary at times to resort to storage by refrigeration in order to synchronize parasite emergence with host production. Storage of adult parasites at low temperatures has, for many years, been practiced by those engaged in biological-control work, both for long-distance shipping of parasites and for proper timing of parasite emergence and liberation. It appears, however, that an adequate general study of the effect of cold storage on insects has never been made, and, as a result, the utility of the method has not been fully realized, especially as regards storage of parasites for any length of time. The fact that results are sometimes adverse has doubtless inhibited investigational work. It is to be hoped that future work will clear up many of the present problems in this important field.

The chief value of cold storage should lie in the *introduction* phase of biological-control work rather than in mass *production*, since the former is concerned with any means of establishing the species, while the latter is more concerned with maximum reproduction after establishment, in order to accomplish complete distribution over the infested area at as early a date as possible. Emphasis should be placed on the fact that in introduction work the percentage mortality or sex-ratio reverses are relatively unimportant so long as sufficient numbers of parasites are sent initially to insure even a few for breeding stock.

Cold Storage of Adult Parasites.—In the present studies, the cold-storage method was found to be quite successful. Parasites were held first as adults, by storage at 4.4° C. Adults of *Mormoniella* and *Muscidifurax*, whose life expectancy in the laboratory is one to two weeks, live as long as five months at this temperature if they are removed at intervals of 3 or 4 days for feeding, although mortality is fairly high after such a long

period. The fecundity of the surviving adults does not appear to be impaired, and the sex ratio of the progeny is favorable. Adults of *Mormoniella vitripennis* and *Muscidifurax raptor* survived five months; adults of *Pachycrepoideus dubius* Ash. and *Microbracon* sp., four months.

Results of tests with *Mormoniella* adults serve to confirm the observations noted above. Four hundred and thirty-three *Mormoniella* reared at 27.5° C. were refrigerated at 4.4° C. from June 6, 1939, to July 13, 1939, or for a total of 37 days. At intervals during this time they were removed from refrigeration and fed honey. The initial age of the paarsites was from 3 to 5 days after emergence. After 37 days of refrigeration, 105 adults remained alive. (Mortality could undoubtedly be decreased by more uniform feeding periods than were used.) These 105 adults were removed from refrigeration and put with housefly puparia in which they were observed to oviposit. From these puparia 289 adults emerged, two-thirds of which were females and one-third males.[1] These data indicate that neither spermatoza nor ova are materially affected by refrigeration of the adult.

The principle of cold storage of insect parasites is, of course, to lower the rate of metabolism so that longevity is increased. This phenomenon is well known, but the exact effects are not well understood. According to Wigglesworth (1939, p. 344),

"In insects exposed to low temperatures, the R. Q. may fall to a very low figure . . . The low temperature seems to cause some disturbance in metabolism, the nature of which is not known. The values at the low temperature are too low to be explained by an exclusive oxidation of fat, and too prolonged to be explained by the increased solubility of gases in the tissue fluids."

Even though the process of cold storage is logically sound, certain complicating factors enter, so that a greater or less amount of mortality occurs, as previously pointed out. Wigglesworth (1939, p. 364) says:

"[Many insects] accustomed to warm surroundings . . . soon die even at temperatures well above freezing-point. The cause of death is not understood. It is often attributed to the accumulation of toxic products which at normal temperatures would be eliminated . . . This type of effect by cold is sometimes termed the 'quantity factor' because it must act for some time before it causes death."

[1] *Mormoniella* exhibits arrhenotokous parthenogenesis.

The mortality obtained in the present study was undoubtedly due to several factors which would be very difficult to analyze separately. Freezing is, of course, a direct cause of mortality but is not to be considered here, since freezing temperatures were not used in these experiments. It should be pointed out, however, that some insects can actually withstand freezing without adverse effects. One possible cause of mortality—one readily thought of—is starvation. Even though parasites are held at a low temperature, a certain amount of metabolism occurs; and, unless the energy lost is regained by periodical feedings and subsequent assimilation of food, death by starvation may result. This is supported by the repeated observation that periodical removal from storage to permit feeding on honey greatly reduced mortality.

A further cause of mortality, sometimes not readily associated with cold storage, may be dessication. Because of the continued removal of moisture in the form of ice, the air in an electric refrigerator of the coil type, such as that used in the present experiments, is very dry. Various authors have shown that low humidity may be a cause of death by means of desiccation. At low temperatures, loss of moisture by the insect would occur very slowly, but this is a factor to be considered, unless parasites are stored in tightly corked vials instead of in those having the usual cotton plug. Van Steenburgh (1934) states that larval parasite mortality during cold storage appears to be due to desiccation of the host egg. And according to Lund (1934, p. 335-36),

" . . . the mortality of the parasites and unparasitized host eggs generally decrease regularly with an increase in humidity at all temperatures—the mortality apparently varying more with humidity than with temperature."

Since the experiments involving cold storage of adult *Mormoniella* and *Muscidifurax* indicated distinct possibilites for this method of shipping refrigerated parasites, it was thought desirable to run tests on storage of their immature stages at low temperatures in order to ascertain whether or not any adverse effects of low storage temperatures on these stages might be evidenced. As a consequence, experiments were designed to test the effect of cold storage on immature stages of the two parasites, *Mormoniella* and *Muscidifurax*.

Cold Storage of Immature Stages.—A common procedure in biological-control work, as is well known, has been that of ship-

ping parasites in the larval or pupal stage in cold storage. Several authors have pointed out recently, however, that low storage temperatures may affect the fecundity of adult parasites thus exposed in their immature stages.

Van Steenburgh's (1934) most satisfactory results with *Trichogramma* pupae in host eggs stored 75 days at 35° to 45° F. showed little mortality but about 50 per cent reduction in fecundity.

Schread and Garman (1934) concluded that

"*Trichogramma* species reared in grain moth eggs are affected by refrigeration in the following ways. (a) At temperatures below 47° F. mortality is gradual and increases with the length of exposure. There is some survival with refrigeration extended to 72 days, but the percentage is so small that it is worthless for production purposes. (b) The sex ratio is upset when temperatures below 47° F. are employed, the change being more evident in the generation following than in the generation emerging from refrigerated eggs. (c) Wing deformity is directly proportional to length of refrigeration and indicates a general weakening of the indivduals."

Under the most adverse conditions tabulated by Schread and Garman (1934), that is, after storage for 39 days at 37° F. and 60 percent relative humidity, the emerging generation exhibited a 1:1 sex ratio, showing that even under such conditions loss of the breeding stock would not result. In an earlier paper, these workers (Schread and Garman 1933) give as the extreme figure a male preponderance of 23:1 in the first generation removed from adults that were subjected to storage at 38° F. and 60 percent relative humidity for 60 days in the pupal stage.

Hanna (1935) found that larvae of the parasite *Euchalcidia caryobori* Hanna were not affected when stored at 16° C. (60° F. +) for as long as 55 days, as shown by normal fecundity and sex ratio of the adults. The preponderance of male progeny from similarly treated pupae, however, indicates an adverse effect in the form of partial or complete sterilization. Male pupae are much more affected than are female. Low storage temperatures cause the retardation of spermatogenesis in the male and possible retardation of the growth of the eggs or ovarian malformation in the female. Flanders (1938) discusses and summarizes the effect of cold storage on the reproduction of parasitic Hymenoptera.

While the aforenamed authors clearly show a reduction in fecundity of adults or a male-predominant sex ratio in certain cases where immature stages of a parasite were subjected to prolonged cold storage, in none of the cases mentioned would this have resulted in loss of the parasite species in introduction, had any quantity of individuals been shipped in storage in both late larval and pupa stages.

The present experiment involved the subjection of full-grown larva of *Mormoniella* to each of the following temperatures: 0-2°, 6°, 10°, 15°, and 23° C. Those held at 23° emerged in 9 days; those held at 15° emerged in 28 days; the remainder did

Table 1.--Progeny of five groups of 50 Mormoniella female parasites which were subjected to storage at different temperatures during the larval stage, then removed and allowed to emerge, mate, and to oviposit, under uniform conditions, among 200 housefly puparia.

Group	Storage		Number of Hosts		Number of Adult Parasites Produced[1]		
	Temperature, in Degrees C.	Period in Days	Stung	Producing Adult Parasites	Male	Female	Total
1	0 - 2	31	120	50	264	238	502
2	6	31	111	47	234	290	524
3	10	31	90	28	117	177	284
4	15	28[2]	21	8	52	41	93
5	23	9[2]	17	5	10	21	31

[1] Mormoniella is a gregarious parasite; as many as 15 may mature in one host.

[2] Adults emerged during storage.

not emerge after being held 31 days, although those at 10° developed into pupae. The larvae held at 0-2° and at 6° showed no outward change. The fact that *Mormoniella* larvae matured and emerged when stored at 23° and 15° and pupated while stored at 10° indicates that the process involved at these three temperatures is nothing more than a slowing down of metabolism, and that development will proceed through to emergence at any temperature above the threshold of development if storage is sufficiently prolonged.

After being held at the different temperatures for the time indicated, the parasite larvae were removed, and the adults were allowed to emerge. Three days later, after feeding and mating had taken place. 50 females of each group were removed and placed with 200 housefly puparia in a quart jar. Oviposition occurred readily, and the parasite progeny matured and emerged in the usual time. These progeny were then counted, and the sex of each was determined. The results of these counts are shown in Table 1.

These data, contrary to what might have been expected from

previous work, indicate that the lower the temperature to which mature larvae of *Mormoniella* are subjected, the greater is the fecundity of the resulting adults. In the present experiments the number of hosts "stung" was considered to be the best measure of fecundity, since an egg was usually deposited when the host was stung. The number of adult parasites that emerged was somewhat variable, partly because of the factor of superparasitization. As a general practice, *Mormoniella* was reared at 27.5° C. in the laboratory. Under such conditions the total progeny approached the numbers obtained at 0-2° and 6° in

Table 2.--Progeny of three groups of 50 Muscidifurax female parasites which were subjected to storage at a temperature of 4.4° C. during immature stages, then removed and allowed to emerge, mate, and to oviposit among 200 housefly puparia.

Group	Stage Tested	Period of Storage at 4.4° C. in Days	Number of Hosts Stung	Number of Adult Parasites Produced		
				Male	Female	Total
1	Larval	28	200	47	70	117
2	Larval	31	200	59	49	108
3	Pupal	25	200	47	40	87
Control[1]			200	30	56	86

[1] Fourteen-day life cycle at 27.5° C.

Table 1. The reason for the low number of progeny obtained from those parasites reared at 15° and 23° is not at all clear, but this was possibly due to their remaining in cold storage for a short time after emergence. These data are of a preliminary nature and must be supplemented in order to determine the exact significance of the effects that have been noted. At least they show plainly that storage at such low temperatures is not harmful so far as reproduction is concerned.

The sex of the progeny of *Mormoniella* adults subjected to different temperatures in their full-grown larval stage, indicates no marked relation between temperature variations and sex ratio, although the data in Table 1 show a slight preponderance of males at 0-2° C. This could be interpreted as indicating that when stored as larvae at a temperature below freezing, males may be affected. The sex ratio for the entire group is 1.13 females to 1.00 male. On the other hand, the sex of adults which have been subjected to low temperatures in the immature stages is about 2.66 females to 1.00 male. Indications are that this may be the effect of differential mortality on the male larvae and pupae.

Experiments similar to those described above were conducted

with *Muscidifurax raptor*, but at only one temperature (4.4° C.). Since pupae had not been used in the previous experiments, they were included here. The results of the tests are given in Table 2. From the data in this table it is evident that even subjection of *Muscidifurax* pupae to prolonged low temperature does not result in the production of sterile adult males (as has been demonstrated for some species), since close to a 1:1 sex ratio was obtained.[2]

There does not appear to be any appreciable difference between experiments and control, either in reproductive capacity or in sex ratio of the progeny, although there are not sufficient data at hand to be evaluated statistically.

Summary and Conclusions.—Mature larvae and pupae of the pteromalid parasites *Mormoniella* and *Muscidifurax* spp. were subjected to storage for periods of 25 to 31 days at temperatures ranging from 0° C. to 23° C.; they were then removed, and the adults were allowed to emerge at a temperature of 27.5° C. Fecundity appeared to be highest in those adults whose immature stages had been subjected to the lowest temperatures. Apparently, immature male parasites were not sterilized at the low temperatures used in these studies, since the succeeding generation exhibited a normal sex ratio. The data obtained show no consistent effect of temperature upon the sex ratio.

Adult *Mormoniella*, *Muscidifurax*, *Pachycrepoideus*, and *Microbracon*, when given periodic feedings, may be held at low temperatures for periods of one to several months without material effect upon their reproductive processes, although mortality increases with length of storage.

In conclusion, it may be stated that, while in certain cases cold storage may, to some degree, affect sex ratios or fecundity, importation of parasites by the cold-storage method, either as adults or as immature stages, may well be feasible and may even be the most satisfactory method of shipment, especially when slow transportation over long distances is necessary. This would at least be the case with the parasites used in the present studies; and, if one may judge by the data of other authors, the method might be applied to many species for introductory purposes. Individual studies, however, will probably be desirable for each species concerned.

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[2] *Muscidifurax* like *Mormoniella*, exhibits arrhenotokous parthenogenesis.

Literature Cited

Flanders, S. E. 1938. The effect of cold storage on the reproduction of parasitic Hymenopetra. Jour. Econ. Ent., 31(5):633-4.

Hanna, A. D. 1935. Fertility and toleration of low temperature in *Euchalcidia carybori* Hanna (Hymenoptera, Chalcidinae). Bul. Ent. Res., 26:315-22.

Lund, H. O. 1934. Some temperature and humidity relations of two races of *Trichogramma minutum* Riley (Hym. Chalcididae). Ann. Ent. Soc. Amer., 27:324-40.

Schread, J. C. and P. Garman. 1933. Studies on parasites of the Oriental fruit moth. I. *Trichogramma.* Connecticut Agr. Exp. Sta., Bul. 353:687-756.

Schread, J. C. and P. Garman. 1934. Some effects of refrigeration on the biology of *Trichogramma* in artificial breeding. Jour. N. Y. Ent. Soc., 42:263-83.

Van Steenburgh, W. E. 1934. *Trichogramma minutum* Riley as a parasite of the Oriental fruit moth (*Laspeyresia molesta* Busck.) in Ontario. Canad. Jour. Res., 10(3):287-314.

Wigglesworth, V. B. 1939. The principles of insect physiology. 434 p. 316 figs. E. P. Dutton and Company, New York.

OBSERVATIONS ON BRACHYSOMIDA CORPULENTA CSY. (Coleoptera; Cerambycidae)[1]

GEO. R. HOPPING
Vernon, British Columbia

Brachysomida corpulenta Csy. was described from a single female from the Levette collection, the type locality given only as California.[2] In the Hopping collection, two females were discovered which agree closely with the original description of *B. corpulenta.* Mr. W. S. Fisher at the U. S. National Museum has kindly compared both specimens with the type in the Casey collection and they agree except in minor detail.

The species is easily recognized by three longitudinal, slightly raised lines on each elytron. These lines are nearly devoid of vestiture and have only a few scattered punctures. The two females before me are dark brown. The type is uniformly brownish-black and the elytra have a slight purplish tinge which seems to be lacking in my specimens. They may not have been fully hardened when they were collected. They were taken by Ralph Hopping at Kaweah, Tulare County, California, over thirty years ago.

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[1] Contribution No. 2247, from the Division of Entomology, Science Service, Department of Agriculture, Ottawa.

[2] Casey, Col. T. L., Memoirs on the Coleoptera 4:224, 1913.

Several years before my father died, he received from Dr. E. G. Linsley, a single specimen of *Brachysomida* which is undoubtedly the male of *B. corpulenta*. Since the male apparently has not been known before, the following description is given.

Length 8.5 mm., breadth across humeri 3.3 mm.; entirely black, faintly shining. Head with front very short, about half the length of the clypeus, densely punctate, the punctures not uniform in size; basal two-thirds of clypeus punctate, remainder nearly glabrous; fronto-clypeal suture deeply impressed; coronal suture moderately impressed between the antennae, fading out posteriorly between the eyes; moderately coarsely and densely punctate behind the antennae, the punctures not uniform; antennae stout, about two-thirds the body length, the scape equal in length to the second and third segments combined; the second segment a little broader than long, half the length of the third, basal three or four segments with conspicuous gray hairs; remainder of antennae with short appressed fine pubescence; entire head with long gray hairs. Pronotum with base broader than apex, lateral angles placed before the middle; apex margined rather feebly, strongly margined behind, densely and coarsely punctate, the punctures irregular in size; on the disc a few small areas where punctures are more widely separated, and a glabrous, feebly impressed, rather broad, longitudinal line on basal half, not attaining hind margin. The entire thorax has long, fine gray hairs. Elytra strongly tapered from humeri to apices, each elytron with three broad slightly raised longitudinal lines on which the coarse punctures are scattered; the line nearest the suture reaches back only two-thirds the distance from base to apex, the second and third not quite attaining the apex; spaces between these lines densely and coarsely punctate, the punctures becoming finer toward the apices; silvery vestiture confined mainly to spaces between the raised lines; lateral elytral margins with a well-defined, smooth bead, the sutural bead of each elytron well defined posteriorly, becoming feeble toward the scutellum; elytral apices rounded to suture with a faint suggestion of truncature; ventral surface more finely, moderately sparsely punctate, more densely so on the mesepisternum and finely strigate on the posterior lateral portion of the metasternum; last ventral abdominal segment with posterior margin broadly and evenly rounded with a faint suggestion of a minute notch at middle, but this last may not be a constant character.

The male differs from the female mainly in the much more strongly tapered elytra, the entirely black color, and the more strongly developed raised lines of the elytra.

The specimen was taken by Dr. E. G. Linsley at Lebec, Tejon Pass, Calif.; elevation 4000 feet, May 11, 1928. It has been returned to Dr. Linsley at the University of California, Berkeley.

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THREE NEW OXYBELUS FROM SOUTHERN CALIFORNIA

(Hymenoptera, Sphecidae)

BY V. S. L. PATE

Cornell University

The descriptions of the following three species of *Oxybelus* from southern California are presented here in order that they may be available in connection with other investigations.

Oxybelus cocopa[1] Pate, new species

The superficial habitus of *cocopa* is very similar to that of the following Mojave Desert form *pitanta*, from which, however, it may be readily distinguished by the yellow clypeus and antennae, the heavy silvery vestiture, the non-foveolate mesonotal-scutellar suture, the straight non-fornicate femoral keel, the rounded squamal lobe, the obsolescent lateral propodeal carinae, and the different conformation of the clypeal lobe.

Type. ♂; In desert on Thompson Ranch, IMPERIAL COUNTY, CALIFORNIA. June 4, 1911. (J. C. Bridwell; visiting flowers of *Pilostyles Thurberi.*) [United States National Museum.]

Male. 4 mm. long. Black; the following citrinous: palpi, mandibles except red apices, clypeus, antennae, pronotum dorsally to and including tubercles, tegulae and axillary sclerites, scutellum anteriorly, postscutellum, fore and middle femora beneath, hind femora apically, all tibiae and tarsi entirely, and first five abdominal tergites with a narrow linear preapical fascia. Fulvous: femora exclusive of yellow maculation, and last abdominal segment. First two abdominal segments ferruginous. Squamae and mucro pellucid subhyaline. Wings clear hyaline, irridescent; veins and stigma light fulvous.

Head fulgid; suborbicular in anterior aspect; clypeus and front with dense appressed, silvery sericeous pile; vertex with similar decumbent pubescence; temples with a thinner but similar vestiture. Front gently convex except for flattened area below behind scapes, with fine close puncturation, width at distal end of scapes one-half the vertical eye length; vertex with puncturation somewhat coarser and more separated than that of front; ocelli in a very low triangle, the ocellocular line one-fourth the postocular

[1] After the Cocopa, a tribe of the Yuman Indians.

distance; temples vertically striatopunctate; temporal carinae absent but occipital carina rather well developed and slightly flanged. Antenna with scapes obterete, three-tenths the vertical eye length; pedicel obterete, one and a third as long as first flagellar article; flagellum short, thick, finely puberulent, first segment one and a half the length of second, ultimate article terete, twice the length of penult segment; interantennal distance five-sixths the antenocular line. Clypeus with median length one-fifth the vertical eye length; flat laterally to gently tumid discally; median lobe gently rounded out, the apex with a depressed, glabrous, nitidous flange which is obscurely quinquecrenulate marginally. Mandibles falcate; inner margins with a low obtuse dentiform angle on basal third.

Thorax with a vestiture of appressed, glistening silvery pubescence throughout. Pronotum very short, transverse, linear; dorsal face sharply carinate anteriorly to and including tubercles; lateral angles obtuse. Mesonotum gently arched, with rather close, coarse punctures; posterior margin foveate; axillae immarginate laterally; scutellum transversely subsemicircular, gently tumid, with scattered coarse punctures, bisecting carinule weak to obsolescent, lateral margins with wide pellucid flanges; postscutellum transversely sublunate, one-half length of scutellum, rugose, bisected by a carinule; squamae subequal in length to scutellum, transverse-obliquely carinulate, apices acute, inner (posterior) margins with a small rounded convex lobe which does not extend as far caudad as apices. Mucro subequal in length to scutellum, concave above, width at base one-third the length, divergent gradually to apex, the width of which is one-half the length, and with a broad shallow V-shaped excision there, the latero-apical teeth rounded. Mesopleura with coarse punctures obscured by heavy vestiture; prepectus margined anteriorly; episternal suture weakly impressed and foveolate; hypersternauli and sternostirae not evident; metapleura glabrous, horizontally costulate. Propodeum fulgid, with rather close coarse punctures throughout; dorsal face with appressed silvery sericeous pile, otherwise glabrous; posterior face with discal areole strongly margined, broadly cuneate, concave and nitidous within, closed by an acute angle above, longstalked ventrally, lateral surfaces coarsely striatopunctate; lateral carinae well developed along dorsal face but weak to obsolescent along posterior face and simple not forked below; lateral faces horizontally striatopunctate.

Legs: fore metatarsi with four slender, elongate spines. Middle and hind tibiae with several rows of slender, elongate, testaceous spines on outer faces; the latter also weakly serrate there; longer hind tibial calcar three-fourths the length of hind metatarsi. Hind femora with a short, weak, straight keel above at apex.

Abdomen with a thin vestiture of decumbent silvery pubescence; constricted between segments, the first five with pellucid,

testaceous flanges apically. Tergites with rather coarse close puncturation throughout; chromatorachides moderately developed on first six and with their caudal margins weakly serrate; third to sixth inclusive with long slender latero-apical spines; penult tergite without evident dorsolateral carinules. Pygidium elongate subrectangular, width at base one-half the length, tapering to truncate apex, the width of which is one-third the length, the disc coarsely punctate. Sternites perfulgid; more sparsely punctate than tergites; each with a transverse submedian welt; hypopygium emarginate at apex.

Female. Unknown.

Paratype. A topotypic male specimen, bearing the same data as the type, agrees with the latter in all structural details but has the scutellum entirely yellow and only the first abdominal segment fasciate.

Oxybelus pitanta[2] Pate, new species

The present Mojave Desert form is closely related to *abdominale* from which it may be distinguished by the markedly different conformation of the clypeus, the absence of temporal carinae, the narrow subhastate discal areole of the posterior propodeal face, the truncate inner squamal lobes, and the narrower mucro.

Type. ♂; Cronise, SAN BERNARDINO COUNTY, CALIFORNIA. July 9, 1938. (P. H. Timberlake; on *Chilopsis linearis* [Desert Willow].)

Male. 5 mm. long. Black; the following stramineous: mandibles except red apices, pronotal tubercles, fore and middle tibiae with a narrow stripe on outer faces, hind tibiae basally at knees, and first four abdominal tergites with a very narrow preapical fascia briefly interrupted medially. Fulvous: antennae entirely, trophi. Badeous: apex of clypeal lobe, legs distad of trochanters (hind tibiae brunnescent on outer faces), tegulae and axillary sclerites; pronotum dorsally between lateral angles obscurely sordid badeous. Ferruginous: first two and last two abdominal segments. Pellucid dilute testaceous: squamae, mucro, and apical flanges of first few abdominal tergites. Tibial calcaria testaceous. Middle and hind tarsi brunnescent. Wings clear hyaline, iridescent; veins and stigma dark badeous.

Head suborbicular in anterior aspect; clypeus and front with a moderately heavy vestiture of appressed silvery sericeous pile;

[2] Pitanta: The Chemehuevi name for the Serrano Indians who lived north of the San Bernardino Mountains, in the Mojave Desert.

vertex and temples with a similar but thinner pubescence, that of vertex suberect. Front with moderately coarse, subcontiguous setigerous punctures throughout; width at distal end of scapes five-ninths the vertical eye length; flat below to weakly and angularly tumid above in lateral aspect; bisected by an impression running ventrad from median ocellus. Vertex fulgid, with punctures somewhat coarser and more separated anteriorly than on front, becoming rather coarsely striatopunctate posteriorly; ocelli in a curved line, the ocellocular line one-fourth the postocellar distance; temples with vertical striatopuncturation; temporal carinae weak to absent; post-temporal region sparsely punctured above, subnitidous below; occiptal carina strong, nitidous behind and below this. Antennal scapes obterete, one-third the vertical eye length; pedicel obterete, subequal in length to first flagellar article; flagellum simple, finely puberulent, second segment three-fourths length of first, last article simple, terete, twice length of penult segment; interantennal line seven-eighths the antennocular distance. Clypeus with median lobe one-third the vertical eye length; finely punctate throughout; flat laterally to gently tumid discally, medially with a low elongate subnitidous tubercle; median lobe with width subequal to median clypeal length, apically with a sunken, concave glabrous, nitidous bevel, the dorsal edge not completely margined but medially and laterally with a marginate dentoid angle, apical margin gently rounded out, bluntly angular medially, laterad of lobe with a small, inconspicuous tooth on each side. Mandibles slender, falcate; inner margins with a low obtuse dentoid angulation on basal third.

Thorax more or less fulgid; dorsum and pleura with a moderate vestiture of appressed silvery pubescence, and with moderately coarse, close punctures throughout. Pronotum short, transverse; flat dorsally, anteriorly with a high, erect, arched, laminate carina, notched medially, mucronate at lateral angles, from which descends a vertical carinule, and continuous onto tubercles. Mesonotum simple; mesonotal-scutellar suture impressed, foveolate; scutellum transversely subrectangular, gently tumid, coarsely punctate, bisected by a low carinule, lateral margins with broad pellucid flanges; postscutellum one-half length of scutellum; squamae large, broad, flat, subequal in length to scutellum, transversely-obliquely carinulate, apex subacute, inner (posterior) margins with a lobe subtruncate just before apex. Mucro subequal in length to scutellum; flaring from base (width there one-third the length) to apex (width there two-thirds the length) which is roundly excised, the lateroapical angles broadly rounded; concave above, with no trace of carinules or rugulae within. Mesopleura with prepectus sharply margined anteriorly; episternal suture impressed, foveolate; hypersternauli moderately impressed; sternostirae trisinuate, moderately developed, running obliquely forward and beneath to the sharply margined anterior edge of mesosternum; metapleura glab-

rous, fulgid, with parallel, horizontal costulae. Propodeum fulgid; dorsal face with a very thin vestiture of short suberect light hair, otherwise glabrous; with moderate puncturation throughout; dorsal face traversed on each side by oblique, subparallel, somewhat irregular rugulae; posterior face on disc with a large, deep, sharply margined, narrow subobhastate areole, trigonally acute and closed above, glabrous, nitidous, perfulgid within, long-stalked ventrally, laterad of which surface is traversed by horizontal, subparallel, somewhat irregular rugulae; lateral carinae well developed for entire length, erect and sublaminate dorsally, and simple but with a faint indication of a fork ventrally below; lateral faces with arcuate subparallel rugulae.

Legs: fore metatarsi simple, with four small spinules. Middle and hind tibiae with several rows of long testaceous spines on outer faces; longer hind tibial calcar slender, acuminate, seven-eighths the length of hind metatarsi; hind femora with a fornicate keel above at apex.

Abdomen fulgid; moderately constricted between the segments; with a thin vestiture of short decumbent hair, the tergites somewhat silvery fasciate caudally. Tergites with moderately coarse puncturation throughout; first bisected by a weak impression; first three with chromatorachides, that of third weak, of first two moderately well developed and weakly serrate caudally; third to sixth inclusive with large strong latero-apical spines; penult without evident dorsolateral carinules apically; pygidium subrectangular, slightly longer than wide at base, tapering to apex, the width there one-half the basal width, disc coarsely punctate, apex subtruncate. Sternites subfulgid, more sparsely punctate than tergites, second to sixth with a transverse preapical welt.

Female. Unknown.

Paratypes. Two topotypical males, bearing the same data as the type except that one was taken at flowers of *Asclepias erosa*, agree with the type in all essential features of livery and structural detail.

Oxybelus puente[3] Pate, new species

The weakly margined, edentate upper edge of the clypeal bevel, the subtrigonal discal areole of the posterior propodeal face, and the more weakly angulate front differentiate *puente* from its nearest relative *fossor* Rohwer and Cockerell, of which *umbrosus* Mickel is the male.

Type. ♂; RIVERSIDE, CALIFORNIA. July 9, 1933. (P. H. Timberlake; taken in copula, flying over sand.)

[3] After the Puente Hills between Whittier and Riverside, California.

Male. 5 mm. long. Black; the following deep stramineous: mandibles except red apices, scape anteriorly and annulate at base and apex, pedicel, pronotum dorsally to and including tubercles, scutellum with a small spot at each anterior lateral corner, inner margins of squamae, fore femora apically and beneath, middle and hind femora narrowly annulate at apex, all tibiae on outer faces, fore tarsi entirely, middle and hind metatarsi, axillary sclerites, and first abdominal tergite with a narrow transverse preapical line on each side. Abdomen bright ferruginous. Apex of clypeal lobe castaneous. Flagellum with first few segment brunneous, becoming bright fulvous apically. Middle and hind tarsi beyond first segment sordid fulvous. Pellucid dilute testaceous: tegulae, squamae, apical two-thirds of mucro. Wings clear hyaline, irridescent; veins and stigma badeous.

Head suborbicular in anterior aspect; clypeus and front with a moderate vestiture of appressed silvery pile; vertex and temples with similar but thinner pubescence, that of vertex suberect. Front with rather coarse, subcontiguous punctures throughout except below behind antennal scapes; width at distal end of scapes two-thirds the vertical eye length; flatly concave below behind scapes to transversely subangularly tumid a little above them, bisected by a fine impression running ventrad from median ocellus. Vertex fulgid, anteriorly with punctures somewhat coarser than front, becoming punctatostriate posteriorly; ocelli in a very low broad triangle, inner margins of hind ocelli with a glabrous, nitidous, subtuberculate welt, ocellocular line one-fourth the postocellar distance; temples vertically striatopunctate; temporal carinae entirely absent. Antennal scapes obterete, one-third the vertical eye length; pedicel obterete, four-thirds the length of first flagellar article; flagellum finely puberulent, inconspicuously incrassate distad, first two segments subequal in length, last article simple, terete, twice the length of penult segment; interantennal line seven-tenths the antennocular distance. Clypeus with median length one-fourth the vertical eye length; flat laterally to tumid discally, bisected by a weak arched keel; median lobe with apical width five-thirds the median clypeal length, apically with a narrow, transverse, linear, concave, glabrous nitidous bevel, submarginate above, apical margin shallowly bisinuate, weakly angulate medially and sharply so laterally and in addition with a rounded emargination laterad of which is a strong mucronate tooth. Mandibles falcate; inner margins at basal third with a weak obtuse dentiform angle.

Thorax fulgid; dorsum with a rather sparse clothing of declivous aeneous hair; pleura with a more noticeable vestiture of appressed silvery pubescence. Pronotum short; dorsal face flat, anteriorly with a moderate, cristate carina distinctly interrupted at lateral angles. Mesonotum perfulgid, with large close punctures, disc wtih a broad shallow longitudinal concavity, coarsely

foveolate posteriorly; scutellum transversely subrectangular, flatly tumid, coarsely punctate, bisected by a low carinule, lateral margins with pellucid laminate flanges; postscutellum transversely rugose, three-sevenths (.43) the length of scutellum; squamae large, subequal in length to scutellum, transversely carinulate, apices acute, inner (posterior) margins with a lobe subtruncate a little before apices. Mucro one and four-tenths the length of scutellum; flaring from base (width one-third the length of mucro) to apex (width two-thirds length of mucro) which is deeply excised (depth of excision one-fourth the length of mucro), the latero-apical angles rounded, concave above and crossed one-fourth way from base by a transverse carina. Mesopleura with moderately coarse, close punctures throughout; prepectus sharply margined anteriorly; episternal suture impressed, foveolate; hypersternauli weak; sternostirae moderate, bisinuate, running obliquely forward and beneath to the sharply margined anterior edge of mesosternum. Metapleura glabrous, perfulgid, with parallel, horizontal costulae. Propodeum perfulgid; with a very thin and inconspicuous vestiture of puberulent hair; dorsal face traversed laterally by oblique, subparallel, somewhat irregular rugulae between which surface is finely punctate; posterior face discally with a sharply marginate, deep concave, narrow subcampanulate areole which is closed and finely, irregularly areolate above, glabrous, nitidous within, long-stalked ventrally, laterad of which surface is traversed by subhorizontal, subparallel, irregular rugulae between which surface is finely punctate; lateral carinae strong throughout, sublaminate above, widely and strongly forked ventrally below; lateral faces traversed by subparallel, somewhat irregular fine rugulae.

Legs: fore metatarsi with three short stiff spines. Middle and hind tibiae with several rows of declinate testaceous spines on outer faces; longer hind tibial calcar slender, acuminate, about three-fourths (.76) the length of hind metatarsi; hind femora with a short, sharp, subfornicate keel above at apex.

Abdomen fulgid; very slightly constricted between segments; with a very thin vestiture of short decumbent silvery hair. Tergites with moderately coarse, separated punctures throughout; first bisected by a moderate impression; first two with moderate, welt-like chromatorachides; fourth to six inclusive with large strong latero-apical spines; penult without dorsolateral carinules apically; pygidium subquadrate, slightly broader than long, tapering slightly from base to apex where the width is subequal to the length, disc very coarsely punctate, apex subtruncate. Sternites more finely punctate and more heavily pubescent than tergites; second to fourth with a transverse pre-apical welt; sixth and seventh with caudal margins deeply angularly excised.

Allotype. ♀; Topotypical. Same data as type.

Female. 5 mm. long. Agrees wtih the male (type) except in the following features:

Livery much the same but antennae largely light brunneous; abdominal dorsum bisected by a broad light fuscous streak.

Vestiture similar but clypeus, front, temples and mesopleura with heavy sericeous pile; pygidium with appressed ferruginous setulae.

Head with width of front at distal end of scapes eight-tenths the vertical eye length. Antennal scapes about four-tenths (.39) the vertical eye length; pedicel two and a half times length of first flagellar article which is two-thirds length of second; interantennal distance five-eighths the antennocular distance. Clypeus with median length about one-fourth (.242) the vertical eye length; flat laterally to very gently tumid discally, medially with an elongate, subcompressed tubercle; median lobe with apical width about twice the median clypeal length, apically with a narrow, transverse, deflexed, nitidous, glabrous bevel, immarginate above, apical margin bisinuate medially and thus obscurely tridentate, the latero-apical angles in addition with a large strong tooth.

Thorax in general the same as male.

Legs: fore metatarsi with five spines. Middle and hind tibiae strongly spinose on outer faces.

Abdomen perfulgid; with punctures more separated on tergites. Pygidium flat, trigonal, one and a fifth times as long as broad at base, apex broadly rounded, disc with coarse, close, setigerous punctures.

Paratypes. CALIFORNIA: RIVERSIDE: July 9, 1933; (P. H. Timberlake; flying over sand): 2 ♂, 2 ♀; May 25, 1928; (P. H. Timberlake; on *Erigonum fasciculatum* [California Buckwheat]): 2 ♂; August 29, 1926; (P. H. Timberlake; on *Polygonum lapathifolium*, 1 ♂; September 20-24, 1931; (P. H. Timberlake; on *Baccharis viminea* [Mulefat]: 2 ♂; September 30, 1934; (P. H. Timberlake; on *Baccharis emoryi* [Waterwillow]): 2 ♂; October 9, 1929; (P. H. Timberlake; on *Eriogonum gracile*): 1 ♀. WHITTIER, LOS ANGELES COUNTY; August 11, 1920; (P. H. Timberlake; on *Foeniculum vulgare* [Fennel]): 3 ♂. CLAREMONT, LOS ANGELES COUNTY; (C. F. Baker): 1 ♂, 1 ♀. CUSHENBURY SPRINGS, SAN BERNARDINO COUNTY; September 1, 1936; (P. H. Timberlake; on *Lepidospartum squamatum* [Scale-Broom]): 1 ♂.

The paratypes agree with the typical pair in all essential details. The males taken at Riverside, September 20-24, 1931, are smaller, melanic specimens, as is also the male from Cushenbury Springs. A number have a distinct fuscous streak down the back of the abdomen.

THE NEARCTIC SAWFLIES OF THE GENUS RHOGOGASTER
(Hymenoptera)

BY HERBERT H. ROSS
Illinois Natural History Survey, Urbana, Illinois

In North America, the sawfly genus *Rhogogaster* Konow is primarily a western genus, being represented most abundantly in the Rocky Mountain region from British Columbia to California. The genus comprises a group of four medium sized species which are uniformly green with black markings on the dorsum and legs. Fifteen names have been proposed for the nearctic members of the genus; three of these belong to other genera and some of the remainder must be reduced to syonymy. Color patterns on head, pleurae, and abdomen vary considerably in shape and extent of the black areas, and are of only limited use for identification. Characters of the genitalia, especially the saws, have reliable identification characters.

Our species fall into two natural groups: one, with flat head and shorter eyes, includes *lateraria* (Cresson) and *addenda* (Cresson); the other, with slightly rounder head and longer eyes, includes *californica* (Norton) and the holarctic *viridis* (Linnaeus). The generic synonymy and definition has been given by Ross (1937:104)*.

KEY TO NEARCTIC SPECIES

1. Apical sternite cleft with a sheath, fig. 6, females.....2
   Apical sternite not divided along meson, males.....5
2. Pectus green or straw-color.....3
   Pectus black.....4
3. Lancet with ventral lobes close together, spurette in a depression and not projecting above it, fig. 9.....*californica*
   Lancet with ventral lobes further apart, spurette projecting above level of depression, fig. 8.....*viridis*
4. Lancet with spurettes arising from depression at base of ventral lobes, fig. 10; abdominal tergites with dorsal area black, latero-ventral portion almost entirely green.....*addenda*
   Lancet with spurettes arising from ventral lobe above depression, fig. 11; abdominal tergites more banded in appearance, the dorsal black area of each tergite continuing as a band down the latero-ventral portion.....*lateraria*
5. Costa and stigma entirely green or whitish.....6
   Costa and apex of stigma dark brown or black.....7

* Illinois Biological Monographs 15:1-173; 1937.

6. Head of penis valves more or less rectangular, fig. 2..*californica*
   Head of penis valves hatchet-shaped, fig. 1.....*viridis*
7. Mesopleurae and pectus separated by a broad black stripe which extends to, or almost to, the posterior margin of the pectus; praeputial processes no longer than width at apex, fig. 4 .....*lateraria*
   Mesopleurae and pectus without a separating dark band or this band irregular and extending only midway across sclerite; praeputial processes longer than width at apex, fig. 5....*addenda*

Rhogogaster viridis (Linnaeus)

Tenthredo viridis Linnaeus, Systema Naturae, 10th ed.: 557, 1758.
Rhogogaster ruga MacGillivray, Can. Ent. 60:160; 1923. ♀. *New synonymy.*
Rhogogaster respectus MacGillivray, N. Y. Ent. Soc. Jour. 31:165; 1923. ♂. *New synonymy.*

This species has the habitus of some species of *Tenthredo*, being robust, about 10 mm. long, bright green in life with black markings on dorsum of head and thorax, and with the dorsum of the abdomen black. The sheath, fig. 6, is round at apex compared to the more pointed sheath of *californica*, figs. 7A and B; this difference, however, is not sufficiently marked to be useful for diagnosis. The male frequently has the black on the abdomen reduced to narrow, transverse bars.

The species occurs throughout the Rocky Mountain region from Alaska to California, but apparently extends east only as far as Manitoba; it is recorded from many localities in northern Europe and Asia. Available data indicate a flight range from mid-May to mid-July.

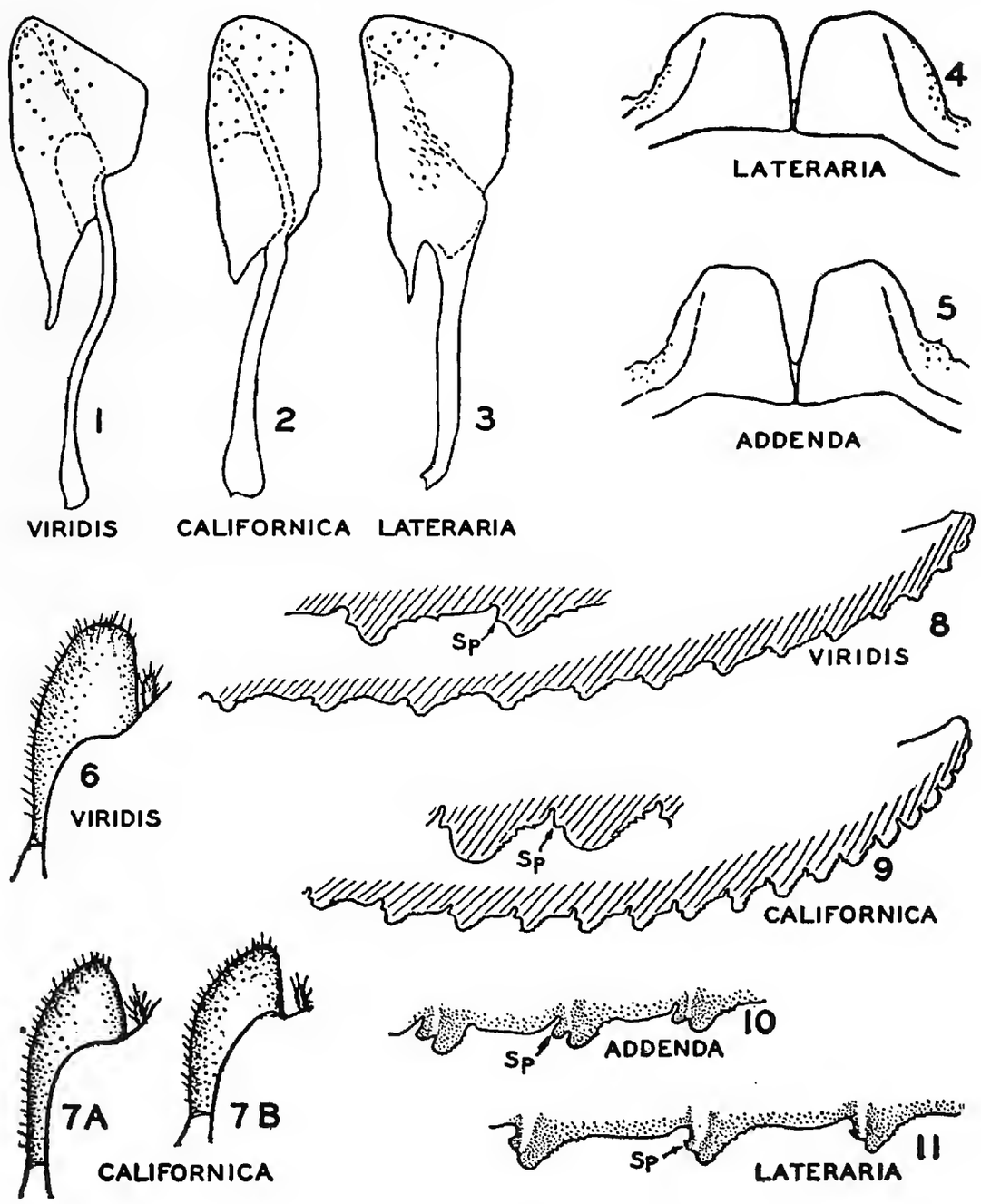
Distribution Records.—Alaska: Eagle, Katmai, Skagway. Alberta: Edmonton, Fawcett, Gull Lake, High Prairie, Wabamum, Waterton, Wetaskewin. British Columbia: Great Divide. California: Carville, Lassen National Park, Meadow Valley, Nash Mine. Manitoba: Birtle, Husavick. Montana: Lake McDonald, Glacier National Park. Yukon: Hootalinqua.

Rhogogaster californica (Norton)

Tenthredo californicus Norton, Ent. Soc. Phil. Proc. 1:198; 1862. ♀.
Tenthredopsis evansii Harrington, Can. Ent. 21:98; 1889. ♀. *New synonymy.*
Tenthredo ripula MacGillivray, N. Y. Ent. Soc. Jour. 31:109; 1923. ♂. *New synonymy.*

This resembles *viridis* in external characteristics but is dis-

tinguished in both sexes by differences in genitalia. Its distribution embraces not only the western portion of North America but also a band across the northern part of the continent extending



EXPLANATION OF FIGURES

Parts of *Rhogogaster*, Figs. 1-3, penis valves. Figs. 4-5, praeputial lobes. Figs. 6-7, sheaths. Figs. 8-11, ventral margin of saws. sp—spurette.

to the Atlantic coast. It has essentially the same seasonal timing as *viridis*, from May to mid-July.

Distribution Records.—ALBERTA: Banff, Beaver Lodge, Fawcett, Gull Lake, Rodner, Waterton. CALIFORNIA: Hopland, Lake

Tahoe, Lassen, Modoc County, Plumas County, Sequoia National Park, Sonoma County, Trinity County, Truckee, Tulare County, Yosemite Valley. COLORADO: Longs Peak Inn. IDAHO: Worley. MANITOBA: Aweme, Birtle. MICHIGAN: Douglas Lake. MONTANA: Drummond, Florence, Gallatin County. NEW YORK: Karner. ONTARIO: Sudbury. OREGON: Corvallis, Eagle Ridge. UTAH: LaSal Mountains. WASHINGTON: North Yakima. YUKON: Whitehorse.

RHOGOGASTER LATERARIA (CRESSON)

Tenthredo lateraria Cresson, Amer. Ent. Soc. Trans. 8:23; 1880. ♀.
Tenthredo retosta MacGillivray, N. Y. Ent. Soc. Jour. 31:109; 1923. ♂. *New synonymy.*

This species is smaller and with much more solid and extensive black areas than the preceding two, the abdomen appearing banded. The head is markedly flattened dorsad and wider than high. The species is restricted to the Rocky Mountain region and has not been taken north of Salmon Arm, B. C. It is a spring form, first collection date being March 21, at Corte Madero Creek, California, latest being July 22, at an elevation of 6,000 feet in the Blue Mountains in Oregon.

Distribution Records.—ALBERTA: Waterton. BRITISH COLUMBIA: Okanagan Falls, Salmon Arm, Vernon. CALIFORNIA: Corte Madero Creek, Lake Tahoe, Muir Woods, South Anselmo. IDAHO: Juliaetta, Moscow, Worley. OREGON: Corvallis, Eagle Ridge, Wallowa Lake. WASHINGTON: Wawawai.

RHOGOGASTER ADDENDA (CRESSON)

Tenthredo addenda Cresson, Amer. Ent. Soc. Trans. 8:23; 1880. ♀.
Tenthredo vittatipes Cresson, Amer. Ent. Soc. Trans. 8:24; 1880. ♂. *New synonymy.*
Rhogogaster truncatus Rohwer, U. S. Nat. Mus. Proc. 43:211; 1912. ♀. *New synonymy.*
Rhogogaster pitohatus Rohwer, U. S. Nat. Mus. Proc. 43:211; 1912. ♀. *New synonymy.*

Slightly smaller than *lateraria* but almost identical with it in color and general structure. The females are readily distinguished by saw characters; the males are very similar and frequently difficult to differentiate except by characters mentioned in the key. The species range is very similar to that of *lateraria* but records indicate a seasonal timing two or three weeks later.

Distribution Records.—BRITISH COLUMBIA: Agassiz, Cultus Lake, Nanaimo. CALIFORNIA: Alameda, Cisco, Fallen Leaf Lake, Giant Forest, Gold Lake, Lake Tahoe, Martinez, Nash Mine, Santa Cruz Mountains. COLORADO: Manitou. IDAHO: Juliaetta, Mt. Moscow. MONTANA: Bonner. NEVADA: Reno. OREGON: Corvallis, Mt. Hood. WASHINGTON: Blue Mountains, Dayton, Easton, Elhi Hill, Garden, Olympia, Spokane, Wawawai.

SPECIES TRANSFERRED TO OTHER GENERA

Rhogogaster sayi Rohwer=*Macrophya rapae* (L.) *New synonymy.*
Rhogogaster reliqua MacGillivray = *Tenthredo olivacea* L. *New synonymy.*
Rhogogaster respersus MacGillivray = *Tenthredo olivacea* L. *New synonymy.*

AN ALTERNATE HOST RECORD FOR THE APHID, THECABIUS POPULI-MONILIS (RILEY)

On October 25, 1942, along the banks of the Arroyo Seco River in Monterey County, California, the author found apterous forms of *Thecabius populi-monilis* (Riley) on the roots of willow (*Salix* sp.).

This aphid forms bead-like pseudogalls on the upper side of the leaves of *Populus* spp. in central and southern California, and as far as the author is aware, there are no records of the migration of this aphid to the roots of any plant.

On May 12, 1942, at Gonzales, which is not far from the Arroyo Seco locality, first to third instar aphids of this species were found in bead-like galls on cottonwood. The galls persisted, and by August no living aphids in the galls were found.

At Arroyo Seco, the apterous aphids were exposed on the small, fibrous roots by turning over rocks just above water line. They were covered by a white, waxy material. This aphid preferred a habitat where leaves collected under the rocks; this apparently afforded them more protection.

Some of the aphids had wing pads, and winged forms emerged in the laboratory and were later determined as this species by Professor E. O. Essig of the University of California.—W. H. LANGE, JR.

NOTES ON THE NORTH AMERICAN SPECIES OF *ORTHOPLEURA* SPIN.

(Coleoptera, Cleridae)

BY A. B. WOLCOTT

Downers Grove, Illinois

The writer trusts that the following notes and key may prove to be of some aid to students of our beetle fauna. The occurrence of a supposedly new species enables the author to include its description. All the known species with the exception of three (*O. purpurea* Gohr., *O. ichnoides* Chevr., and *O. suturalis* Chevr.,) are before the writer at this time. The characters used in the key for these three species are derived from their original descriptions.

The presence of a more or less distinct, post-median elytral pale fleck is a matter of no moment, as it may, or may not occur in individuals of the same species. The punctation of the elytra is rarely of any importance as a diagnostic character due to the fact that it is so nearly identical in the different species, that it could better be considered as of generic value, hence these features are given but little consideration in the following accounts.

Orthopleura cyanipennis Chapin

Orthopleura cyanipennis Chapin, Proc. Ent. Soc., Wash., 22:52. 1920.

A paratype of this fine and beautiful Mexican species is strikingly similar in size, color and form to *Tenerus higonius* Lewis, a Formosan insect, but the resemblance, remarkable as it is, is merely superficial. *Cyanipennis* is a slender species with head, prothorax and legs bright red, the elytra steel blue. Length (in specimen at hand) 7.6 mm.

Orthopleura hintoni Wolcott, new species

Allied to *O. cyanipennis* Chapin, but more robust. Head, prothorax, base of antennae, body beneath and legs red. Head rather coarsely punctured, the occiput finely but distinctly rugulose. Antennae with scape and next two or three segments red, the balance of the segments of the funicle light piceous, shining, clava dark piceous. Sides of prothorax straight, pronotum quadrate, rather coarsely punctured, sides densely punctured, all punctures well separated, at middle of base a large smooth tubercle prolonged

anteriorly as a smooth, feeble costa to beyond the middle of the disk, the tubercle and costa with a few rather coarse, scattered punctures. Head and thorax rather densely clothed with long reddish hairs. Elytra blue, basal three-fifths rather coarsely and moderately densely punctured, basal portion scabrous in small areas, in other small places there is a tendency for the punctures to become seriate; apical two-fifths finely and densely punctured, these fine punctures also intermixed with the coarse punctures of basal portion. Pubescence erect, moderately dense and fine, black. Scutellum obscurely red. Legs red, distinctly punctured and pubescent. Length, 9.6 mm.

Holotype, a female in the collection of the author, MAZATLAN, (West Coast) MEXICO, collected by Dr. H. E. Hinton, August 4, 1932, to whom this fine species is dedicated.

This species is so closely allied to *O. cyanipennis* Chapin, that it is only after long consideration that the writer has ventured to characterize it. The more robust form, the coarser puncturing and the presence of feeble costa are the characters depended upon for the recognition of this species.

ORTHOPLEURA QUADRATICOLLIS SPINOLA

Orthopleura quadraticollis Spinola, Mon. Clér. pl. XXXII, fig. 4, 1844.

In 1910 (Publ. Field Mus. Nat. Hist. Zoöl. Ser., Vol. VII, no. 10, p. 393), the writer called attention to this species and gave some descriptive notes drawn from the figure given by Spinola. Due to the fact that Spinola lost his descriptive notes he figured but did not describe this species and he failed to mention the locality or country from which his specimen was derived. However, the figure is very good, and should serve to identify the species. Sometime ago the writer received from Drs. H. E. Hinton and R. L. Usinger a fine male specimen of this species collected at Bejucos, Temescaltepec, Mexico, July 4, 1937. This specimen agrees in all respects with the cited figure by Spinola, and affords an opportunity to describe it in detail and thus make it better known.

General color deep rich red; form elongate, subcylindrical, rather robust; elytra moderately convex, conjointly rounded at apex, sutural angles obtusely rounded, dorsum subopaque. Head dark rufous becoming very dark (nearly black), on occiput; pubescence short, rather dense, yellow, darker on occiput. Antennae

with scape and funicle red, sparsely clothed with short flavous hairs, clava consisting of three enlarged segments, dark piceous, inner angles of the first and second segments of clava produced into flattened rami, which are obtusely rounded at their apices, three enlarged segments of clava together longer than two-thirds total length of antenna. Prothorax dark rich red, as broad as long, quadrate, sides parallel, pronotum dark rich rufous, clothed with long, dense golden yellow sericeous recumbent hairs, median longitudinal vitta extending from base to apical margin, nude, exposing the integumental ground color, wide at base, which has neither a tubercle nor a costa present, disk with fine, dense, feebly impressed punctures. Scutellum obscurely rufous. Elytra wider at base than prothorax, wider posteriorly, sides feebly, broadly rounded to apex, which is conjointly obtusely rounded, sutural angles obtusely rounded, color piceous, suture, lateral and apical margins narrowly yellowish-red, pubescence concolorous with the surface from which it arises, short, fine and rather sparse. Metasternum dark red, sparsely feebly punctured, at sides densely punctured. Abdomen shining, dark piceous, apical segment reddish, coarsely, sparsely and feebly punctate, sides with a few long yellow hairs. Legs red, rather densely coarsely punctured rather densely clothed with long hairs, tarsi of all legs fuscous, tibiae of middle fuscous, tibiae of front and hind legs fuscous at apex.

Length (in present specimen), 10 mm.

O. quadraticollis Chevr., and *O. lepida* Klug are the only members of the genus, as far as known to the writer, in which the suture and lateral margins are margined with a pale color. *O. lepida* is a small species (4.5 mm. long) of Cuba, and bears but little resemblance to Spinola's species. Chevrolat (Rev. Mag. Zoöl., 1874, p. 329) described under *O. damicornis* F. a supposed variety which he designated as "Var. D." from Cuba, it is identical with *lepida.*

In occasional specimens of *O. binotata* Gorham the elytra may be margined in a similar manner to *quadraticollis,* but may be readily distinguished by the maculations of the pronotum. *O. suturalis* Chevrolat, blue-black, with the suture and elytral apices broadly reddish has a dark pronotum. *O. cyanipennis* Chapin and *O. hintoni* Wolcott, are the only species in which the elytra are of a distinct blue color. *O. punctatissima* Chevr., and *O. texana* Bland, are closely allied species, in the former the antennae are black, piceous at base, head clothed with rather dense gray pubescence; the latter has the head clothed with short golden-yellow hairs, the antenna with the scape and funicle dark rufous with yellow hairs, clava black. *O. teneroides* Gorham has the sides of

the prothorax broadly. feebly rounded, the punctation of the very black elytra is much coarser than in any of the other known species. The pronotum with rather long, dense, sericeous golden yellow pilosity at each side middle of disk. *O. damicornis* Fab., has the head black, clothed with black hairs, the pronotum red with the sides and base narrowly margined with black, and the elytra feebly shining.

These notes and the key which follows should facilitate identification of the several species.

KEY TO THE AMERICAN SPECIES OF ORTHOPLEURA SPINOLA

1. Pubescence of pronotum evenly distributed 2
   Pubescence of pronotum so distributed as to form vittae 3
2. Pronotum dark piceous 4
   Pronotum wholly or in part red 5
5. Elytra wholly red 6
   Elytra distinctly blue 7
   Elytra black or blue-black 8
   Elytra piceous 9
4. Elytra with suture broadly and apex, pitchy red ..... *suturalis* Chevr.
   Elytra uniformly piceous ..... *guadeloupensis* n. sp.
7. Pronotum with feeble tubercle and costa ..... *hintoni* n. sp.
   Pronotum with tubercle and costa wanting ..... *cyanipennis* Chpn.
8. Elytra blue-black, elytral margins pale yellowish-red ..... *lepida* Klug
   Elytra black, very coarsely punctured ..... *tenercides* Gorh.
   Elytra black, rather finely punctured ..... *damicornis* Fab.
9. Funicle red, head clothed with golden-yellow hairs ..... *texana* Bland.
   Funicle black, head clothed with gray hairs ..... *punctatissima* Chevr.
6. Thorax red, sides and three vittae, black ..... *purpurea* Gorh.
3. Thorax red, elytra piceous, suture and lateral margins yellow 10
10. Pronotum with a narrow nude median vitta dark red ..... *quadraticollis* Spin.
    Pronotum with distinct spots and vittae of integumented color 11
11. Pronotum with two large ovate dark spots at base ..... *binotata* Gorh.
    Pronotum with sides and two linear vittae, black ..... *ichnoides* Chevr.

APPENDIX

Orthopleura guadeloupensis Wolcott, new species

Piceous, thinly clothed with fine, short brown pubescence. Antennae with scape and following segment red, infuscate, balance of funicle dark piceous, clava finely clothed with short, gray pubescence, clava formed as in *O. quadraticollis* Spinola, but very pale piceous, nearly rufous, finely pubescent. Pronotum piceous, densely, sparsely and coarsely punctate. Elytra dark reddish piceous, punctured as usual in this genus, at apex densely clothed with flavo-cinereous pubesence. Abdomen rufous, densely rather coarsely punctate, the segments each with their posterior margins dark piceous, fifth segment elongate trapezoidal semi-circularly emarginate at apex, sixth ventral segment short, obtusely rounded at apex. Metasternum dark piceous, punctate. Legs piceous red, densely and rather coarsely punctured. Length, 5.7 mm.

Holotype, a male in the collection of the writer, GUADELOUPE. (Staudinger).

A TAXONOMIC NOTE ON ARADUS DEPICTUS VAN DUZEE

This species was synonymized with *concinnus* Bergroth by me (Ann. Ent. Soc. Amer. 29:495, 1936) because no mention was made of distinctive characters in the original description, the characters mentioned by Parshley (Trans. Amer. Ent. Soc. 47: 47-50, 1921) were variable in the series of specimens before me, and the ranges of the two forms overlapped. Dr. Parshley (*in litt.*) has since called my attention to constant structural differences in the antennae which serve to distinguish the two species.

In *concinnus* the antennae are relatively short and the second segment is slightly shorter than the interocular space and evenly narrowed to just before the base. In *depictus* the antennae are longer, the second segment being longer than the interocular space, rather evenly thickened on its apical two-thirds, and abruptly narrowed at basal third. The third segment is less than half as long as second in *concinnus* and more than half as long as second in *depictus*. In *concinnus* the second segment is usually annulate with white at middle and at apex whereas it is entirely brown in *depictus*. The scutellum is relatively broader in *concinnus*.—R. L. USINGER.

IXODES CALIFORNICUS BANKS, 1904, *IXODES PACIFICUS* N. SP., AND *IXODES CONEPATI* N. SP.

(Acarina: Ixodidae)*

BY R. A. COOLEY, *Senior Entomologist,* AND GLENN M. KOHLS, *Associate Entomologist, United States Public Health Service.*

IXODES CALIFORNICUS BANKS

This tick was described by Banks (1904, Proc. California Academy Sciences, 3d Ser., Zool., Vol. III, No. 13, p. 369, Plate XLI, Fig. 57) from "several specimens" found on a bird, "*Toxostoma crissalis,*" at Claremont, California (Baker). The author apparently believed the specimens to be females for he states, "Length ♀ 4 mm."

Through the kindness of Dr. Joseph C. Baequaert we have had an opportunity to examine the type material from the Museum of Comparative Zoology, Harvard University. It was found that the lot contains 5 nymphs. Because of the absence of females, an attempt was made to locate further type material in the California Academy of Sciences, but without success. Through Dr. Bequeart we have learned that Mr. Banks now considers it very likely that he saw only nymphs when he described *californicus* and that all of the specimens were in fact nymphs. Banks' description and figures of the nymphs made in 1904 are entirely adequate for the recognition of the specimens. These nymphs are specifically different from those of the tick which has been generally accepted as *californicus.* They suggest *I. brunneus* Koch, 1844, the nymph of which has never been adequately described and figured. Whether *californicus* will eventually fall as a synonym of *brunneaus* can be determined only when nymphs of *brunneus* are available for study.

Banks in 1908 (A Revision of the Ixodoidea, or Ticks of the United States, Bureau of Entomology, Technical Series, No. 15, p. 24) redescribed *Ixodes californicus* Banks on the basis of a male and female from specimens taken in Claremont, Santa Clara County, Santa Cruz Mountains, and Redwood Creek, Humboldt County, all of California, and the hosts given are gray fox and black-tailed deer. His redescriptions and figures were ade-

* Contribution from the Rocky Mountain Laboratory (Hamilton, Montana) of the Division of Infectious Diseases of the National Institute of Health.

quate for the recognition of the common *Ixodes* of the Pacific Coast and the name *californicus* has since been erroneously used for this tick, which is now described as *Ixodes pacificus* n. sp.

Ixodes pacificus Cooley and Kohls, new species

Female

Body. Capitulum, scutum and legs brown-black. Unfed, body nearly elliptical. Scutum reaching about half the length. Postscutal areas with numerous long hairs. Lateral folds distinct, narrow. Length, from scapulae to posterior margin, 2.64 mm.; width, 1.14 mm. Fully fed specimens are a little wider and swollen behind and may reach 9.0 mm. in length.

Capitulum. Length, from posterior corners to tip of hypostome, 0.84 mm.; width of basis just posterior to the palpi, 0.45 mm. Basis with an even, convex curvature on top, lateral margins abrupt, converging posteriorly. Posterior margin a concave line, salient; cornua absent. Porose areas oval or sub-triangular, separated by less than the length of one. Surface smooth, shagreened, shining. Palpi long, bluntly rounded apically; lateral margins nearly straight, median margins curved. Article 2 longer than 3. Combined length of 2 and 3, 0.6 mm. Surface of palpi faintly shagreened, punctate and with a few hairs which are short except for two or three long ones near the base on the median side. In ventral view the basis is evenly curved, broadly rounded and salient behind; transverse sutural line visible. Auriculae mild as short ridges. Palpi flattened medially. Article one with the inner plate visible as a triangular point.

Hypostome. Long, rounded apically. Denticles 3/3 for most of the length but 4/4 in the distal portion; more visible in specimens mounted in balsam. Lateral denticles longest and pointed; median files with the denticles progressively smaller and rounded. Length about 0.54 mm.

Scutum. Slightly longer than wide, widest at about the middle. Posterior border broadly rounded. Scapulae pointed, moderate in length. Sizes from 1.26 mm. x 1.14 mm. to 1.44 mm. x 1.36 mm. Lateral carinae never distinct but traceable in some specimens. Cervical grooves usually visible only in reflected light as long, shallow depressions which are first convergent, then divergent and terminate before reaching the postero-lateral border. Surface shagreened throughout. Punctations fine and numerous. Hairs long and large, confined usually to longitudinal bands in the median and the lateral areas. Hairs on the scutum very similar to those on the postscutal area but usually a little longer.

Legs. Smooth and shagreened. Tarsi long, tapering, and with subapical humps very small on I, absent on all others. Ventral hairs on legs long and spinelike. Haller's organ on I distant from

the distal end. Length of tarsus I, 0.84 mm.; metatarsus, 0.50 mm. Length of tarsus IV, 0.82 mm.; metatarsus, 0.54 mm.

Coxae. Smooth, mildly convex, with very long hairs and with posterior edges salient. Internal spur on I long, tapering and pointed; absent on II, III and IV, but on II III there are salient corners. External spurs short on all coxae.

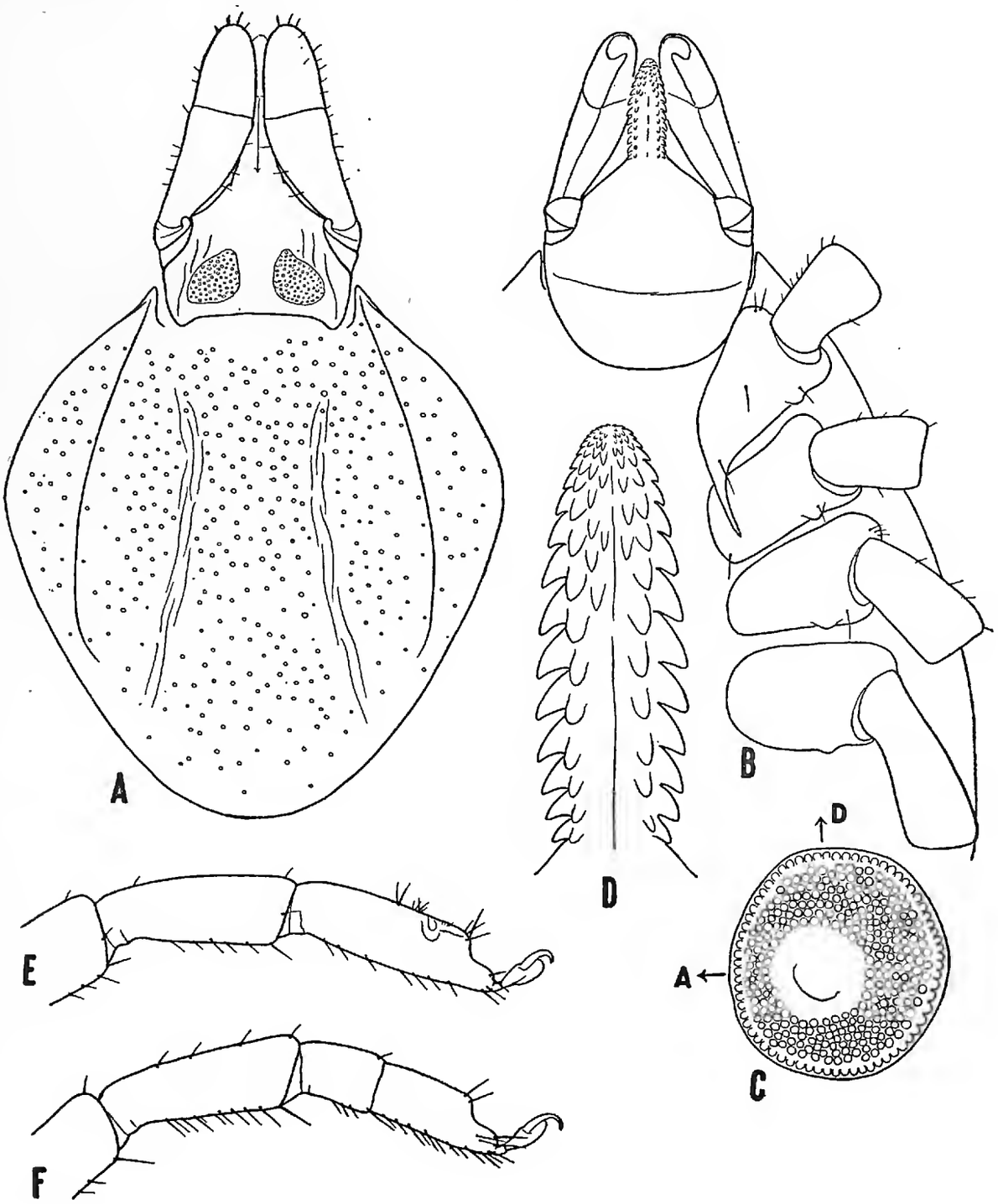


Figure 1. Female *Ixodes pacificus* Cooley and Kohls. A. Capitulum and scutum, dorsal. B. Capitulum and coxae, ventral. C. Hypostome. D. Spiracular plate. E. Tarsus and metatarsus of leg I. F. Tarsus and metatarsus of leg IV. G. Shape, replete specimen.

Spiracular plate. Suboval, with the longer axis transverse and with the nearly level surface well elevated over the body surface. Goblets moderate in number and size. Size about 0.3 mm. x 0.27 mm.

Sexual opening. Placed between coxae IV.

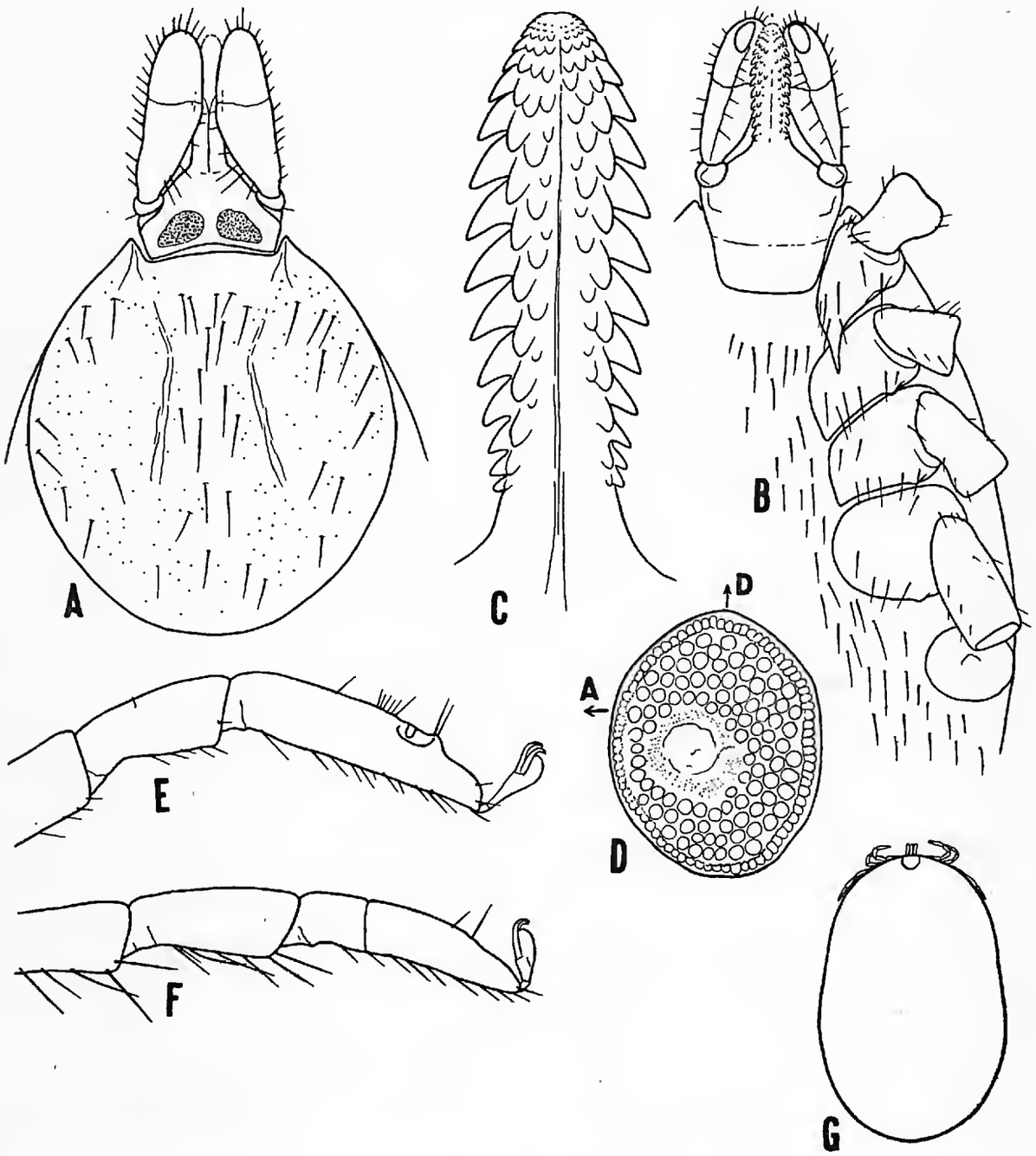


Figure 2. *Ixodes pacificus* Cooley and Kohls. A. Male capitulum and body, dorsal. B. Male capitulum and coxae, ventral. C. Male spiracular plate. D. Male hypostome. E. Male tarsus and metatarsus of leg I. F. Male tarsus and metatarsus of leg IV. G. Nymph, capitulum and scutum, dorsal. H. Nymph, capitulum and coxae, ventral. I. Nymph hypostome. J. Nymph, spiracular plate. K. Nymph, tarsus and metatarsus of leg I. L. Nymph, tarsus and metatarsus of leg IV.

Male

Body. Oval, a little wider behind. Length, from scapulae to posterior border, 2.19 mm.; width, 1.32 mm.

Capitulum. Basis flattened (mildly convex) edges salient at the sides and behind; lateral borders convergent behind. Cornua absent. Surface punctate. Palpi broad, rounded apically, and with article 2 depressed dorsally. Article 1 simple. Hairs short excepting about three on the median side of article 2. In ventral view the basis is short and with a salient point behind. Auriculae present as lateral ridges. Palpi flattened medially and with the ventral edge in line with a mild tooth on inner plate of article 1.

Scutum. Length 2.04 mm.; width, 1.02 mm. Surface about equally convex on both ends. Pseudoscutum usually not visible but if visible then broadly rounded behind. Scapulae long, bluntly pointed and round on top. Hairs numerous and long, similar to those on the lateral folds; each hair arising from a depression which directs the supine hair backward. Punctations numerous, fine. The surface in general faintly shagreened.

Hypostome. Large and with large lateral denticles, those near the base larger, directed posteriorly and well raised above the surface of hypostome. The small median denticles as diagonal crenulations. Length about 0.33 mm.

Ventral plates. Median plate three times as long as the anal plate. Pregenital plate not clearly defined. Punctations on all plates numerous and fine, shallow. Hairs on all plates fine and numerous.

Legs. Essentially as in the female but with metatarsus on leg I relatively much shorter.

Coxae. Essentially as in the female but the internal spur on coxa I is shorter.

Spiracular plate. Oval with the longer axis longitudinal. Macula a little ececntric on the antero-ventral side. Length, 0.268 mm.; width, 0.221 mm.

Sexual opening. At the level of coxae III.

Nymph

Capitulum. Basis broad with the posterior edge salient and nearly straight. Cornua definite, small, divergent, slightly elevated over the level of the posterior margin and often with the elevation extending forward. Surface impunctate, shagreened. Palpi long, laterally straight, medially curved. Article 1 simple in dorsal view. Hairs few. In ventral view basis is long, waisted at the middle, broadly rounded and salient behind. Auriculae as mild lateral extensions. Article 1 of the palpus with a faint ventral tooth.

Hypostome. Rounded apically. Denticles first 3/3 and then 2/2 with the lateral teeth pointed and larger, the medians rounded and progressively smaller to the median line. Length about 0.19 mm.

Scutum. Sub-circular, slightly wider than long. Scapulae short and rounded. Lateral carinae faint, nearly straight. Cervical grooves distinct, first convergent and then divergent, fading out before reaching the postero-lateral margins. Surface shagreened. Punctations few and small. Hairs few and small.

Legs. Essentially as in the male and female. Metatarsus on leg I about half as long as the tarsus.

Coxae. Essentially as in the male.

Spiracular plate. Sub-circular with the longer axis transverse. Porose central. Goblets few and scattered. Length, 0.134 mm., width, 0.115 mm.

Holotyype (female), *allotype* (male) and *paratypes* all from A. P. 8096, a lot of 5 females and 6 males collected from vegetation, MONTEREY COUNTY, CALIFORNIA, March 16, 1932. Also 8 paratype nymphs, A. P. 20022, from Vancouver, B. C., reared by Mr. J. D. Gregson.

Holotype and allotype, paratypes of adults and paratype nymphs are deposited in the collections of the Rocky Mountain Laboratory, Hamilton, Montana. Paratype adults and nymphs are placed in the United States National Museum, Washington, D. C.; Museum of Comparative Zoology, Harvard University, Cambridge, Mass.; Division of Entomology and Parasitology, University of California, Berkeley, California.

The nymphs of *pacificus* may be readily distinguished from those of *californicus* by several characters including their very small, ridge-like auriculae. In *californicus* they are large, triangular, and protrude laterally.

The adults of *pacificus* differ from those of *I. scapularis* Say, 1821, in several respects. The absence of cornua in the *pacificus* female and the much smaller spiracular plates in the male will serve to separate the two species. Furthermore, *pacificus* is known only from coastal regions of British Columbia and Western United States as far south as San Diego, California. It undoubtedly extends south into Lower California. *Scapularis*, however, is widely distributed in much of the Southeastern United States and it has also been reported from near Tampico, Mexico.

Ixodes conepati Cooley and Kohls, new species

Female

Described from holotype (unengorged) and one paratype (a little engorged).

Body. Color well sclerotized parts brown-black. Length (tips of scapulae to posterior extremity), 4.05 mm.; width, 2.25 mm. Oval, widest at about the middle. Color, yellow-brown. Scutum reaching about half the length. Postscutal area smooth, striate, and with numerous hairs which are similar to those on the marginal folds.

Capitulum. Length (cornua to tip of hypostome), 0.9 mm.; width of basis (dorsum back of palpi), 0.66 mm. Sides either curved or straight and slightly convergent behind. Cornua distinct, moderately rounded, and at about the same level as the salient posterior margin. Porose areas large, depressed and well separated. Surface smooth, shining, and faintly shagreened. Inner plate of palpal article 1 visible as a small button. Article 2 longer than 3; combined length, 0.95 mm.; greatest width, 0.21 mm. Laterally straight, medially curved; widest across article 2. Hairs few and small. In ventral view basis is broad, slightly convex, broadly rounded and salient behind. Auriculae absent. Transverse sutural line visible. Palpi flattened medially. Inner plate on article 1 visible as a small sub-oval plate.

Hypostome. Long with sides nearly parallel, apex rounded. Denticles 3/3 for about the terminal one-third, then 2/2 to the base. Denticles progressively smaller from the laterals to the median line. Length about 0.51 mm.

Scutum. Length, 1.8 mm.; width, 1.68 mm. A little longer than wide, widest in front of the middle; rounded behind. Scapulae long, thin and pointed. Lateral carinae distinct and curved, starting at the scapulae and nearly reaching the postero-lateral margins; more precipitous on the median than on the lateral sides. Cervical grooves shallow, indefinite, first convergent then divergent, and reaching posteriorly to opposite the termini of the carinae. Punctations numerous, moderate in size. Surface faintly shagreened, shining. Hairs very few and short (negligible).

Legs. Long and small. All tarsi terminating abruptly with subapical dorsal humps only moderate. Ventral hairs more numerous and coarser on leg IV than on I. Length of tarsis I, 0.75 mm.; metatarsus, 0.61 mm. Length of tarsus IV, 0.75 mm.; metatarsus, 0.72 mm.

Coxae. Coxae II, III, and IV mildly convex; salient on the posterior margins. Internal spur on I long, thin, and pointed; absent on all others. External spurs on all coxae short, rounded, and all about equal. A few hairs on all coxae.

Spiracular plate. Large, nearly circular, with the slightly longer axis transverse. Surface a little elevated over that of the body, faintly convex. Goblets numerous and large. Size 0.37 mm. by 0.35 mm.

Sexual opening. Situated between coxae III.

The specimen included as a paratype, differs from the holotype in having the palpi shorter (articles 2 and 3, 0.69 mm.), in hav-

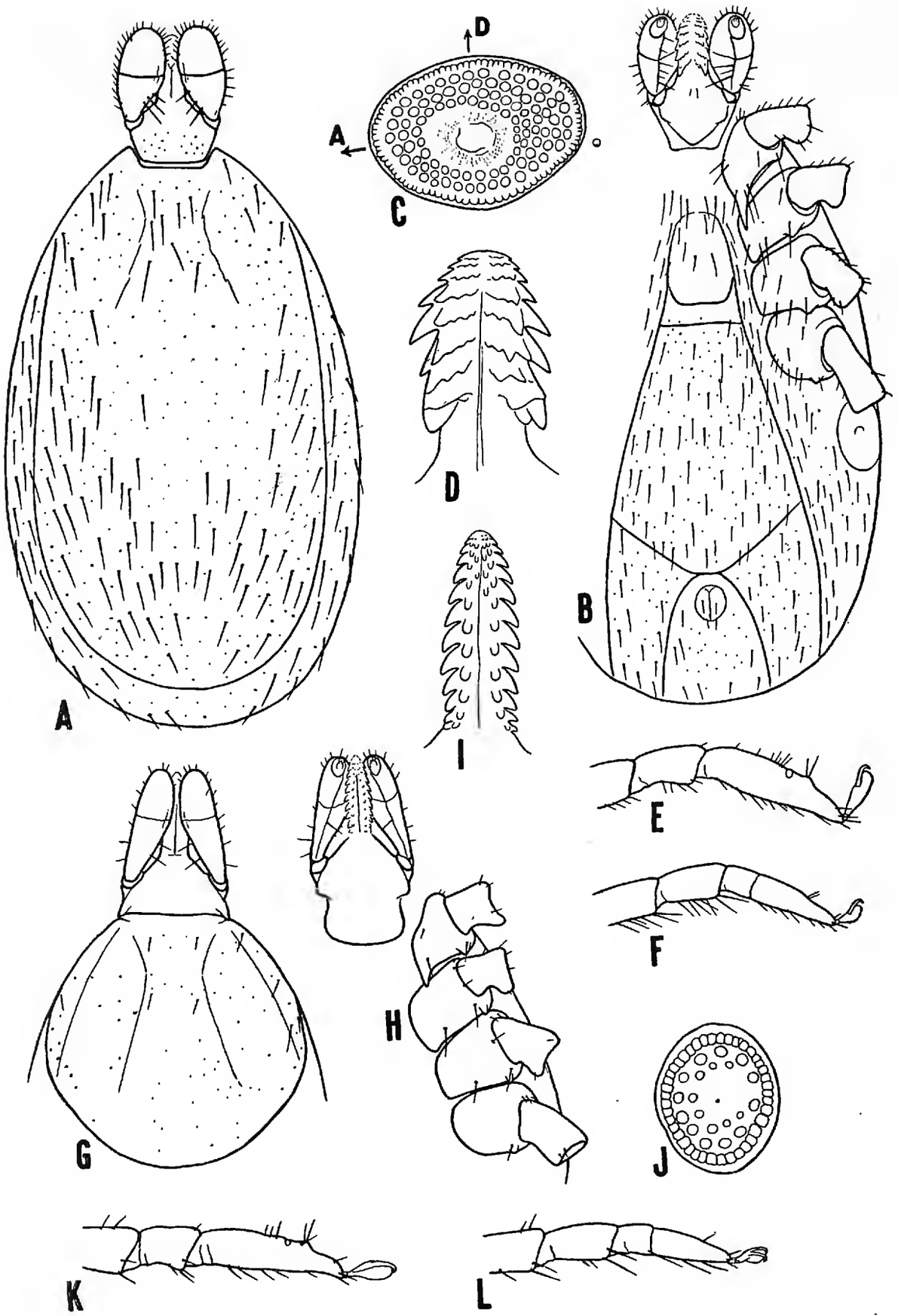


Figure 3. Female *Ixodes conepati* Cooley and Kohls. A. Capitulum and scutum, dorsal. B. Capitulum and coxae, ventral. C. Spiracular plate. D. Hypostome. E. Tarsus and metatarsus of leg I. F. Tarsus and metatarsus of leg IV.

ing the posterior margin of the basis a little depressed below the level of the cornua, and in having the scutum wider than long (length 1.71 mm., width 1.8 mm.). Closely related species have similar variations. The hypostome is lacking in the paratype.

Male unknown.

Holotype. Female, A. P. 17256, from a cave near NEW BRAUNFELS, TEXAS, September 13, 1940. Cave was evidently frequented by various animals.

Paratype. Female, A. P. 18440, from *Conepatus* sp., BREWSTER COUNTY, TEXAS, March, 1940.

Holotype deposited in the collections of the Rocky Mountain Laboratory. Paratype deposited in the United States National Museum.

The species is closely related to *marmotae* Cooley and Kohls, 1938, and *cookei* Packard, 1869. From *marmotae* it differs in lacking auriculae entirely and from both in being larger, in having longer legs and relatively longer palpi and hypostome. *I. conepati* is known only from southern Texas, *cookei* only from Eastern States, and *marmotae* only from Western States.

SUMAC-GALL APHID, MELAPHIS RHOIS (FITCH), IN ARIZONA

This very interesting aphid was collected in Cave Creek Canyon, Chiricahua Mountains, Arizona, August 22, 1943, on smooth, scarlet, or red sumac, *Rhus glabra* L., by Dr. Wyatt W. Jones. He described the galls as follows: "I was somewhat surprised to see very large, sac-like galls on reddish leaves and to find hundreds of small winged aphids within. The galls were apparently always within one-half inch of the base of the leaflet and very close to the mid-vein, but not attached to it. In general the galls are bladder-shaped, but more or less irregular. Some were larger in diameter than three-fourths of an inch."

This is primarily an eastern species and I have been able to find printed reports of its occurrence in New York (Fitch, 1886), Illinois (Walsh, 1866), Minnesota (Oestlund, 1887), New Jersey (Smith, 1890), Iowa (Osburn, 1892) Ohio (Cook, 1904, by Jackson, 1908), Kansas (Sanborn, 1906), Connecticut (Patch, 1923), North Carolina (Brimley, 1938). I also have mounted specimens from Ottawa, Canada (Ross, 1916), South Carolina (Nettles, 1933), and Pennsylvania (Pepper, 1938).—E. O. ESSIG.

THE GENUS CULICOIDES IN NORTHERN COLORADO
(Diptera, Ceratopogonidae)

BY MAURICE T. JAMES
Colorado State College, Ft. Collins, Colorado

During the summer of 1942, about 5000 specimens of *Culicoides* were taken in a light trap operated by Prof. Miriam A. Palmer on the campus of Colorado State College. This material, together with a few specimens obtained from other sources, supplied the material on which this paper is based. Ten determined species were taken in the Ft. Collins light trap; an eleventh is added from the Denver Mountain Parks Area.

I am indebted to Miss Palmer for the illustrations of the male genitalia.

Culicoides hieroglyphicus Malloch

This was by far the most abundant species in the Ft. Collins light trap, being represented by 2430 specimens, May 19 to September 16. It remained important throughout the season and during August and early September accounted for more than half the light trap catch. Also taken at Evergreen, Colorado, July 25, 1942 (James) 2 ♀♀.

The male genitalia show some variation. Some specimens are as in the illustration in Root and Hoffman; in others, the submedian projections of the ninth sternite are much shorter and the foot-like apex of the claspers is less pronounced.

Culicoides obsoletus Meigen

Light trap, Ft. Collins, 659 specimens, May 22 to September 18; unimportant, however, until about July 1, after which time it ran second in importance to *hieroglyphicus*.

Culicoides variipennis Coquillett

Light trap. Ft. Collins, 63 specimens, May 25 to August 31. Never present in great numbers in any catch.

Culicoides stellifer Coquillett

Light trap, Ft. Collins, 198 specimens, June 29 to Sept. 12. Unimportant except during the period from July 6 to August 2. Also taken at Evergreen, Colorado, July 25, 1942 (James) 2 ♀♀.

CULICOIDES BAUERI HOFFMAN

Light trap, Ft. Collins, 112 specimens, June 3 to August 5. Never of much importance; most abundant from June 15 to July 19.

CULICOIDES CREPUSCULARIS MALLOCH

Light trap, Ft. Collins, 481 specimens, May 16 to September 14. The first species to appear in the spring, it remained of approximately equal importance throughout the summer. Also taken at Evergreen, July 25, 1942 (James) 3♀.

CULICOIDES HAEMATOPOTUS MALLOCH

Light trap, Ft. Collins, 299 specimens, May 23 to September 14. Like *crepuscularis*, it remained of approximately equal importance throughout the summer, except for the tendency to show peaks of abundance in early July and early September.

CULICOIDES COCKERELLI COQUILLETT

Light trap, Ft. Collins, 7 specimens, June 3 to August 1. All specimens evidently are the same species, yet the coloration and pattern on the mesonotum varies considerably. In Root and Hoffman's key, some specimens may trace to *luteovenus*, but the wing pattern is quite different in the two species.

The male genitalia are in general quite similar to those of *C. luteovenus;* they agree with Root and Hoffman's illustration in the general structures of the ninth tergite, the side pieces and the claspers. The seta-like hairs of the side pieces, however, instead of forming a dense patch, spread over the entire inner surface. The aedoeagus is similar in structure, except that its chitinous supports unite in the middle. The harpes are similar except that their bases are a little more slender and the apices are somewhat recurved.

Culicoides stonei James, new species

Female. Head yellowish-brown. Eyes narrowly separated. Antennae yellowish-brown; last five segments subequal, fusiform; basal ones bead-like; ratio of length of last five combined to that of basal eight combined about 10:10. Palpi brown; third segment considerably inflated. Thorax yellowish-brown, its pollen uniformly yellowish-brown, without evident markings; pleura yellowish; legs yellow. Wings without light or dark spots; macrotrichia

rather uniformly distributed. Abdomen yellow. Length, 1-1.5 mm.

Male. Coloration as in female. Antennal plume yellow. Apicolateral processes of ninth tergite very large, inner process of side piece much smaller than the dorsal, claspers gently bent and slender beyond middle, harpes slender, simple, and pointed apically, rather stout and bent over themselves basally.

Holotype, male, allotype female, and paratopotypes, 6 males and 16 females, FT. COLLINS, COLORADO, June 17 to August 31, 1942, at light (M. A. Palmer).

In Root and Hoffman's key, this species traces to *C. unicolor.* In the key to male terminalia, it runs to couplet 9, but the tip of

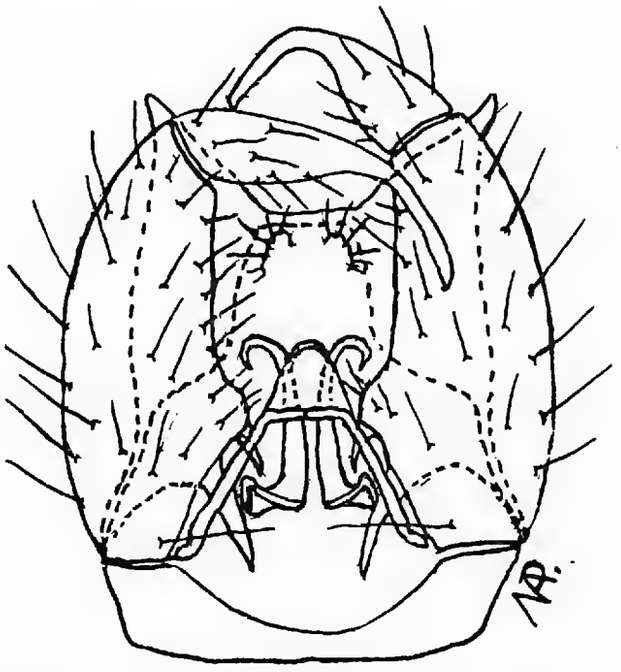


Figure 1. *Culicoides stonei* James, male genitalia, x 300.

the aedoeagus is rounded instead of being either pointed or truncate. I take pleasure in naming the species after Doctor Alan Stone, who compared a female specimen and a sketch of the terminalia with *C. melleus* and *C. unicolor*, and decided that it was distinct from both those species.

CULICOIDES SIMULANS R. & H.

Evergreen, Colorado, July 25, 1942 (James), 22♀, 1♂.

The one male available shows slight variations in the genitalia from the Root & Hoffman figure, in that the harpes end in a single curve outward instead of an S-shaped curve, and the aedoeagus is rounded at the apex. These variations, however, are probably not of specific value.

Culicoides palmerae James, new species

Female. Head uniformly brown. Eyes narrowly separated. Antennae light brown; last five segments of flagellum subequal, fusiform; light basal one small, bead-like, ratio of combined length of last five to combined length of first eight 19:15. Palpi dark

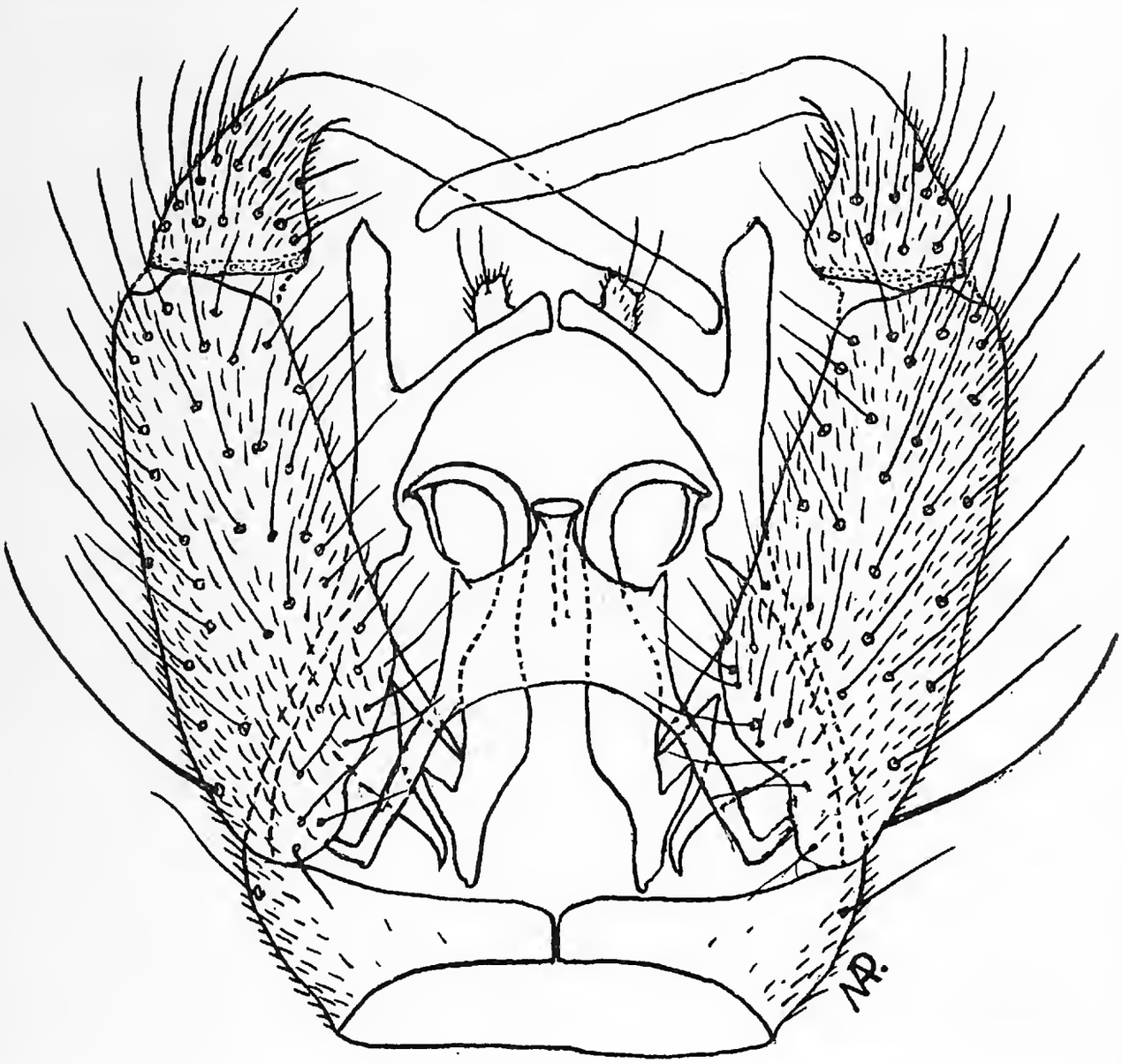


Figure 2. *Culicoides palmerae* James, male genitalia, x 300.

brown; second segment four times, third twice, as long as wide, third definitely swollen and with a sensory pit near apex; ratio of length of second, third, fourth, and fifth segments about 4:5:1:1. Proboscis black.

Mesonotum brown; a very narrow median longitudinal stripe on the anterior half darker; indistinctly defined areas behind sensory pits more or less reddish brown; submedian spots on posterior half and prescutellar area dark. Legs brown; hind tibia with a light basal annulus. Wings brown, with two distinct light spots,

one at the cross-vein and one in cell R_5 beyond apex of cell R_3; also light spots which are usually large but more or less indistinct at apices of R_5, M_1, M_2, Cu_1, and anal cells, and near middle of wing. Abdomen yellowish-brown to almost black. Spermathecae 2, oval, about 50 by 75, base of duct very narrowly chitinized, rudimentary spermetheca present. Length, 1-1.5 mm.

Male. Coloration as in female. Antennal plume light brown, darker apically. Wings somewhat more slender than in female, and with markings less distinct. Genitalia very large, one-fourth length of abdomen, and of a very characteristic type. Ninth tergite extremely convex, notched at apex, and with exceptionally large, somewhat truncated apicolateral processes; claspers sharply bent at basal fourth, the inner angle being distinctly an acute one (about 60°); claspers slender beyond bend; aedoeagus and harpes also characteristic.

Holotype, male, allotype, female, and about 500 paratypes, male and female, Ft. Collins, Colorado, June 2 to August 26, 1942, at light (M. A. Palmer).

The thoracic pattern is indistinct; therefore, in Root and Hoffman's key (Amer. Jour. Hygiene, 25:152-154, 1937) this species should be placed in the second half of couplet 10, where it will trace best to *simulans* Root & Hoffman. In the key to male genitalia, it fits the first alternative of couplet 1, but may immediately be separated from all species treated there by the large, blunt apicolateral processes of the ninth tergite, as well as by the form of the claspers. The relationship among Nearctic species is probably closest to *simulans*, though, to follow Root and Hoffman's grouping based on genital characters, *palmerae* is deserving of a separate group rank.

Light trap, Ft. Collins, 581 specimens (not all types), June 2 to August 26. Most important from June 10 to July 21, during which time it was at least as abundant as *C. hieroglyphicus.*

DISCUSSION

Seasonal abundance at Ft. Collins in 1942, as indicated by the light trap, is shown in Fig. 3. The graph is based on estimated weekly totals, the estimate being made by totaling the weekly catch, multiplying by seven, and dividing by the number of daily samples. For example, if the light trap were operated five nights of a given week, the total of the five samples was multiplied by seven-fifths.

Three types of graphs are represented. In three species, *cre-*

puscularis, *variipennis*, and *haematopotus*, the size of the catch remains fairly constant throughout the season. Three other species, *palmerae*, *stellifer*, and *baueri*, have a definite season of abundance, and outside of this season occur as stragglers, if at

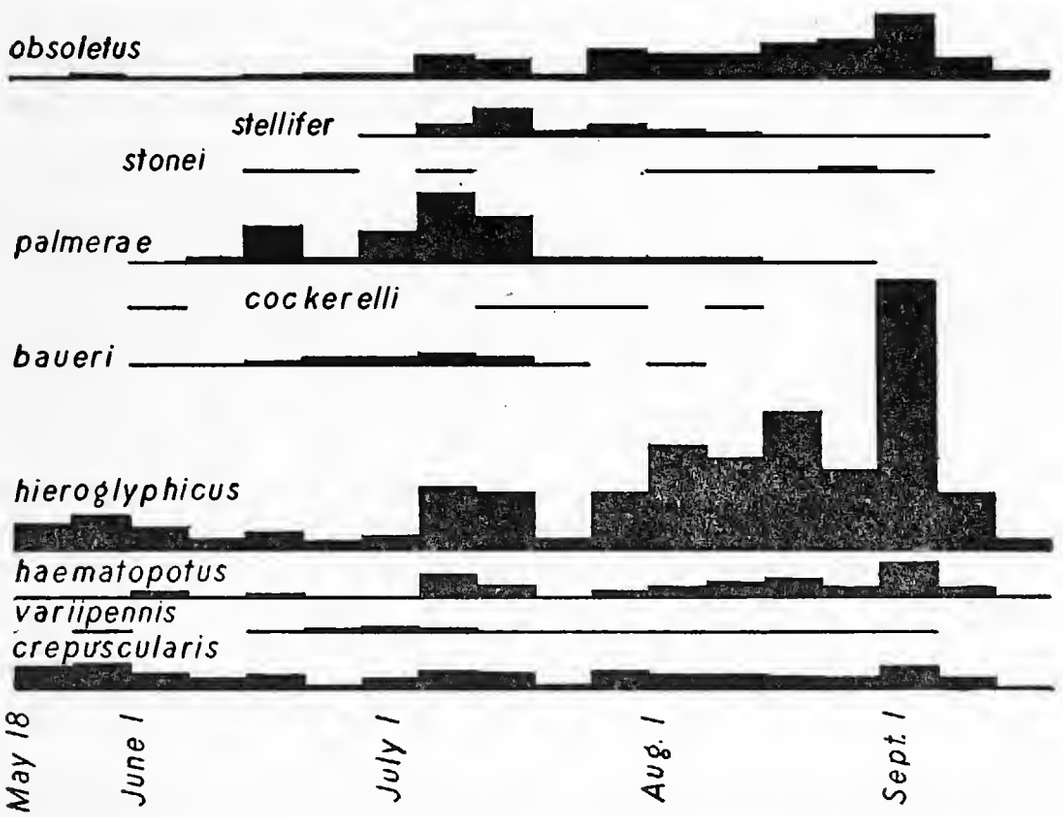


Figure 3. Seasonal abundance, by weeks of *Culicoides* species taken by light trap, Ft. Collins, Colorado, May 18 to September 18.

all. A third type, represented by *obsoletus* and *hieroglyphicus*, is a combination of the first two; the species occur throughout the season, but attain a definite peak of abundance in the late summer. *Cockerelli* and *stonei* are too scarce to place in a definite type, though they seem to belong to the second one.

A NEW GENUS OF HALIPLIDAE (COLEOPTERA) FROM CALIFORNIA

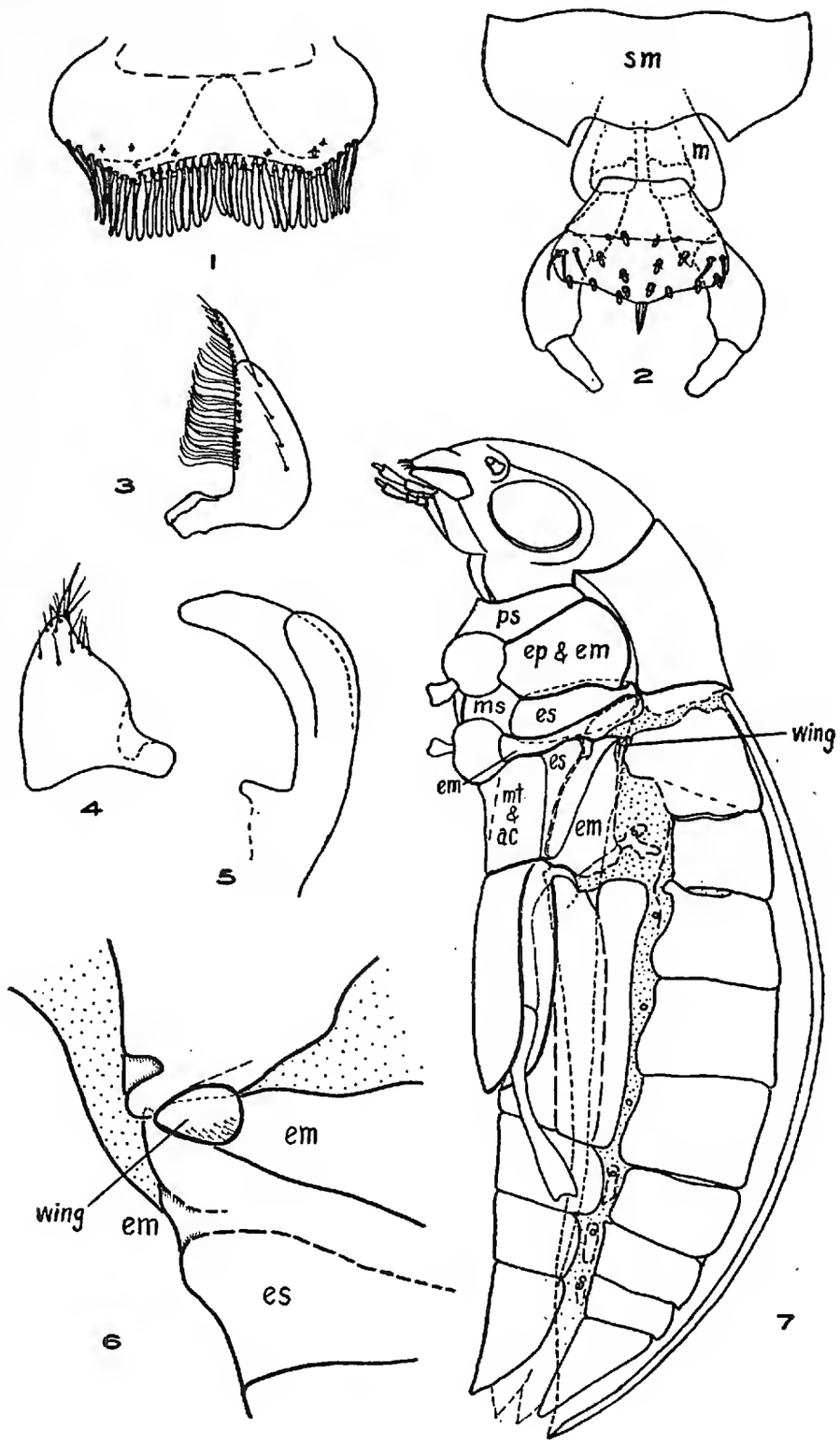
BY HARRY P. CHANDLER
University of California, Berkeley

Apteraliplus Chandler, new genus

Size small, 1.8-2.4 mm.; spindle-shaped, widest point at posterior two-fifths; hump-backed when viewed from side; highest point behind middle. *Head* with eyes small, prominent; antennae eleven segmented, two basal segments as long as wide; terminal segment of palpi much smaller than penultimate. *Pronotum* with basal portion transversely flattened; with a short, broad, punctured, basal depression on each side; sides roundly and evenly convergent; anterior margin transversely arcuate. *Elytra* conjointly depressed at base; not truncate at apex; each with ten regular rows of small weakly impressed, unpigmented punctures; with a row of very small setigerous punctures between the eighth and ninth striae; epipleura weakly differentiated, ending just before the last ventral segment of the abdomen. *Metathoracic wings* greatly reduced, scale like. *Prosternum* shallowly abruptly declivous along the median portion of the anterior margin; arcuately rounded from side to side; posterior process gently raised above the base, constricted between the coxae, convex, roundly truncate at apex, sides not margined. Suture between the episternum and epimeron obliterated. Episternum of the metathorax separating the metasternum from the epipleura. Anterior process of the metasternum elevated above base. Suture between metasternum and antecoxal piece obliterated. Hind coxae conjointly semi-circular, faintly punctured. *Abdomen* with three anterior sternites united, with sutures obliterated; three posterior sternites exposed; last sternite large, triangular; tip very strongly and closely punctured, margined with short setae. Legs with swimming hairs on outer posterior edge of the tarsi and the front and middle tibia; a setigerous striole on the inner distal half of the posterior tibia.

This genus is proposed for the single species described as *Brychius parvulus* Roberts[1], from a single specimen taken by Baker from San Mateo County, California. The species was not again recognized until two specimens were collected by T. Aarons from Lake Lagunitas on the Stanford University Campus, Palo Alto, California, which were determined by Dr. Van Dyke. Shortly afterward the author discovered one unidentified speci-

[1] Roberts, C. H. 1913. Critical notes on the species of Haliplidae of America North of Mexico with descriptions of new species. Jour. N. Y. Ent. Soc., 21:94-95.



APTERALIPLUS PARVULUS ROBERTS (HALIPLIDAE)

Fig. 1. Clypeus; Fig. 2. Labium; Fig. 3. Left paramere; Fig. 4. Right paramere; Fig. 5. Aedoeagus; Fig. 6. Wing region of female; Fig. 7. Side view of male with elytra removed (Note the greatly reduced wing). Abbreviations: *ac.*—antecoxal piece; *em.*—epimeron; *ep.*—episternum; *m.*—mentum; *ms.*—mesosternum; *mt.*—metasternum; *ps.*—prosternum; *sm.*—submentum.

men in the University of California collection, labeled Palo Alto, V-20-22, S. E. Flanders. On January 2, 1942, the author visited the locality in which Aarons had collected and secured a good series upon which this study is based. They were found abundantly in small pools. Lake Lagunitas is a reservoir which is dry during the late summer and fall months. With the coming of the winter rains this reservoir rapidly fills. This species was found in small shallow pools at the shallow end of the reservoir. These pools were located in a boggy region caused by the recent rains and seepage from a canal above, and had not yet connected in any way with the reservoir. It was estimated that the reservoir would reach and cover this section about two weeks after the collections were made. As three of the four known records are from Palo Alto, and as the border of San Mateo County (the type locality) is less than one mile distant from the above-mentioned reservoir, it appears that this species may have an extremely limited distribution. Its lack of wings makes impossible the usual method of Haliplid dispersal. The drainage system in which it is located is very short, extending a distance of less than 15 miles from the Coast range eastward to the south end of San Francisco Bay. As the swimming hairs of the legs are well developed and the adults are observed to swim quite well for a Haliplid, it appears that the species is adapted to still water and any dispersal in the drainage basin would be only in a down stream direction. There is a possibility that the eggs might be dispersed in mud on the feet of birds as is thought to be the case in various other fresh water animals. This would be less probable if the dry season is passed in the pupal stage which is most likely the case.

Roberts placed this species in the genus *Brychius* without giving any specific reasons. The shape of the pronotum has been used extensively to define the genus *Brychius* in keys and in this respect the flattened base of the pronotum and the weakly convergent sides do suggest *Brychius*. However, other characters show it to be much more closely related to some of the other Haliplids. Its nearest affinities, in so far as the author's knowledge of the family goes, is with the subgenus *Liaphlus* (genus *Haliplus*) from which it is amply separated for generic ranking. Carr[2] in his paper on North American species of *Brychius*,

[2] Carr, F. S. New species of the genus *Brychius*. Can. Ent., 60:26.

quotes Mr. Barber who studied the type as follows, "Its convex pronotum, with sides strongly arcuate and convergent, and with the basal impressions at lateral fourth deep but short without trace of the sinuate carina which in *elevatus* and *hornii* extends from the base at lateral sixth to apical fourth, together with the gibbous apically acuminate elytra and the much narrower and anteriorly not prominent prosternum, seem to me to be good enough characters for generic segregation."

The males may be separated from the females by the usual thickened protarsi; their smaller size and the narrower, more rounded apex of the prosternal process. The metathoracic wings of the male are almost entirely reduced, being doubtfully represented by an imbeded bristle like sclerite (Fig. 7). In the female they are represented by a scale like appendage, bearing a number of short setae on the lower half.

KEY TO THE GENERA OF HALIPLIDAE

1 Pronotum with sides of basal two-thirds nearly parallel, sometimes slightly sinuate, anterior margins strongly rounded, base with two longitudinal striae extending forward for more than half the length of the pronotum; epipleura broadly extending almost to the tip of the elytra, which are never truncate; metasternum reaching the epipleura; last abdominal segment usually acuminatly produced with a median longitudinal groove; form elongate; poor swimmers, usually found creeping along the bottoms of running streams, occasionally in lakes....*Brychius*

– Pronotum with sides widest at base and convergent anteriorly, with or without basal striae; epipleura evenly narrowed, usually ending near the base of the last ventral segment, never reaching the apex; episternum completely separating the metasternum from the epipleura; last abdominal segment without longitudinal groove; free swimming, usually found in still or slow-moving water.....2

2. Ultimate segment of palpi as large as penultimate labrum and clypeus small, width less than half the greatest diameter of the eyes; hind coxal plates margined, large, only the last sternite completely exposed; elytra with fine sutural striae; form broad and convex; general distribution in the warmer parts of the world.....*Peltodytes*

– Ultimate segment of palpi much smaller than penultimate; hind coxal plates not margined; last three sternites exposed; labrum broad, width more than half the diameter of the eyes, emarginate anteriorly; elytra without fine sutural stria.....3

3. Prosternum evenly rounded from side to side, process raised above base, narrowly constricted between coxae, apex roundly

truncate; tip of last abdominal sternite very closely and strongly punctate; wings reduced; suture between metasternum and antecoxal piece obliterated; size small (1.5–2.5 mm.); spindle-shaped; humpbacked. Known only from central California coastal region ..... *Apteraliplus*

– Medial portion of the prosternum and prosternal process forming a plateau-like elevation which is at least in part angularly separated from the lateral extensions of the prosternum, apex of posterior process squarely truncate; suture between the metasternum and antecoxal piece not obliterated; size large to small; general distribution in the cooler parts of the world. ..... *Haliplus*

NOMENCLATURE

BY T. D. A. COCKERELL

Citrus Experiment Station, Riverside, California

Nomenclature is not to be despised. It is a part of language, it is a means whereby we record and arrange our ideas. In bygone times, the human mind was aware of only a very small part of its environment, but science has enlarged our vision enormously, so that what we, collectively, know, can only be known in small part by any one individual. Most of our knowledge would be lost, were it not recorded in language, by means of names, by nomenclature.

There is one limitation to any system of rules, imposed by the methods of science. No committee or group may make a rule which asserts that which is false. Thus, it was recently shown that a certain author had proposed a generic name, without indicating any species. His specimens are preserved, and we now know whot he had. Later on another author described a species under what was presumed to be the same generic name, using, however, a different spelling. This species is not congeneric with that of the first author. Now it is alleged that the species of the second author must be the type of the genus of the first author, although the latter never saw it and actually had a different genus. This is manifestly absurd, and the way out of the difficulty is to ignore the name proposed by the first author, since he included no named species, and take up the name of the second author, with its type described by him.

More difficult is the problem of the generic name proposed

with the mention of a described species, but actually, so far as the author was concerned, based on another species, perhaps not congeneric. In such a case we must consider that the generic name was founded on an aggregate, regarded by the author as one species, but actually consisting of more than one. We should naturally refer the name to the species cited, but sometimes it happens that the author misunderstood that species, and based his genus on characters only possessed by some other specie, which he wrongly regarded as the same. If this species, in the possession of the author, had not been named or described, we have this dilemma: either the generic name must be considered as founded on the cited species, or else on a species which had not been described, in which case the name would have no valid basis. Sometimes the above facts could not be ascertained from a study of the published records. It seems very desirable to rule that in general unpublished information should not be used to describe questions of nomenclature, when it disagrees with what has been published. For example, a certain author described a "species" which actually consisted of two. Another writer took one of these as representing the species, but on looking, at a much later date, at the original specimens, the type label was found on the other species. Which then is the type of the species?

Perhaps the worst confusion arises from the interpretation by some authors of the rule concerning secondary homonyms. The matter came to a head in this form. Numerous species had been described in several related genera, and these genera were accepted by all except a certain French author, who threw them all together, with the result of finding a number of apparent homonyms, which had (it was held) to be renamed. Now certain authors claim that the saying "once a homonym always a homonym" legalizes this action, and compels us to use the substitute names. This in spite of the fact that, as I learned from Dr. K. Jordan, the whole of the International commission was opposed to such an interpretation, with the exception of Dr. Stiles. It amounts to saying that if a name has been falsely held to be a homonym, it becomes invalid, the whole matter being dominated by someone's mistake. This is surely absurd, and leads to a lot of unnecessary changes in names.

When an author has not designated holotypes, what is our duty in the case? For instance a German author, who described many hundreds of species, labelled all the specimens "type," and it

was well known that the series were frequently composites. Another German author proposed that he and I should go over the whole collection, and designate holotypes. Circumstances prevented this, but supposing we had done as proposed, should we have been at liberty to pick out a specimen at random from each series and label it holotype? Or should we have carefully read every word of each description, striving to ascertain, if possible, what it was the author actually described? The latter method seems more reasonable but some large and important collections have been type-labelled by the former, and the results are generally considered binding except as occasionally happens, when the holotype label is found on a specimen from a locality not represented in the original collection which the author used, or on a sex not known to the original author.

Notes on the Habits of Melecta sierrae Linsley

In May, 1942, the writer had the opportunity to make a few fragmentary observations on the habits of *Melecta sierrae* Linsley in the vicinity of Miami Ranger Station, Mariposa County, California. In this area it is a parasite of *Emphoropsis cinerea* Smith, subsp. nov. On May 12, an unemerged female was removed from a 1941 *Emphoropsis* cell series along with both sexes of the host. During the next ten days, *Melecta* were encountered frequently visiting flowers of manzanita (*Arctostaphylos* sp.) along with *Emphoropsis*, the females of which were collecting pollen. Females were also seen to enter *Emphoropsis* burrows on several occasions, always during the absence of the host. *Emphoropsis* appears to be only semi-gregarious, many of the burrows being solitary. They were most commonly encountered in banks but several were found in flat ground. The entrance is not protected by a turret.

Melecta sierrae flies much more slowly than its host. The females spend most of the day flying about in search for burrows of *Emphoropsis*, occasionally visiting manzanita flowers for nectar. At night and during periods of cold or wet weather the females remain in resting burrows excavated in the talus at the base of the banks in which the host bees are nesting. Several females may occupy the same burrow and will frequently share it with male *Emphoropsis* and occasionally with *Tetralonia* sp.—E. Gorton Linsley.

* New names in bold face type, synonyms in italics.

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