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The Pan-Pacific Entomologist

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THE ROLE OF THE ENTOMOLOGICAL MUSEUM[1]

BY EDWARD S. ROSS

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San Francisco, California

Before the turn of the Century, entomology was indeed a minor science compared with what it is today. What there was of it was largely limited to the field of taxonomy. There was no such thing as a professional systematist. Most systematic entomology was practiced as an avocation chiefly by physicians and clergymen. Museums were still relatively small, means of communication were poor, and most published work was based on private collections. Gradually these private collections found their way into museums. Museums gained financial support, sponsored expeditions, employed larger staffs, and ever added to the accumulation of research material.

More recently, coupled with the impetus of economic entomology, the museum is evolving into something new. There is an increasing number of trained professional systematists and skilled amateurs. Many of these have found it unnecessary to build large private collections but have come to depend on the museum as a source of research material. With modern service, the greatest utilization of museum specimens is now through use of the mails. The museum is becoming a concentration point and a mail order house for insects and the curator, an experienced shipping clerk whose diet is constantly supplemented by the glue of postage stamps and address stickers.

As one of these well-nourished, label-licking curators, I should like to take this opportunity to define some of the various functions of the entomological museum and to discuss some of its problems as I see them.

[1]Retiring presidential address read before the 208th meeting of the Pacific Coast Entomological Society, December 3, 1949. The views expressed in this paper are those of the author and do not necessarily reflect those of this Society or of the California Academy of Sciences.

First of all, we might note that museums and libraries have much in common; in fact, a library might be considered but a kind of museum. Beyond their constant current use, museums and libraries together comprise the link of knowledge between past and present generations and those of the future. Libraries preserve for future reference man's published data and ideas. Museums, whether dealing with the arts, history, or the sciences, preserve samples of his material things. In systematic biology, at least, there exists a very important bond between libraries and museums for it is usually possible to find lodged in some museum the very specimens upon which publication has been based. Since the all-important need for checking conclusions developed in the fields of morphology, physiology, the applied sciences, etc., is dependent upon a common denominator of identification, it follows that almost all branches of biology owe a debt to the museum; the checking point for these vital identifications.

The need for active museums in any field of biology varies directly with the degree of stability of its nomenclature, and the quality of its monographs. When any taxonomic group has been thoroughly sampled geographically, and when the type upon which each proposed name is based has been expertly studied, the importance of specimens in museums diminishes. It is not surprising that the value of a museum specimen viewed in this light decreases with the increased size of the species. For example, many will admit that the museum phase in the fields of mammalogy and ornithology is over. Thanks to a rather stable nomenclature, these sciences are now well along with more interpretive studies. For this reason it is surprising that most museums still have mammalogy and ornithology departments about as well staffed as ever whereas support for departments dealing with certain smaller forms of life is often non-existent.

Although we have been at it a long time, the museum phase of entomology is now hardly underway. The systematics of insects, even that of groups having great economic importance, is far from settled. This has often resulted in an unfortunate frequency of name changing and much criticism of systematists, especially by those engaged with applied problems. Beyond the ever-present human factor, much of the difficulty has been due to a failure to study available museum types and series. One might add also the common tendency to rely too much on what

is in museums with a resultant disregard of biology. Reference to what is available in museums is, of course, not as easily had as the uninitiated might expect. Types, if indeed extant, are scattered in museums all over the world and it is a costly and time consuming matter to see them all. Nevertheless, we must rely on the museum to preserve such material at least until all the problems of nomenclature have been settled.

In thus preserving and making available for use the specimens upon which the literature is based the museum performs one of its most important functions; namely, that of being a place where collections can be received, curated, and preserved for future reference.

Another important function of a museum is to act as a concentration point for unstudied specimens—the "raw material" of taxonomic research. A good part of such "raw material", of course, represents an assemblage of the unstudied portions of private collections. The major and most intriguing part, however, results from field expeditions sponsored by the museum. Any enthusiastic systematist eagerly scans such fresh accumulations because the thrill of new discoveries and vistas of new concepts is often his reward. When a museum fails to gather new material it is as dead and as unproductive as a machine without fuel.

I do not wish to imply that all new specimens are immediately studied. Any museum possesses vast assemblages of unstudied specimens. These need not be a cause for alarm. Entomology is far too extensive a field to have specialists studying all groups during any single period. In fact, many categories as high as the family level haven't yet had any serious attention. Sooner or later, however, someone will appreciate the fact that specimens have been stockpiled for his use in museums. He will thus be able to base his work at a much higher level than privately possible, see specimens from regions he may never personally hope to visit, and arrive at sounder taxonomic conclusions that could only result from an analysis of the maximum amount of data.

Museums go to considerable expense and labor in building up these materials for taxonomic research. It is the duty of the specialist to use this material in his work. Before publishing a

paper purporting to be a revision of a group, the worker should always ask himself, "Is this paper as complete as reference to all available accumulations in museums would render it?" If not, the worker would be committing one of the crimes of science in taking up precious publication space with conclusions that are not based on analysis of all data.

This brings us to the subject of the means of using museum facilities. All museums, of course, attempt to have table space and equipment for visiting scientists. Most often this is the only manner in which types may be studied. Obviously, however, it is impossible for a specialist personally to visit each museum in the course of a given taxonomic project. The only recourse is the ever-increasing practice of borrowing specimens through the mails. In this manner a worker can have before him at one time the often vast reservoir of specimens available in museums. Curators, because of pressure of other work, or a fear of losing specimens, unfortunately are not always eager to fill loan requests. They should realize, however, that it is one of their primary duties to honor any loan request made by a worker in good standing, or who is properly recommended. Unstudied specimens lying idle in museums at a time when revisionary work is being done might just as well be back in the field if they are not utilized during such fleeting periods of activity.

The worker on his part should realize that there are certain limits to a reasonable loan request. In general, curators dislike packing up large portions of collections that have been placed in definitive arrangement following more or less recent study by a recognized worker. In these cases requests should be limited to certain critical species. The worker should never expect to retain duplicates from series correctly identified by others except on an exchange basis. Certain collections, such as those of Leconte, Horn, and Casey, upon which a tremendous amount of nomenclature has been based, should never be freely loaned at least until the types or type series have been recognized and separated. Any portions of such collections that have not been mentioned in the literature need not be treated with such reverence.

In all the hundreds of loans this Academy has granted, we have had no losses in transport even in shipments to foreign countries. Any damage enroute has usually been due to improper packing rather than to rough handling. In spite of this, museums

do suffer some abuses, but these are so rare that they should not be an excuse for a discontinuance of the lending of specimens. Occasionally, though rarely, we have been unable to secure a return of loaned specimens. In some cases excessive series of duplicates, often the best specimens, have been retained in spite of the fact that workers should strive, for the good of all, to build up institutional collections rather than to reduce them. Most of the abuse, however, centers around the desire to possess holotypes. Much of this is legal but often borders on the unethical. I might cite one example passed on to me by my predecessor, Mr. Van Duzee. In this case a worker, having borrowed a few thousand unstudied western representatives of a family, discovered that a large number of new species were represented. Unfortunately for him, the types would have to be returned to this Academy. What did he do? He used the borrowed collection as an itinerary source for a very fruitful field trip. By visiting each of the potential type localities at the season indicated on our labels, he was able to secure and designate his own specimens as holotypes.

Abuses of the loaning privilege are more than offset by the contributions to science and the museum that result. The lending museum benefits by being able to make available to local workers authoritatively identified reference material enhanced in significance by mention in the literature. Most specialists will also try to fill in gaps in institutional collections with duplicates of needed species from their own collection.

Another function of a museum is to be a "specialist." Most museums are unavoidably regional in scope. They naturally tend to have the best collections from the areas in which they are located and workers elsewhere tend to depend upon them as sources for collections from such regions. There is also a desirable tendency to explore certain adjacent foreign regions that are faunistically related. Thus, for example, this Academy is a recognized source of research material from Western North America but has also developed large accumulations from North Western Mexico, Alaska, and the islands and shores of the Pacific.

Another form of museum specialty results from the research inclinations of its staff. The resultant development of outstanding collections in a taxonomic group is a desirable and an essential step toward making real published contributions. It is undesirable,

however, for curators of any period to decide that their institution will cease to build up collections of other groups. This can even be aggravated by such curators using existing general collections as exchange material to augment their specialized collections. Such taxonomic specialization is, however, quite admissable in cases where a broad, general collection is being actively maintained nearby by another institution.

A further function of many museums is to have a representative set of insects from a world standpoint. It is becoming increasingly evident that it is impossible to study intelligently any local fauna without a broad knowledge of genera from a world, but more particularly a European, standpoint. In many Orders higher categories have been very incompletely correlated from a world standpoint. There is a need for first hand examination, not a mere literature knowledge, of the type species upon which these categories are based. A good deal of the frequent changing of name combinations has been due to a tendency of certain workers to know only a limited fauna. As we study northward on our continent the need becomes more and more urgent to know the Palaearctic fauna. As we proceed southward, a knowledge of the Neotropical becomes indispensable. To fill this need with limited funds and staff is one of the challenging problems of our museums.

The educational function of entomological museums associated with universities is obvious. The separately maintained museum, however, has an opportunity to be of much broader service. Whereas the services of a university museum must of necessity be more or less limited to registered students and staff, the independent museum spreads its influence to all age groups. Very often it is the only place where youth, the post-university-age amateur, and the professional entomologist can find the means for pursuing his work. We take pride here at the Academy in the number of young people who profit by our efforts. Many have gone on into professional entomology, others continue as enthusiastic amateurs. Avocational entomology can add to the fullness of many a life and this fact alone could well justify the place of museums in our society.

A well balanced public museum should also provide adequate exhibits in the field of entomology. These should emphasize the local fauna and answer common questions.

So far I have tried to analyze some of the functions of the entomological museum. At this time attention might be given to some of its problems.

The major problem is that financial support of the activity is more in proportion to the size of the organisms involved than to the size of the job. Most museums receive material faster than it can be assimilated. The chief bottle neck is the lack of sufficient cases and drawers to arrange identified collections and thus make room for new material. Added to this is the lack of sufficient staff.

These shortages, it appears, all stem from the fact that museum activity, like that of a library, is very unspectacular. It fails to arouse the interest of the general public who these days is constantly being steeped in publicity about some new insecticide, antibiotic, advances in atomic and medical research, etc. Money today comes to the institution that is well promoted and has something understandable to promote. It is in the field of expeditions that the greatest chance for money drawing publicity can develop but here, unfortunately, the most fruitful collecting trips are simple, plodding affairs. The participants must return bearing a tale of a narrow escape from the embrace of a boa constrictor to attract much attention.

Most museums, to be truly scientific, tend to collect objectively all insects regardless of any known economic significance. Because only a very small percentage of the vast insect world directly affects man's welfare, it follows that a proportionately small percentage of museum activity can be justified on economic grounds. There is, however, great cultural value in objectively knowing the inhabitants of this planet, their habits and distribution. Our alternative is to remain ignorant of such things and this is unthinkable. This is a difficult idea, however, to get over to a materialistically minded public and the various legislative bodies controlling appropriations. No one seems to demand an economic return from certain other cultural pursuits of man such as his art and music but when it comes to science, the public has been educated to expect immediate and tangible returns. This situation is often aggravated in the privately endowed museum which is free from the pressure of the tax payer. Here there is a tendency to engage purposefully in research that has no eco-

nomic bearing. This, although almost suicidal, is as it should be. Work on insect groups having economic importance can be well justified in tax-supported institutions. If the worker in the private museum clamors to work in these fields too, who will be left to study the non-economic groups which constitute the bulk of the insect world?

With the steady decrease in private fortunes, the hope is not too good for any great increase in financial support for the needed expansion of independent museums wherein most of the major insect collections are lodged. With this in mind, systematists should perhaps search for ways in which they can work more efficiently under existing conditions.

Undoubtedly the greatest single boon to progress would be a relaxation of institutionalism and individualism in regard to types. In this country, at least, types are so woefully scattered and often so poorly curated that many workers try to get along without reference to them. This often results in errors that might well have been avoided. With so much work to be done and so few to do it, we cannot afford to have to continually go back to correct errors. Every revision should have its nomenclature firmly fixed by reference to types.

Is it not too much to hope for a central institution whose function is to concentrate types or information about types? This would mean a pooling of all available types in this country in one safe place. Workers could then, in a relatively short time and a limited journey, speed their work immeasurably and be able to accomplish more in a lifetime. Space in journals would be more efficiently used, concepts of species would be less provisional, and the value of each publication would be more lasting.

Such an institution could be built around a file covering the citation, data, and institutional location of the type, or potential lectotype, for every name proposed for insects and their relatives. This file would be of great value in itself but the ideal objective, (of course unobtainable) would be to possess a type specimen for every name. It might be possible to exchange types of exotic species present in American museums for types of American species deposited abroad. This, of course, would not be so vital in cases where types of a given group are already concentrated in one institution. In cases where types cannot be obtained, each

worker who goes abroad to see them could contribute compared specimens together with copies of his notes, drawings, and photographs. In many of the older collections, of course, types are not yet clearly determined. Such types would not be separated from the parent collection until they have been clearly worked out by a good specialist. Workers actively engaged in continuous research in a group would be permitted temporarily to hold the types they create as long as they are needed. A policy of making publication of a new name in a journal contingent on such eventual deposit would not be unreasonable. If a worker expects the world to recognize his new name, he should willingly place its type where it is available to all.

I am sure the immediate reaction of many curators to this proposal will be one of horror, but most of this horror I believe would be based on unscientific selfish reasons. *It is not the purpose of types to make an institutional or private collection valuable or indispensable.* Admittedly it would mean that some museums would give up more than others. As matters stand, however, no institution is self-sufficient in regard to types and all stand to gain in the long run. What is really important is that our ponderous science would advance more rapidly with unwavering, steady steps.

The question immediately arises as to the location of this depository. I am sure that the authorities of the United States National Museum would feel that theirs is the logical place. This might be so if the National Museum was itself logically located. But in this day we have very little assurance that Washington, D.C. will not be a prime target in a future war and as long as there is even a remote danger of such an unfortunate happening, it, or any similar potential target area, is not the place for a museum. Furthermore, the climate of Washington, D.C. is far from stimulating during the summer months when most workers are free to study types.

I really didn't intend to start a discourse on the location of the National Museum, but now that I have, I might as well state my opinion. This highly important national collection deserves a much better deal than it is getting. A country as rich as this should be well able to quarter and staff this worthy activity under much better circumstances. Anyone who has recently visited this

museum and has noted the crowded research conditions in Entomology well knows of what I speak.

There is no good reason why the exhibit and research functions of the National Museum, or any other museum for that matter, need be in the same building or vicinity. The exhibits could take over the entire present structure and the research activity should be given a separate, specially designed building with ample space for expansion and for visiting workers. Most of all, since a fresh start is already needed and a move must be made, it should be moved to some smaller, non-industrial community with a good climate and a pleasant natural history environment. Under such conditions I am sure that the health of that rare species, the museum systematist, would be improved and he would spend much less time and energy in getting between his home and his desk.

Many will propose that this dream institution should remain on the Atlantic seaboard. Actually, however, the West and Middlewest are growing and there is a strong case for a more central location. There are already a number of large museums along the Atlantic Coast and the moving of the National collections would not leave too great a void for workers in that region. The identification service of the Department of Agriculture would benefit by shorter mailing distances as well. Should the National collections be adequately housed and more favorably located, I am sure that many workers would favor the concentration of all types in that collection. Such types should, of course, be housed in special rooms and there should be a provision for a permanent and adequate staff to care for them. The problem of past commitments regarding the permanent ownership of types in the various museums might be overcome by the use of indefinite loans. The policies and management could be under the surveillance of a democratically selected board of curators representing the various institutions contributing to the pool.

The Pacific Coast for many years has had, with minor exceptions, such a central type depository here at the California Academy of Sciences. The present proposal is merely to extend this principle to a National scale.

Perhaps this idea is too visionary and, because of man's inherent selfish nature, may never be put into effect. It would be interesting, however, to hear the reactions of systematists.

DESCRIPTIONS OF NEW SPECIES OF STAGBEETLES FROM FORMOSA AND THE PHILIPPINES

(Coleoptera: Lucanidae)

BY BERNARD BENESH

North Chicago, Illinois

A selected lot of Lucanidae of doubtful status, secured as a loan from the California Academy of Sciences, reveals, after a protracted study by me and comparison by the late Dr. Gilbert J. Arrow with material in the British Museum (Natural History), that it contains no less than twelve species, of which number six are new to entomological science, whilst the others indicate new localities, thus adding to their recorded ranges. The species are members of the lucanid subfamilies DORCINAE and FIGULINAE, and represent just a fraction of the stagbeetles collected by Fred C. Hadden in the Philippines, and J. Linsley Gressitt in Formosa. They are described in subjoined diagnoses, including also the description of a new Philippine species of *Aegus* from my personal collection. To complete the description of one species (*Dorcus gracilicornis*), of which only the male sex was represented in the lot, the writer has drawn on his private collection. Unless otherwise noted the determinations are mine.

I wish to express my gratitude to the entire entomological staff of the Academy, who were of material assistance during my brief visit, especially to Drs. Edwin C. Van Dyke, Edward S. Ross, and last, but not least, to Hugh B. Leech, who graciously permitted the use of his private binocular microscope. My thanks are due also to Mr. Rupert L. Wenzel, Chicago Natural History Museum for correction of this contribution.

The species are diagnosed as follows:

Subfamily DORCINAE

Genus DORCUS Megerle (Nomen catalogum)

The Antelope stagbeetles

MacLeay, Horae Ent., 1:111, 1819.

Dorcus gracilicornis Benesh, new species

Figures* 3, ♂, 4, 4a, ♀.

Male. Head transverse, broader than long, declivous in front, finely granulate throughout, of satiny aspect, anterior half and

*Illustrations to appear in next issue.

around the eyes remotely shallowly punctured, subopaque. Anterior angles obtuse, thence diverging diagonally to the canthus, which is parallel and half way encompasses the eye; postocular section slightly produced. Clypeus produced, broad, truncate. Anteocular bosses prominent, with an elongate fovea. Mandibles falciform, granulate, flattened on top, laterally rounded, and with a small sub-median, inwardly directed acute, prong-like, tooth. Eyes oblong, facetted, marbled, parallel. Antennae of ten segments, dark reddish-brown, glabrous; scape nearly black, nitid, and as long as the funicle and clava combined; funicle slightly longer than the clava, funicular segments highly polished and strongly shining; clava three-segmented with first and second segment lobate, their bases glabrous and nitid, third circular in outline, depressed, wholly pubescent, the pubescence ash-gray.

Pronotum transverse, depressed, anterior margin sinuate, center produced; anterior angles subacute, extending well beyond the produced center; sides gently broadening from apex to basal third, where there is a distinct acumination, thence diagonally arcuate to basal angles, the latter broadly rounded; base straight. Anterior margin paralleled by an impressed line; anterior angles, lateral and basal margins punctured; disk granulate throughout and more shining than the head.

Scutellum heart-shaped, punctured, depressed (on a lower plane than the elytra). Elytra parallel, narrower at base, slightly attenuate posteriorly, black with a reddish tinge, nitid; humeri feebly produced to front, simple (not mucronate); basal area strongly rugose (as in *D. glabripennis*), suture paralleled by a punctate stria; between sutural stria and lateral declivity the elytra are uneven by ill-defined striae; margins punctate striate, posterior irregularly punctate.

Legs moderate. Anterior tibiae strongly furcate, furcation downward bent, followed by three unequal, equidistant teeth; between furcation and distal spur (above the tarsus) with a tuft of golden setae; upper area ridged, setose in fissures; outer margin fringed by long, unequal, golden setae. Intermediate and posterior tibiae armed in distal half with a single spine, and linearly setose. Tarsi as long as the tibiae, black, excepting the praetarsus, which is reddish-brown, glabrous dorsad and strongly shining, fasciculate setose ventrad; praetarsus as long as the other four segments of tarsus combined. Lower margin of anterior, and hind margin of intermediate and posterior femora setose.

Beneath black, excepting the palpi, anterior margin of prosternum, margins of coxal cavities, geniculation of legs, and inflexed portion of the elytra, which are cherry-red. Mentum transverse, granulate, sculptured by large, confluent crescent-shaped and irregular punctures; anterior margin feebly emarginate, lateral angles obtuse. Genae, prosternal and metasternal episternum strongly punctured; lateral area of metasternum pilose. Ventral

segments finely punctured; margin of fifth (terminal) segment fringed with long golden setae.

Female. Head transverse, black, nitid, rather large in proportion to the rest of the body, slightly narrower than the prothorax, rugosely sculptured by irregular large punctures; vertex bituberculate in line with the eyes; occiput impunctate; anterior margin nearly straight; clypeus produced and bilobate in front, diverging towards the base; anterior angles very feebly arcuate, diagonal to canthus, the latter gently dilated and halfway circumscribing the eye; cheek slightly produced, thence converging to base; eyes oblong, simple, slanting; mandibles slender, acute, trigonate in cross section, carinate laterally, outer margin nearly perpendicular, top elevated in center, forming an oblongo-conical node; inner margin armed with an inwardly directed tooth, this simple on right mandible, slightly exised posteriorly on left, thus forming a supplementary denticle. Antennae dark piceous, glabrous, excepting the sixth and seventh segments which bear golden setae posteriorly; clava clothed with ashy-gray pubescence. Scape equal in length to funicle and clava, club-shaped, feebly bent at middle. Funicle slightly longer than the clava, first funicular segment pyriform; second to fifth with base narrower and progressively dilated apically, their apices square, sixth as the preceding but diagonally truncate. Clava three-segmented, first and second segments lobate, pubescent, their bases apically glabrous and nitid; third segment circular, flattened, pubescent throughout.

Prothorax convex, quadrangular, dark chocolate-brown, nitid, anterior margin sinuate, fringed with short golden setae and paralleled by an impressed line; anterior angles produced, but not as strongly as in male, subacute; sides gently arcuate to posterior quarter and diagonal to base, basal angle broadly arcuate, basal margin straight, lateral and basal margins strongly punctate and feebly reflexed; disc finely, but not closely, punctured.

Scutellum as in the male, but less punctate, medially impunctate. Elytra reddish-brown, excepting the suture, lateral margins and scutellum which are darker; basad narrower and rugulose, humeri rectangular, rounded, parallel for three-fourths of their length, attenuate in posterior fourth and rounded apically; irregularly punctato-striate; striae deep and strongly delimiting (overemphasized in the illustration) three broad elytral intervals, which attain the lateral declivity, destitute of marked punctuation in basal half; strial punctures (four rows) fairly large, oblong, circular on lateral margins; punctuation of posterior third more closer, confused.

Legs as in the male, but proportionally more robust; anterior tibiae broader, five-dentate externally, and tibial spines stronger.

Underside dark chocolate-brown, excepting the mandibles and mentum which are black, subopaque. Mentum transverse, slightly hollowed medially, transversely rugose. Prosternal process plain

and obtuse behind. Ventral segments not so closely punctured as in the male, fifth segment non-setose. On the whole, the ventral pubescence described for the male is nonexistent in the opposite sex, at most being indicated by inconspicuous minute setosity on posterior margins of the femora.

Measurements (in millimeters):

	Length ♂	Width ♀
Head	3.8 x 7.5	3.2 x 6.1
Mandibles	4.5	2.2
Prothorax	5.2 x 8.9	5.0 x 8.2
Elytra	14.5 x 9.3	13.5 x 8.2

Holotype: 1 ♂, ARISAN, FORMOSA, VI, 2, 1932, J. L. Gressitt, collector, in the collection of the California Academy of Sciences (ex coll. J. Linsley Gressitt). *Allotype:* 1 ♀, Baibara, Formosa, VII, 14, 1937, B. Benesh collection, Accession No. 4593 (ex coll. Y. Miwa).

The male approximates in habitus *D. vicinus* Saund., from which it is readily distinguished by the less exserted mandibles and shining dorsum (*vicinus* opaque throughout). The female with its broad head (nearly as wide as the prothorax) and elongate body, somewhat resembles, on a larger scale, our scaritid groundbeetle, *Scarites subterraneus;* it was received from Dr. Yushiro Miwa of Taihoku, Formosa, May 5, 1939, with the annotation "unknown Dorcid ♀."

Dorcus clypeatus Benesh, new species

Figure 5, ♂

Black, depressed. Head, mandibles and pronotum finely granulate, of satiny aspect; elytra roughly sculptured, shining; evidently a relative of *Dorcus glabripennis* Westwood.

Male. Head transverse, twice as broad as long, anterior nearly straight, antero-lateral angles obtuse and slightly emarginate, canthus parallel, circumscribing the eye in anterior half; postocular section slightly produced and gently arcuate to base; disk sloping towards the front. Clypeus, from which the specific name is derived, remarkable in its peculiar form and variation, differs in the typical male from the two smaller paratype males; it is broad, concavely excised, and has a lateral digitiform process; subclypeus broader than the clypeus, acutely angulate on sides and discernible, when viewed from top, as a small lateral projection; in the two paratype males it is simply broad and truncate, without the excision and subclypeal process. Mandibles symmetrical, acute, cylindrical in cross-section, near the upper center with a strong, dorsally flattened and slightly backwards directed obtuse tooth. Antennae with clava and funicle slightly shorter than the

scape, clava rufous, pubescent; funicle and scape glabrous, black, nitid.

Prothorax broader than long, sinuate in front, anterior angles produced and subacute. Sides in anterior third with a feeble emargination, uniformly arcuate to a pronounced acumination at median third; posterior third diagonal to basal angles, the latter broadly arcuate. Base apparently straight. Lateral margins narrow and explanate, slightly reflexed and delineated by an impressed line, remotely punctured in anterior angles and along the lateral margins.

Scutellum heart-shaped, broader than long, transversely elevated across the middle, front and rear declivous, cribripunctate. Elytra ogival in the typical male (parallel in the two smaller males), broadest in anterior third, humeri produced and mucronate; sides gently convergent from near the middle to posterior third, thence regularly rounded to apex; irregularly punctatostriate from ante-humeral area to scutellar margin, forming uneven intervals between the four recognizable striae, these interstices slightly convex and with scattered punctures; sides more rugulose than in adjacent areas and with two or three rows of punctures.

Legs fairly short and stout; anterior tibiae strongly furcate and externally four to six dentate; intermediate and posterior tibiae armed in apical third with a single spine; tarsi slender, shorter than the tibiae, ventrally setose.

Beneath finely punctured and more shining. Mentum transverse, narrowing towards the front, flattened, with basal transverse depression, anterior angles broadly arcuate, base straight; sculptured throughout with horseshoe-shaped confluent impressions. Maxillary palpi piceous, shining. Prosternal process broadened posteriorly and terminating in a round node, with an elongate impression between coxal cavities; a lateral lamina present on each side at base.

Female: Agrees in habitus with the female of preceding species, but with the following distinct characters: head more rugose; mandibles shorter and broader at base; eyes round and parallel (not slanting as in *gracilicornis*); lateral margins of prothorax less arcuate; elytra more coarsely sculptured, with striation more pronounced; ventral punctuation coarser and more remote. Prosternal process as in the male, but simple, without depression; concolorous throughout (*gracilicornis* bicolored).

Measurements (in millimeters):

	Length ♂	Width ♀
Head	4.9 x 9.9	3.1 x 6.0
Mandibles	6.0	1.9
Prothorax	6.5 x 11.4	5.4 x 8.0
Elytra	14.3 x 11.5	13.7 x 8.5

Holotype: 1♂, SAKAHEN, FORMOSA, VII, 15, 1934, J. L. Gressitt, collector, in the collection of the California Academy of Sciences (ex coll. J. L. Gressitt). *Allotype:* 1♀, Taiheizan, Formosa, VII, 6, 1934, J. L. Gressitt, collector, in the collection of the California Academy of Sciences (ex coll. J. L. Gressitt). *Paratypes:* 2♂♂, Hassonzan, Formosa, VII, 25, 1934, J. L. Gressitt, collector, in the collection of the writer and that of the California Academy of Sciences.

The three males are apparently of minor development, indicated by the feeble lateral emargination of the pronotum, and irregular striation of elytra in the typical male. The smaller paratype males display simple pronotum, without emargination or excision, and the elytra are more regularly striate, approaching that of the female. It can be safely assumed that in examples of maximum development, when discovered, the pronotum will have the characteristic S-like excision and smoother elytra of its gigantic congeners, as is evident in *Dorcus antaeus, grandis, hopei* and *parryi.* Both females here described are remarkable for their extremely pedunculate body, a character that is more pronounced than in any other species of Lucanidae known to the writer.

DORCUS NITIDUS Kirsch

Mittheilungen Mus. Dresden, 2:138, 1877.

Two males and five females of this interesting species have been collected by J. L. Gressitt in Formosa: 1♂, Hori, VI, 21, 1932; 1♂, Mizuho, VI, 21, 1932; 2♀♀, Hori, June 1932, April 1935; 1♀, Bukai, VI, 16, 1934; 2♀♀, Bukai, May 1935.

This is a new addition to the lucanid fauna of Formosa, hitherto known from the Papuan Region; it is a well marked species, in which the antennae are distinguished by double setae at the apex of the anterior margin of each of the last four segments of the funicle.

Genus PROSOPOCOILUS Hope

The dish-faced stagbeetles.

Catalogue of the Lucanoid Coleoptera, p. 30, 1845.
(=*Cladognathus* Burmeister, Handbuch der Entomologie, 5:364, 1847).

Prosopocoilus piceipennis (Westw.)

Cladognathus piceipennis Westw., Trans. Ent. Soc., London (2) 3:202, pl. X, fig. 6, ♂, 1855.

Hemisodorcus picipennis Van Roon, Cat. Coleop., Pars 8, Lucanidae, p. 32, 1910.

Three females taken by Gressitt on Hainan Island: 2♀♀, Dwa Bai, VII, 25, 1935; 1♀, Liamui, VIII, 3, 1935.

This record extends the known range of *piceipennis* from the Asiatic mainland to an insular stepping-stone; it will probably be found to occur on Formosa also. Westwood originally placed the male with some doubt as a variety of *P. gracilis* (Saund.), from which species it differs in having broader mandibles, that are armed at base with an inwardly directed tooth. The female of *piceipennis* is obovate, on the average much larger than *gracilis*, has the dorsum rugulose and has a much broader canthus, which is rectangular opposite the eyes.

Genus Aegus MacLeay

Horae Entomologicae, 1:112, 1819.

Aegus horridus Benesh, new species

Figures 1, 1a, ♂.

Dark chocolate-brown, opaque, with the exception of the head which is black.

Male. Head transverse, nearly three times as broad as long, anterior margin nearly straight, antero-lateral angles obtuse, sides diagonally divergent from the anterior angles to a point opposite the eyes; cheeks parallel; basal angles obtuse, converging to basal margin; margins of anterior half of head beset with golden setae. Clypeus broad, semicircularly excised, setose on top and front. Disk nearly flat, declivous to front, with a transverse-frontal ridge, produced in center, on line with the anterior edge of the eyes. Eyes small, facetted, golden-orange. Mandibles porrect, furcate at apex, strongly keeled above for three-fourths their length; distantly punctured above and beneath; beset with sparse, coarse, stubby setae; apical fourth and keel nude; inner margin with an obtuse basal tooth, thence indentate to apical fourth; apex somewhat palmate, with a large inwardly directed tooth and a broad bicuspid. Canthus and cheek nearly united, with a minute hiatus opposite the base of eyes, fully encompassing the eyes. An-

tennae slender; scape nearly as long as the funicle and clava combined, black basally, geniculation blood-red, slightly bent. Funicle as long as the clava, first funicular segment pyriform, cherry-red, nitid; the rest of funicular segments black, opaque, setose on anterior and posterior margin, and two rows of setae above and below. Clava three-segmented, rufous, pubescent, beset with golden setae.

Prothorax twice as broad as long; anterior margin sinuate, anterior angles subacute. Sides diverging to apical third, thence parallel to about basal third, basal third to base excised; basal angles broadly arcuate, basal margin undulate. Disk with a feeble median canaliculation, paralleled on each side by a frontal circular and basal reniform depressions; disk sloping laterad; remotely punctured by large shallow punctures, margins impunctate and setose.

Scutellum ogival, broader than long, squamose. Elytra convex, dark chocolate-brown, glabrous, impunctate; parallel, posteriorly regularly rounded, apex setose.

Legs slender, setose throughout, excepting the tops of femora. Anterior tibiae furcate, the furcation bent downwardly, outer margin feebly and distantly six-dentate. Intermediate and posterior tibiae with a median, hardly discernible spinule. Tarsi shorter than the tibiae, setose.

Beneath opaque throughout, excepting the mandibles which are shining. Mentum broad, narrowing to front, anterior angles rounded, anterior margin broadly concave and setose. Genae and gula remotely punctate, squamose. Prosternal process shallowly canaliculate, terminating in a round node. Ventral abdominal segments emarginate, the margins somewhat elevated; terminal segment strongly setose.

Female. Unknown.

Measurements (in millimeters):

	Length	Width
Head	2.8	8.1
Mandibles: right	5.4	
left	5.6	
Prothorax	4.2	8.2
Elytra	10.7	8.2

Holotype: 1 ♂ NUEVA VIZCAYA, LUZON, PHILIPPINE ISLANDS, in the B. Benesh Collection, North Chicago, Illinois, accession No. 5240.

Apparently allied to *Gnaphaloryx perforatus* Rits.[1] from which it differs in mandibular armature, vestiture and size.

[1]Assigned to *Aegus* by Arrow, Trans. Royal Ent. Soc., London, 83:113, 1935; whether it really is an *Aegus* is a moot question.

(To be continued in next issue.)

THE MEETING POINT OF AMBRYSUS AND PELOCORIS IN NEVADA

(Hemiptera: Naucoridae)

BY IRA LA RIVERS
University of Nevada, Reno

Until the recent discovery of a new species of *Pelocoris* in Nevada, it was customary to think of that genus as confined to the United States east of the Rocky Mountains, while *Ambrysus* was the western representative of the family, neither overlapping the other in range. With the description of *Pelocoris shoshone* La Rivers (1949) from Ash Springs, Pahranagat Valley, the range of the genus was extended over 800 airline miles westward, the new species representing an apparently isolated population completely surrounded by Ambrysi. The type locality was not thoroughly collected at the time, and no other naucorids were taken.

During a recent winter fish-collecting trip into southern Nevada, the general area was re-visited and more painstakingly searched for additional naucorid material, with rewarding results. The itinerary was from south-to-north, and the type locality of *P. shoshone* was one of the last places to be examined. Collecting northwesterly from Las Vegas, naucorids were first taken at a remarkably endemic area known as Warm Springs, the source of the Muddy or Moapa River, in Clark County just south of the Lincoln County line. Lying in the old course of Pleistocene White River, Warm Springs exhibits many remnant populations in both its vertebrate and invertebrate faunas. I was initially attracted to its possibilities by the fact that Hubbs and Miller had recently described a new genus of cyprinid fish from there (*Moapa coriacea,* 1948), specimens of which I wanted for our museum. During preliminary collecting at Warm Springs, the first naucorid taken was somewhat startling, being a new limnocorine, a subfamily of Naucoridae hitherto unknown in the United States. In one of the swift, warm outlet streams (pH 7.3, temperature 89°F) of the main source pool, an occasional *Ambrysus mormon* Montandon 1909 was intermixed with the limnocorine population in the ratio of approximately 1::20.

Nearby, on a low rise, a small marsh gave rise to water which spilled down the 15-foot slope at the east end of the marsh and

then meandered some 30 yards eastward through short grass to the main stream. At its origin, the marsh water was 83°F; at its terminus, 75°F. This brief system was found to contain all three genera of Naucoridae; in its lower reaches, the limnocorine was present, giving way to increasing numbers of *Ambrysus mormon*, which latter was the only species present in the swiftest portion of the stream where it descended the slope. Above these points, in the marsh waters, *Pelocoris shoshone* was the sole naucorid, occurring typically in the quiet waters under overhanging turf banks. Previously, *P. shoshone* had been known only from the type locality, some 55 airline miles northward.

Subsequent intensive collecting failed to alter the picture. It thus seems that the above-mentioned naucorids are rather markedly restricted to certain specific habitats, although a full-season's sampling may alter this picture. Conversely, an associated *Stenelmis* was found abundantly represented in all these habitats, indicating much less specificity.

The next productive collecting spot northward was Ash Springs, also on the remnant course of White River, where *P. shoshone* was the commonest naucorid, and, in point of fact, the commonest hemipteran—as at Warm Springs, it was confined to quiet waters, preferring vegetation or the overhanging turf banks, and so was found chiefly near the vicinity of the source springs of the long, winding, Ash Springs channel; many of the springs were in the nature of motionless seeps with several feet of mud bottom. However, collecting at the point where two outlet creeks carried water from the quiet channel, showed *A. mormon* to be dominant; in only one instance, under a bank at the immediate outlet, were *Ambrysus* and *Pelocoris* taken together in one sweep of the seine.

Ambrysus mormon is already well-known as the most widely distributed member of its genus in the United States; it and *P. shoshone* are fully winged, and the latter may be expected to occur more widely than its present known range indicates. The limnocorine, however, is incapable of flight, and very probably is restricted to the thermal waters of the Warm Springs area, and there solely to swift streams with suitable gravel bottoms.

Literature Cited

Hubbs, Carl L. and R. R. Miller. 1948. Two new relict genera of cyprinid fishes from Nevada. Occas. Papers Mus. Zool. Univ. Mich. No. 507:1-30.

LA RIVERS, IRA. 1949 (1948). A new species of Pelocoris from Nevada, with notes on the genus in the United States (Hemiptera: Naucoridae). Ann. Ent. Soc. Amer. 41(3):371-376.

LIFE HISTORY NOTES ON *INCITA AURANTIACA* HY. EDW.

(Lepidoptera: Phalaenidae)

BY WILLIAM H. EVANS

Sun Valley, California

In the Gavilan Hills of Riverside County, California, on April 19, 1948, I observed several females of this species laying eggs between the hair entangled terminal bracts of young plants of *Gilia virgata* var. *dasyantha* (Brand.). Each moth required from 8 to 16 seconds to force its ovipositor through the dense wooly hairs and attach an egg near the base of a bract.

In the breeding cage, the eggs hatched on May 8 and 9; and the tiny larvae entered the *Gilia* buds. During the early instars the larvae remained hidden inside the buds and fed on the partially developed floral parts; during the last three instars they rested on the stems and ate blossoms and wooly hairs of the food plant. Leaves and stems were never eaten. In their last instar, I substituted flowers of *Gilia densifolia* Benth., which they readily accepted. Larvae enter the soil to pupate. A brief description of the mature larva follows:

Length 20 mm. Ground color greenish-white. A prominent mid-dorsal brown stripe extends from the second segment to the anal extremity. The following brown markings extend the entire length of the body; a subdorsal stripe which is rather indistinct on all but the first four segments; an irregular dorso-lateral stripe consisting of two fine, confluent lines; a rather dim lateral stripe; and a distinct supropodal stripe. There are a few brown markings on the prolegs. In the dorso-lateral area of each segment from 3 to 10 inclusive, there is a conspicuous rounded black spot a little forward of the center of the segment. The black spots on opposite sides of each of these segments are connected by a transparent orange bar which extends across the dorsal area. One larva lacked black spots on the third segment.

A NEW GENUS AND SPECIES OF APHIDIDAE ON ALOE

(Homoptera)

BY E. O. ESSIG

University of California, Berkeley

A curious aphid which was collected on *Aloe aristata* in a nursery at Glendale, California by members of the Los Angeles County Agricultural Commissioner's Office, Los Angeles, California, was sent to the writer for identification. The specimens could not be determined either to genus or species and a thorough check of literature failed to show that such a species had ever been previously described or named. As this aphid attacks ornamental plants of economic importance it seems advisable to describe and name it so that it may be properly referred to and recorded.

Aloephagus Essig, new genus

Apterous form. Body regulary oval, beset with relatively few short stiff hairs or spines and with irregular and circular groups of glands somewhat similar to those in *Eriosoma;* small rounded tubercles—1 pair on the prothorax and 6 pairs on the abdomen. Eyes small, 3-faceted. Antennae 5-segmented. Rostrum long and slender. Legs short. Cauda triangular.

Type species: *Aloephagus myersi* Essig.

Aloephagus myersi Essig, new species

Apterous viviparous parthenogenetic female (fig. 1). General characteristics as indicated above for the genus *Aloephagus.* Body dull-green or pruinose with dusky markings as illustrated; sparsely covered with short spines arranged in transverse rows on the abdominal segments; with groups of glandular areas; rounded lateral tubercles on the prothorax, and six obvious addominal segments. Antennae 5-segmented, and with few hairs nearly as long as the width of the segments; III only slightly longer than V and with the unguis nearly twice as long as the base. Eyes small and 3-faceted; rostrum long, extending nearly to the tip of the abdomen, slender with apical segments somewhat swollen with few short hairs. Cauda nearly the form of an isosceles triangle with many short, stout curving hairs.

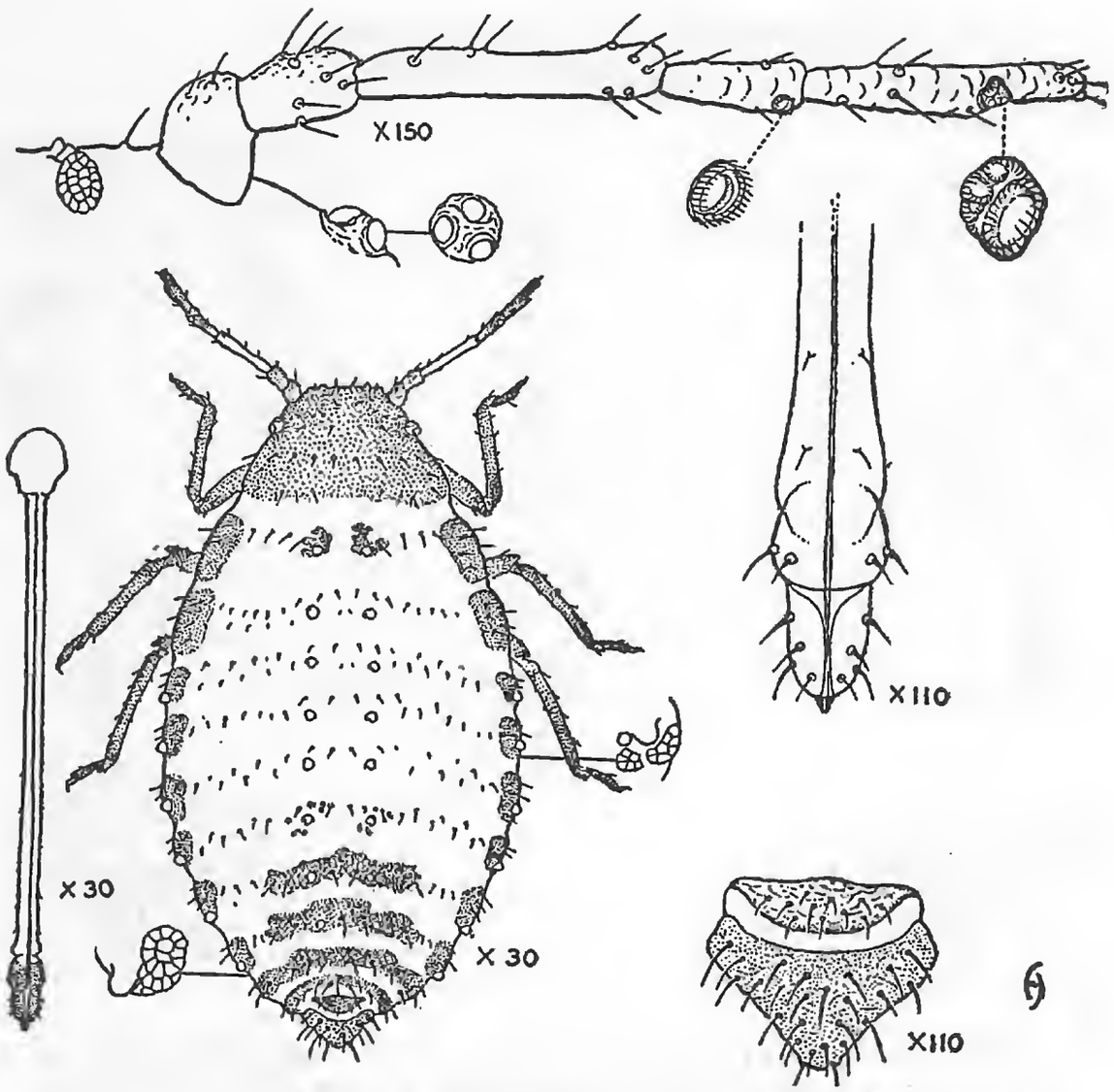

Fig. 1. *Aloephagus myersi* Essig, n. sp. Apterous form and important characters including portion of front of head showing wax glands, antenna, faceted eye (side and front), and rostrum. (Drawing by Frieda Abernathy).

Host plants and distribution in California. Holotype: WEST LOS ANGELES, October 28, 1939, on *Aloe* sp., nursery, F. R. Platt, collector (first report). On *Haworthia rugosa* in quarantine from South Africa, at Inglewood, December 4, 1940, 2 specimens; F. R. Platt, collector. On *Haworthia* sp., Santa Monica, April 25, 1944, 1 specimen; J. Caldwell, collector. On *Haworthia* sp., nursery, Glendale, April 7, 1947, 4 immature specimens; M. Wagner, collector. On *Aloe aristata*, nursery, Glendale, October 3, 1947, 24 specimens; L. E. Myers, collector. These specimens were fresh and covered with white pruinose wax. On *Aloe variegata*, Inglewood, November 12, 1948, 3 specimens; A. D. Phelps, col-

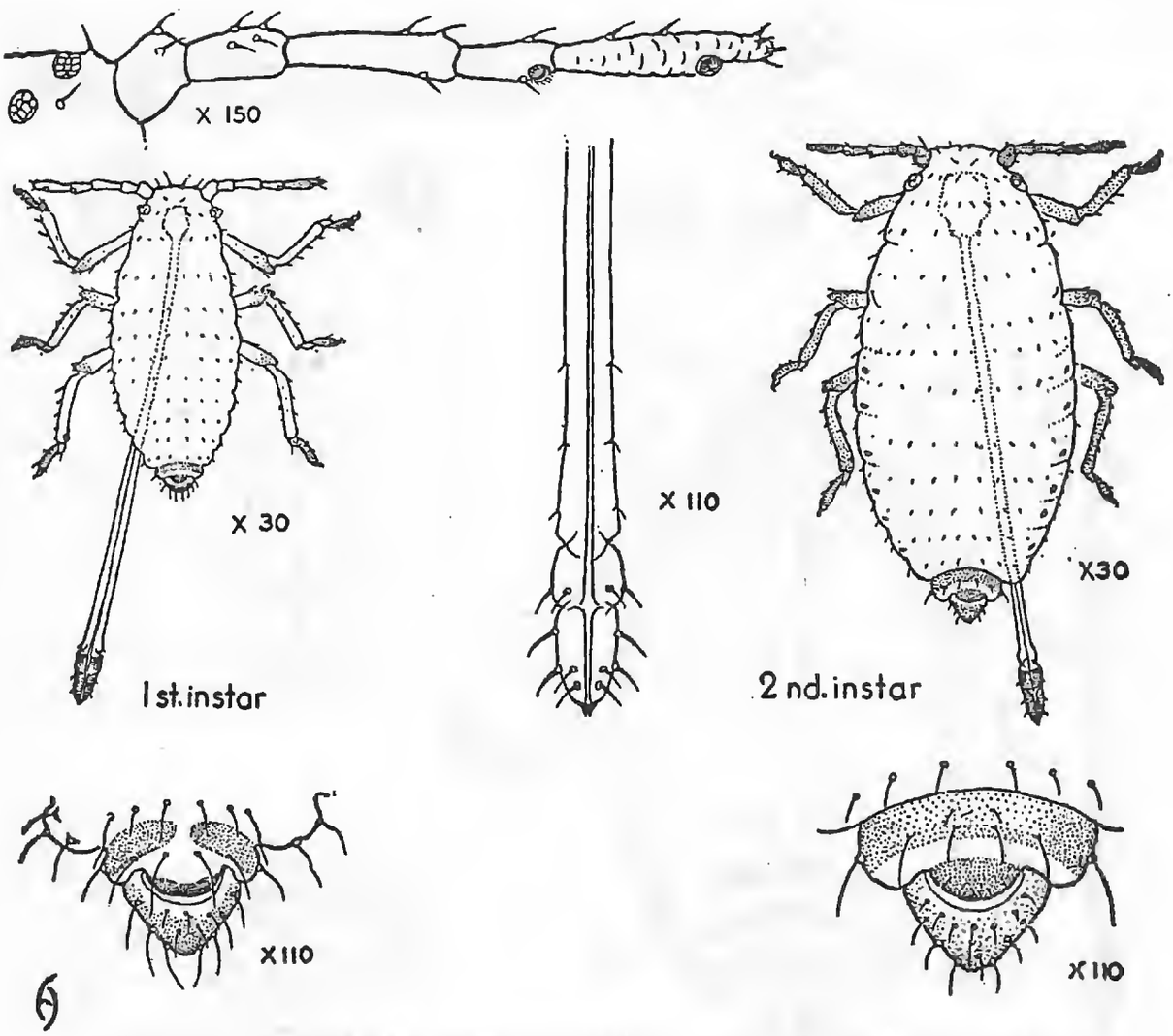

Fig. 2. *Aloephagus myersi* Essig, n. sp. Immature apterous forms. The extremely long rostrum grows but little after birth. (Drawing by Frieda Abernathy).

lector. On *Aloe variegata* (?), Inglewood, September 24, 1948, 6 specimens; A. D. Phelps, collector. On *Aloe* sp. Glendale, October 14, 1948, 3 specimens; W. D. Dyer, collector. An additional collection, July 19, 1949, on *Aloe africana*, Glendale, W. D. Dyer, numbering about 150 specimens on 13 slides received from L. E. Myers.

The entire collection numbering some 193 specimens, mounted mostly in diaphane on 32 slides is distributed as follows: type and 26 slides of paratypes, in author's collection; additional paratypes: 2 slides to State Department of Agriculture, Sacramento; 1 slide to the California Academy of Sciences, San Francisco; 1 slide to the office of Los Angeles County Agricultural Commissioner, Los Angeles; 1 slide to the U. S. National Museum, Washington, D. C.; 1 slide to the British Museum of Natural History, London, England.

NOTES ON CANTHARIS III

(Coleoptera: Cantharidae)

BY DOROTHY MC KEY-FENDER[1]

McMinnville, Oregon

Some years ago when the author and her husband first became interested in Coleoptera, the late Ralph Hopping suggested the Cantharidae as a group in need of revisional work. Beginning on the genus *Cantharis,* the author assembled as much material as possible (both Nearctic and Palearctic) and, in the hope that a fresh approach might be of value, genitalic dissections of all males were made and the species grouped solely on that basis. The North American species fell into seven distinct groups, a grouping that was later supported by other equally important characteristics. The Palearctic material at hand seems to fit well into the author's concept of the subdivisions of the genus but the limited material available necessitates postponement of a study of other than the Nearctic material. The key to the groups herein presented applies to Nearctic material.

The complex generic and subgeneric interrelationships of the Cantharini as a whole offer a fascinating field for study but can only be effectively worked out from the world standpoint.

Some of the subdivisions of the genus *Cantharis* as here constituted must more properly be considered distinct genera. This is true of Divisions I and II of Green (1941), while the author considers the groups under Division II at least of subgeneric rank. In this paper the author presents a discussion of the groups into which the North American *Cantharis* fall, with descriptions of new material in some of the groups. The work is frankly preliminary, but it was felt that further descriptions of new species without correlating them with the rest of the genus were inadvisable.

The author's appreciation is due W. J. Chamberlain for his help in outlining these studies in their early stages; C. A. Frost and P. J. Darlington for their examination of type material; J. W.

[1]Because of the difficulties which arise from two persons of the same name describing material in the same group, it has been considered advisable that the author use the hyphenated name-form McKey-Fender, thus avoiding confusion with the work of her husband, K. M. Fender. The two species of *Cantharis* previously described by the author should preferably be cited *C. dentata* McKey-Fender and *C. bilobata* McKey-Fender.

Green for the loan of his entire Division II collection and for his friendly exchange of ideas; and the author's husband, K. M. Fender—a good listener. The cooperation of many individuals and institutions in making material available for this study is deeply appreciated and to E. S. Ross and Hugh B. Leech in particular the author's thanks are due.

KEY TO THE GROUPS OF NORTH AMERICAN CANTHARIS (*s. lat.*)

1. Third tarsal segment simple, insertion of fourth segment apical, last visible sternite of female unmodified.....*Division* I
– Third tarsal segment emarginate, insertion of fourth segment ante-apical, last visible sternite of female (where known) modified .....*Division* II 2
2. Mandibles toothed, anterior claw of all tarsi bluntly toothed or thickened at base, cleft at tip, the two apical parts similar (Fig. 16)*.....Subgenus *Cyrtomoptera*
– Mandibles simple, claws not as above 3
3. Elytral pubescence duplex, short appressed and longer scattered erect hairs; only anterior claw of male protarsi thickened at base, cleft at tip, the two apical parts dissimilar, all claws of female simple (Fig. 15) .....subgenus *Cultellunguis*
– Elytral pubescence simple (except some *Cantharis, s. str.*), claws not as above 4
4. Some claws cleft or toothed 5
– All claws simple 7
5. All claws cleft (Fig. 17) .....*Carolina* Group
– Some claws toothed 6
6. Anterior claws of all feet invariably acutely toothed (Fig. 18) .....Subgenus *Ancistronycha* (part)
– Anterior claws of at least some feet bluntly toothed or lamellate (all males and some females, Figs. 19 and 20).....*Cantharis s. str.*
7. Slender species, thorax appreciably narrower than elytra, tarsi slender (applies to males, females of our species unknown).....*Absidia*
– Robust species, thorax broad, tarsi broad, lobed (applies to females, see couplet 6) .....*Cantharis* (*s. str.*)

DIVISION I

Rhagonycha Esch. 1830 (part)

Green's (1941) excellent treatment of this group of *Cantharis* is the only systematic work on the genus since Leconte's 1881 synopsis. It covers some forty species, all small and distributed throughout the United States and Canada excepting for the West

*Illustrations to appear in next issue.

Coast states, and which form a closely-knit group, presumably of generic status. It includes the North American species usually placed in *Rhagonycha* except *C. carolina* Fab. and *C. bilobata* McKey-Fender, which are in a distinct group, and those placed in *Ancistronycha* in the Leng "Catalogue of Coleoptera" except *C. loweri* Pic (*decipiens* Horn), a *Cantharis* (*s. str.*), and *C. dentiger* Lec. and *C. neglecta* Fall which with *C. bilineata* Say probably are truly *Ancistronycha.* Though the generic or subgeneric name which should finally apply to Division I remains in doubt, the old name *Rhagonycha* applies to many, possibly most, of the species and is herein retained. Aside from the key characters, the group may be characterized by the male genitalia which have the dorsal plate a simple or emarginate lobe, the median processes (median "hooks" of Division II) rudimentary, represented only by chitinized patches on the median lobe, and the internal sac with setiferous patches.

Division II

The species of Division II average much larger than those of Division I. The internal sac of the male genitalia lacks the definite patches of bristles of that of Division I, but the median lobe has well developed hooks. The apex of the last visible sternite of the female (eighth abdominal) in this group is variously modified. While the shape of this modification offers good specific distinctions, the distortion of dried specimens prevents its taxonomic use except by special methods of study and is therefore not emphasized. The presence of such modifications in *Absidia* has not been demonstrated, since the females of our species are unknown, nor has the author seen females of European *Absidia.* Although the author has made use of specimens relaxed and cleared with weak KOH and observed in glycerine in the preparation of these studies, emphasis is placed on characters apparent by conventional methods of study. The genitalic drawings depict only the terminal parts of the genital armature (dorsal view), these being sufficiently diagnostic. Distribution data are based on material seen by the author.

Subgenus Ancistronycha Mark. 1851 (*part.*)

Cantharis bilineata Say, 1823, *C. dentiger* Lec., 1851 and *C. neglecta* Fall, 1919, constitute the North American representatives of this sub-genus. Their close relationship is clearly shown by the male genitalia as well as the form of the ungual tooth

(Fig. 18). *Dentiger* and *neglecta* are kindred species, their specific resemblances being emphasized by a hind-wing venation common to both and unique in the *Cantharis* known to the author, while *bilineata*, in wing venation and in the simple posterior claw of each pair tends toward *Cantharis* (*s. str.*), a relationship indicated by several European forms as well. Two apparently new species in this group are in the author's collection but are represented only by females and therefore will not be described at this time. The male genital armature of these species has the dorsal plate very much shorter than the ventral lobes and truncate, the ventral lobes very strong and hooked, the tips bi-dentate, the median "hooks" dorso-ventrally flattened, short and triangular. A key to the species follows:

1. Only anterior claw of each pair toothed, pronotal maculation normally bilineate (Eastern U. S. south to Georgia, west to Oklahoma and Minnesota) ..... *bilineata*
– All claws toothed, pronotal maculation confluent medially 2

2. Pronotum smooth, shining, sub-quadrate (Eastern U. S. south to New Jersey, west to Oklahoma and Minnesota) ..... *neglecta*
– Pronotum densely punctate, rough, transverse (Northeastern U. S. west to Ohio. The Leng catalogue also lists Indiana and Texas) ..... *dentiger*

Carolina Group

Two closely related and very similar species fall in this group. They are *C. carolina* Fab. 1801 with its pale color-phase *C. jactata* Say 1825 and *C. bilobata* McKey-Fender 1941, also occasionally pale. The remarkably great development of the basal plate of the male genital armature of these species is found in no other North American group of *Cantharis*. It is very unlikely the name *Rhagonycha* should apply to these two species, but description of the group as new is postponed pending further study. No palearctic species yet examined by the author belongs with these species. The species may be separated as follows:

1. Pronotal maculation interrupted laterally, tips of ungual divisions divaricate, eyes large, pronotal margins broadly reflexed, disc comparatively flat, ventral lobes of tegmen bilobed apically (boot-shaped) . . . (Quebec south to North Carolina, west to New Mexico? or Oklahoma and northern Minnesota) ..... *bilobata*

2. Pronotal maculation normally with unbroken edges, tips of ungual divisions approximate, eyes small, pronotal margins

narrowly reflexed, disc moderately to strongly convex, ventral lobes of tegmen simple apically (Maine to Key West, west to Oklahoma and Minnesota) ..... *carolina*

Subgenus Cyrtomoptera Mots. 1859

Cyrtomoptera Motschulsky, 1859, Coleopteres Nouv. de la Californie, Bull. Moscou, 32: 401.
(*Cyrtomatoptera* Mots.); loc. cit. p. 399.

In the above paper Motschulsky applied the name *Cyrtomoptila,* both in the key (p. 398) and the text (p. 401) only to the European *Cantharis lateralis* L. In the key, *Cyrtomoptila* is distinguished from *Cyrtomatoptera* in having the claws simple apically (i.e., "non fendus a leurs extremites"). In the text (p. 401) *Cyrtomoptera* (note spelling) is stated to be a new genus, the species *Cyrtomoptera latiuscula* Mots. being described and *Cantharis binotata* Mannh. and *Telephorus divisus* Lec. being designated congeners, while the American species, i.e., *Cyrtomoptera,* are again noted to differ from the European genus *Cyrtomoptila* in having the inner claw cleft apically (*C. lateralis*). In view of these facts it seems unlikely that *Cyrtomoptila* should take precedence over *Cyrtomoptera* in spite of its anterior position in the publication. As *Cyrtomoptera* is the spelling which accompanies the "definition" of the genus, it should be preferred over *Cyrtomatoptera,* which is used only once in the key.

C. latiuscula Mots. has been made a synonym of *Cantharis divisa* Lec., which thus becomes the type of the genus. *C. binotata* Mann. (ex err. *notata* Mann. 1843) has been renamed *C. americana Pic,* 1906, and is the type of the subgenus *Cultellunguis* (v. sub.). Thus of the older species *C. divisa* alone remains and this species together with *C. dentata* McKey-Fender, 1944, constitute the subgenus *Cyrtomoptera.*

In addition to Motschulsky's characterization of this subgenus, which emphasizes the form of the claws and the tuberculate sculpture of the elytra, attention must be called to the dentate mandibles, a condition unique in the imagoes of North American *Cantharis.* The male genital armature is characterized by the simple dorsal plate with undeveloped lateral sinuations, the ventral lobes expanded at least basally. The species may be separated as follows:

1. Pronotum normally maculate, last ventral of female with a rufous apical spot, not thickened laterally, dorsal plate of male

armature simple apically, 5.5 to 10 mm., averaging 8 mm. (Low to moderate elevations along coast, San Diego, Calif., north to Vancouver Is. and southwestern mainland of British Columbia, and including the Sacramento, Calif., Willamette, Ore., and Yakima, Wash., valleys.) .....*divisa*

2. Pronotum immaculate, last ventral of female rufous apically and medially, thickened laterally, dorsal plate of male armature emarginate apically, 6 to 10 mm., averaging 9 mm. (Higher elevations in the Sierra Nevada, and Mt. Hamilton, Santa Clara Co., California.) .....*dentata*

Cultellunguis McKey-Fender, new subgenus

Male: Size moderate (6.5 to 9 mm.), slender with relatively long legs and antennae. Head shining, finely punctate, pubescence fine, appressed. Antennae filiform, slender, second segment one-half to two-thirds length of third. Clypeus comparatively short, terminal segment of maxillary palpi elongate, trapezoidal, outer limb much longer than the inner, distal side gently arcuate, apex subacute (Fig. 14). Pronotum subquadrate or slightly elongate, never transverse in the known species, narrower than elytra, shining, virtually impunctate, pubescence fine and sparse. Elytra rugose, tuberculate, sculpture arranged in faint longitudinal lines the prominence of which varies in the species, relatively slender, edges a little thickened. Elytral pubescence duplex, consisting of a relatively dense layer of soft appressed hairs and a layer of longer scattered stiffer hairs. Tarsi lobed, apex of third segment emarginate, insertion of fourth segment ante-apical. Anterior claw of pro-tarsi thickened at base forming an inconspicuous tooth, cleft at tip, the outer cleft portion flattened like a knife blade,—i.e., cultellate (Fig. 15), all others simple. First pro-tarsal segment a good deal longer than those following and broad to very broad, the proportions varying specifically. Tarsi otherwise rather slender.

Genital armature consisting of the well-chitinized, lobed tegmen and tubular median lobe bearing the paired, strongly chitinized median hooks and terminating in the membranous internal sac, which is armed apically with a long flagellum composed of a bundle of long slender bristles. (This structure has been detected in the majority of the species, scarcity of material preventing the necessary preparations in the others.) The terminal portion of the dorsal tegminal plate is bifurcate medially, sinuate laterally; the ventral lobes are much flattened and folded; the basal portions moderately chitinized, a pair of curved plates investing only the proximo-lateral portions of the tegmen, leaving the terminal parts well exposed. The form of the lobes offers reliable specific distinctions.

Female: Differs in having the eyes relatively smaller, antennae shorter, form a little stouter, the first protarsal segment not broader than the others, claws all simple.

Type species: *Cantharis americana* Pic, 1906 (*C. notata* Mann.)

The knife-like shape of the outer cleft portion of the anterior protarsal claws of the male is very characteristic and it is from this feature that the subgenus takes its name. The shape of the tip of this portion and its comparative length varies specifically. The shape of the last segment of the maxillary palpi is also quite distinctive (Fig. 14). *Cyrtomoptera* alone approaches it in form, while species of the other groups have the two limbs more nearly equal (Fig. 13) except a few *Cantharis* s. str. which are intermediate (*consors, rotundicollis, curtisii*) and subgenus *Absidia* in which the inner angle is obscured (Fig. 12).

Cultellunguis includes a well marked group of species which are concentrated in Southern California, one species having been taken in Baja California, Mexico (Ensenada and Catavina), and only one extending north of San Francisco along the coast through Oregon and into Washington. Previously described species include: *americana* Pic, 1906 (*notata* Mann, 1843), *americana larvalis* Lec. 1860, *lauta* Lec., 1851, *ochropa* Lec., 1881, *ingenua* Lec., 1881, and *perpallens* Fall, 1936. In addition *hatchi, macnabiana, mackenziei, americana montereyensis, perpallens sanctaeclarae* and *ingenua knulli* are herein described. A key to the species follows:

1. Legs pale or bicolored 2
– Legs black 10
2. Elytra dark 3
– Elytra pale 8
3. Head entirely black behind eyes 4
– Head entirely pale or with a black occipital spot or spots of variable size 5
4. Clypeus scarcely emarginate apically, sides arcuate, apex of abdomen pale, last ventral of male deeply, broadly emarginate, the sides produced and flattened ..... *ochropa*
– Clypeus strongly emarginate apically, sides oblique, usually piceous beneath (sides and apex of abdomen rarely narrowly pale), last ventral of male simple ..... *macnabiana*
5. Anterior angles of pronotum distinct 6
– Anterior angles of pronotum not evident, evenly rounded into the deeply convex anterior margin ..... *perpallens sanctaeclarae*
6. Legs unicolorous ..... *americana americana*
– Knees black 7
7. Prothorax yellow, form slender, male metacoxae with a conical projection ..... *hatchi*

– Prothorax maculate, form robust, male metacoxae simple .... *americana montereyensis* (part)

8. Anterior angles of pronotum indistinct, evenly rounded into the deeply convex anterior margin, coloration entirely pale, form slender ..... *perpallens perpallens*

– Anterior angles of pronotum distinct, elytra pale with narrow dusky border, pronotal and occipital maculations present, form robust 9

9. Legs entirely pale ..... *americana larvalis*

– Knees black ..... *americana montereyensis* (part)

10. Long hairs of elytra fulvous or golden, last ventral of male broadly, very deeply emarginate, the sides of the emargination prolonged and flattened ..... *mackenziei*

— Long hairs of elytra black, last ventral of male broadly shallowly emarginate, sides not modified 11

11. Form robust, first male protarsal segment broadly expanded, tegminal lobes broad ..... *ingenua ingenua*

— Form slight, first male protarsal segment not broadly expanded, tegminal lobes not notably expanded ..... *ingenua knulli*

Unknown to the author: *C. lauta* Lec. 1851. It would run to couplet four in the key.

CANTHARIS (CULTELLUNGUIS) AMERICANA PIC[2]

Cantharis notata Mannerheim, 1843, Beitr. Käferf. der Aleutischen Ins. etc., Bull. Moscou, 16: 246.

Cantharis binotata Motschulsky (nec Mannh.; ex err.) 1859, Bull. Moscou, 32: 401.

Cantharis peregrina Boheman, 1858-1859, Kongliga Svenska Fregatten Eugenies Resa, etc., Coleoptera, Stockholm, p. 80.

Cantharis americana Pic, 1906, L'Echange, 22: 81.

Elytra piceous, head flavo-testaceous with black maculation behind eyes varying from a pair of spots postero-medially from antennae, to a black area occupying much of the head behind eyes; antennae flavo-testaceous, apical fourth often infuscate; pronotum flavous to testaceous, paired or coalesced black or brown maculation on the anterior half of disc; scutellum, legs and sides and apex of abdominal segments testaceous, sternum piceous; form moderately robust.

Male: Width at base of elytra 1.75 mm., length 8 mm., antennae 6 mm. Clypeus short, emarginate, margin arcuate on either side of center. Antennae not quite reaching two-thirds of body length; eyes small. Pronotum subquadrate, anterior angles prominent, anterior margin moderately convex from the anterior angles; sides sinuate, constricted immediately behind anterior angles and again less strongly immediately before the posterior angles; posterior angles very distinct, a right angle or very slightly greater, posterior margin moderately convex from a little within the posterior angles, not or very slightly sinuate at middle; pronotal edges re-

[2]The name *notata* is preoccupied by *C. notata* Waltl., 1838, a synonym of *C.* (*Metacantharis*) *discoidea* Abiens (Pic 1906).

flexed, a broadly concave area on either side of anterior half occupying one-third of width of disc and tapering posteriorly to posterior fourth leaving a thin reflexed margin; median depressed area extending from posterior edge to just short of anterior edge, posterior edge most deeply reflexed at center and just within angles, disc tumid on either side of posterior half. Elytra moderately stout, combined width one-fourth greater than thorax and nearly one-third of elytral length, longitudinal sculptured lines strong; short pubescence cinereous, erect hairs black. Anterior claw of protarsi cleft, outer cleft portion cultellate, slightly exceeding inner; apex obliquely arcuate; all others simple; first protarsal segment expanded, width equaling two-thirds its length, width of second equals three-fourths its length, width of third equals its length which equals width of second. Posterior margin of last ventral simple.

Male genital armature testaceous or dusky, dorsal bifurcation of tegmen very short, forks narrow, apices acute, widely divergent; median lobe stout, exceeding tegmen; lateral sinuations broadly lobular; ventral lobes laterally flattened at tips, moderately long (Fig. 1).

Female: Form slightly more robust, antennae shorter, not nearly reaching two-thirds body length, claws all simple, pro-tarsi not expanded. Width at base of elytra 2 mm., length 8 mm., antennae 5.5 mm.

Range: West Coast; Coastal California from San Diego north to San Francisco Bay region, San Mateo and Santa Cruz counties; northward along the coast from Marin county into Oregon and Washington.

Specimens examined (including the subspecies): 151.

This species was the earliest described representative of the subgenus and is herein designated the generic type. It is also of widest distribution and has two well developed subspecific variations. Its nearest relative appears to be *C. hatchi* but it is easily separated by the smaller eyes, maculate head and thorax, more robust form (eyes large, head and thorax pale, and form elongate in *hatchi*), and the absence of the coxal spur characteristic of the male in *hatchi*. *Americana*, particularly in the typical form, may show a low metacoxal ridge which seems to foreshadow the prominent spur of *hatchi*, but it can in no sense be said to be spurred. From *perpallens* this species is readily separated by the definite pronotal angles (anterior angles not evident in *perpallens*). In the Willamette Valley, Oregon, this species (subsp. *larvalis*) is usually associated with the Garry oak, *Quercus garryana* Dougl.

(To be continued in next issue.)

OBSERVATIONS ON THE MATING HABITS OF HALICTID BEES

(Hymenoptera: Apoidea)

BY GEORGE E. BOHART

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In October, 1946, on the experimental farm of the University of California, at Davis, rather large numbers of the following species of halictid bees were observed on the fermenting juice of broken watermelons: *Apis mellifera* L., *Agapostemon cockerelli* Crawford, *Halictus ligatus* Say, *H. farinosus* Smith, *H. rubicundus* Christ, and *Lasioglossum sp.* Except for the first, all belong to the family Halictidae. Since the mating of most genera of bees is not readily observed, the following notes are recorded.

Agapostemon cockerelli and *Halictus ligatus*, males and females, were the most abundant, and the males of both species spent most of their time trying to copulate with females. In these attempts the males flew in circles about 4 inches above the watermelons and dropped precipitously upon the feeding females after approaching them from behind. In most cases the females dislodged the males by simply taking flight or by first rolling onto their backs.

In approximately 5 percent of the encounters observed, mating was apparently successful. In such cases the male was seen to straddle the female with his head above her neck. The tip of his abdomen appeared to curl under and slightly to one side of the tip of hers, but this was not clearly observed. When full contact was made, the female crawled across the watermelon and in a few cases took flight for an inch or more. During this activity the male would usually lose hold with his fore- and mid-legs and assume an almost perpendicular position, still clinging to the female with his hind legs. The average time of contact was about 10 seconds. Mating was apparently terminated by the female, who dislodged the male by twisting, rolling over, thrusting with her legs, and then taking flight. The female, when free, immediately resumed feeding, and the male in most cases started searching for another female.

Little discrimination was shown by the males in selecting females for attempted matings. Females observed to be already mated were pounced upon as readily as the others, and females of all the halictid species, with the exception of the *Lasioglossum* which were very small, were subject to encounters by males of at least the three commonest species. In no case, however, was a male seen to make prolonged contact with a female known to be mated or with a female of a different species. Table 1 shows the results of a series of attempted matings observed in about half an hour on one watermelon.

Table 1.—Results of attempted mating by males of two species of Halictidae.[1].

	Agapostemon cockerelli	*Halictus ligatus*
Agapostemon cockerelli	32 A,[2] 3S	14 A
Halictus ligatus	6 A	36 A, 4S
Halictus farinosus	4 A	8 A
Halictus rubicundus	2 A	4 A
Lasioglossum sp.	—	1 A

[1]Observations were made by watching the females rather than the males.

[2]A = Attempted mating; S = apparently successful.

IXth International Congress of Entomology

The IXth International Congress of Entomology will be held from August 17th-24th, 1951, in Amsterdam (Netherlands). Entomologists wishing to receive in due course programs and application forms are requested to communicate with the Secretariate, c/o Physiologisch Laboratorium, 136 Rapenburgerstraat, Amsterdam. Further communications will follow in 1950.

Another European Weevil Established in California

A specimen of *Baris* (*Cosmobaris*) *scolopacea* Germ. was collected at Antioch, Calif., on July 15, 1946, by D. Giuliani. Mr. Peter Ting informs me that he has also collected this weevil at Corral Hollow, near Tracy, on cattails, May 4, 1939, and near Sacramento, June 25, 1949, on rag weed. Rag weed is its normal food plant.—Edwin C. Van Dyke.

PACIFIC COAST ENTOMOLOGICAL SOCIETY

G. F. FERRIS	E. S. ROSS	D. D. JENSEN
Vice-President	*President*	*Secretary*

PROCEEDINGS

Two Hundred and Third Meeting

The two hundred and third meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on January 29, 1949, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Ross in the chair. The following members were present: E. S. Ross, J. M. Watson, Victor Stombler, A. Retan, Ernestine B. Thurman, D. C. Thurman, F. X. Williams, Wm. D. Murray, K. D. Snyder, W. E. Hazeltine, C. H. Spitzer, J. W. Tilden, E. G. Wegenek, R. L. Doutt, H. B. Leech, R. S. Beal, Jr., K. E. Frick, F. H. Rindge, J. E. Gillaspy, E. C. Van Dyke, E. L. Kessel, N. W. Frazier, W. W. Middlekauff, N. D. Waters, C. P. Hoyt, B. E. White, H. H. Blakemore, W. H. Hart, J. du Bois, K. S. Hagen, J. G. Edwards, A. E. Michelbacher, S. H. Benedict, E. O. Essig, D. J. Gould, L. Quate, W. W. Wirth, P. D. Hurd, Jr., S. A. Sher, R. F. Smith, John Hart, and D. D. Jensen. The following visitors were also present: Ruth Ogren, Hal Brydon, Sherman L. Thomas, Sylvia R. Hindebrant, Claude Smith, Kathryn Hoyt, Mrs. F. X. Williams, J. W. Green, E. P. Cook, Jacques R. Helfer, J. H. Freitag, H. T. Osborn, Mrs. H. T. Osborn, and Bap Reddy.

The minutes of the previous meeting, held December 18, 1948, were read and approved.

The membership committee proposed and the Society elected Thomas W. Cook to membership in the Society.

President Ross appointed the following members as a committee to study the constitution and recommend amendments: Dr. Linsley (Chairman), Dr. Michelbacher, and Mr. Hurd.

In response to the president's call for notes, exhibits, and remarks, Mr. Hazeltine displayed 165 males and 3 females of *Pleocoma conjungens* Horn which were collected during the rain at Mt. Hermon.

Dr. Ray F. Smith described his recent visit to the site of some of Le Conte's collections during this early entomologist's trip west in 1867. Slides were shown of two important type localities which were formerly occupied by forts of the U. S. Army. Nothing is left of Fort Wallace near what is now Wallace, Kansas. A single tree stands on an uninhabited plain where the fort formerly

stood. Le Conte spent from June 24 to July 8, 1867, in this area. Portions of several hundred adobe buildings still stand as the remnants of Fort Union near Watrous, New Mexico. At the time of Le Conte's visit in August, 1867, Fort Union was the main supply point and headquarters for the lesser forts in the Southwest area.

Dr. Ross called attention to the fact that Dr. Duncan's presidential address given before the Society in 1947 on the subject: "Some Remarks on the Influence of Insects on Human Welfare", had been reprinted for distribution by the Smithsonian Institution.

President Ross then introduced as the main speaker of the day, Dr. Francis X. Williams, recently retired Entomologist of the Hawaiian Sugar Planters' Association Experiment Station, who spoke on the subject: "Notes on the Natural History of East Africa." Dr. Williams' summary of his remarks follows:

The Pacific Science Board of the National Research Council, on request from the United States Navy, sent me to Africa to study the habits and natural enemies of the giant African snail, (*Achatina fulica*) so destructive now on certain tropical Pacific islands.

Not being a malacologist, I first spent ten days at the Museum of Comparative Zoology at Harvard College, Cambridge, Massachusetts, to study some of the African land snails, under Dr. J. S. Bequaert, entomologist, malacologist, and botanist, and who is well acquainted with tropical Africa.

Mrs. F. X. Williams accompanied me to Africa. She took all the photographs and helped in many other ways.

Nearly all our transportation was by air. We arrived at Mombasa, Kenya Colony, British East Africa, early in December, 1947, and left Africa for the United States on June 19, 1948. In the search for a suitable headquarters for work on *Achatina* snails, we visited the Island of Zanzibar and a number of localities in Kenya Colony, Tanganyika Territory, and the Uganda Protectorate in the interior. Incidental to the work on snails, many other observations on natural history were made.

A very brief discussion of the faunal areas of the Ethiopian region followed; these included the Lower Guinea forest district, a wet area extending from the west into Uganda, some areas of Savannahs, the East African Highlands, and the East African Lowlands. The amount and annual distribution of the rainfall is the chief factor in determining these faunal areas.

The lake region in Uganda is briefly described, the Victoria Nile with its Murchison Falls roaring through a cleft less than 20 feet wide and flowing into Lake Albert, the wonderful macrofauna along its banks—dozens of hippopotami, elephants, water buck, baboons, etc., and large wading birds and fine fish eagles; elsewhere the quantities of lake fish (*Tilapia*), catfish, and lung fish caught overnight at a narrows, the huge marabou storks wait-

ing for the offal. Extensive swamps of the Egyptian bulrush (*Cyperus papyrus*), up to 15 or more feet tall, provide fine shelter for certain birds, etc. The elephant grass (*Pennisetum purpureum*) is much employed by the Africans in building their huts and fences.

On the highland plains, much large game was observed both from train and automobile; they included many antelope, giraffe, zebra, ostrich, and a small herd of buffalo. Secretary eagles were noted striding through the fields. Several kinds of weaver birds were observed nesting in colonies in palms and other trees. The preponderance and destructiveness of the Indian house crow (*Corvus splendens*), introduced into the Island of Zanzibar, was commented upon. The numerous beautiful species (Nectariniidae) of sunbirds, the males in metallic greens, reds, etc., remind us of our humming-birds, as they flutter among the flowers. Large birds of prey and horntails are conspicuous in many parts of Africa.

Among insects, at least a half dozen species of *Ampulex*, or cockroach wasps, were collected. The common *Ampulex compressa* was found in and about habitations. Many kinds of fossorial wasps were seen. Vespid wasps were well represented, large *Eumenes* and *Synagris* constructing their mud nests in buildings. There were fine species of carpenter bees (Xylocopidae) and the wild honeybee (*Apis* sp.), nesting in hollows of the huge baobab trees (*Andansonia digitata*), was very aggressive.

Several species of swallowtail butterflies were common in forest glades. Immense neuropterous insects of the genus *Palpares* flew up at your approach.

About Tanga, on the East African Coast, immense dark cylindrical millipedes that attained a length of at least 9 inches were common. Large millipedes play an important part hereabouts in the reduction of plant trash into humus.

As elsewhere in the tropics, termites are a problem here. Power poles and railroad ties are of metal, as a protection against termites and decay. Termites are also eaten with gusto *au naturelle* by Africans.

At the Diani Beach district on the Indian Ocean and but a few degrees south of the equator, most of the work on snails was carried on. Snails of the genus *Achatina* were very numerous here and reached a length of six inches.

In the Diani district the dry and wet seasons are sharply marked. It is interesting to note here how quickly the waterloving insects take advantage of rain puddles. Hardly have these formed when dragonflies begin ovipositing in them, and water and shore bugs appear almost by magic.

So brief a stay in Africa as ours makes us realize how little we know of the natural history of that vast continent.

After a discussion of the paper the meeting was adjourned.—D. D. JENSEN, *Secretary*.

Two Hundred and Fourth Meeting

The two hundred and fourth meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on March 5, 1949, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Ross in the chair. The following members were present: P. A. Adams, N. D. Waters, P. H. Arnaud, R. L. Doutt, K. S. Hagen, W. D. Murray, A. E. Pritchard, E. C. Van Dyke, R. P. Allen, D. W. Boddy, K. E. Frick, E. G. Wegenek, A. H. Retan, V. Stombler, H. M. Armitage, J. W. Tilden, H. H. Blakemore, K. W. Tucker, D. E. Bryan, V. M. Stern, T. W. Cook, W. W. Sampson, D. J. Raski, M. W. Allen, G. L. Smith, E. B. Thurman, D. C. Thurman, R. F. Fritz, D. Gould, J. E. Gillaspy, P. D. Hurd, Jr., E. G. Linsley, F. X. Williams, N. W. Frazier, J. W. MacSwain, R. van den Bosch, R. F. Smith, J. G. Edwards, W. C. Day, C. A. Hanson, E. E. Seibert, Larry Quate, A. E. Michelbacher, E. S. Ross and D. D. Jensen. Visitors were present as follows: Mrs. E. G. Wegenek, G. L. Stebbins, Alva Grant, Verne Grant, W. W. Allen, J. H. Freitag, C. B. Huffaker, R. W. Bunn, and Louisa Clark Williams.

The minutes of the previous meeting were read and approved.

The membership committee proposed the following for membership in the Society: R. A. Underhill, Kenneth R. Hobbs, K. W. Tucker, and R. W. Hunt. They were unanimously elected.

President Ross requested an expression of opinion from the members of the Society as to whether an informal luncheon should be held in a restaurant at noon before each meeting. After a brief discussion it was decided that such luncheons would be held for those who wish to attend them, but that members who wished to bring their own lunches would meet at the Academy.

President Ross appointed the following members as a committee to select a site for the annual field meeting of the Society which will be held in May: P. D. Hurd (Chairman), J. W. MacSwain, and Paul Arnaud.

In response to a call for notes, exhibits, and remarks, Dr. R. F. Smith reported that on January 26, 1945, at the Fabian Bell Tract near Tracy, California, a large colony of bees (*Exomalopsis* sp.) was found. When 786 cells were dissected out, 173 (22 per cent) were found to have been destroyed by mold, 19 (2.4 per cent) contained last instar bombyliid larvae, and 594 contained last instar bee larvae of which one-third had mold on them. Forty-one or 15.4 per cent of 267 *Exomalopsis* larvae had first instar *Rhipiphorus* larvae in them. These were full fed and occurred in the ventral portion of the thorax where they fed on the fat body of the bee larvae.

On February 15, 1949, at the Shiner Ranch east of Firebaugh, 33 per cent of the bee larvae examined contained *Rhipiphorus* larvae.

Dr. Smith stated that adults are rarely taken and at the present time the biology is known for no American species of *Rhipiphorus*.

Mr. H. B. Leach commented that in one day in British Columbia he had collected 40 specimens of a rhipiphorid species on goldenrod.

Mr. Armitage reported that when Dr. H. T. Osborn found the yellow clover weevil at Yreka, California, in 1948 it was thought to be the first record for the species in California. Since it was known to occur extensively in the eastern part of the United States, the records of some of the eastern collections were checked. In the Cornell University collection specimens were found which had been collected at Eureka, Pomona, and Los Angeles, California, as early as 1907. This case was cited as an illustration of the importance of museum insect collections for the economic entomologist. If these early collections had not been preserved as evidence that the species had existed in California for many years, a program might have been undertaken to determine its distribution in the state. Moreover, quarantine or eradication measures might have been invoked.

Dr. G. L. Stebbins, Professor of Genetics, University of California at Berkeley, was then called upon to present his address entitled, "Insects and Evolution." Professor Stebbins' discussion, which was illustrated with lantern slides, is summarized below.

Of the numerous problems in general evolution in connection with which evidence from insects is important, two have been selected for discussion, namely mimicry and the role of insects in the pollination of flowers. The personal experience of the speaker with mimicry began at the Hastings Natural History Reservation in Monterey County in 1944, where he observed the activity of the Sphingid moth, *Hemaris senta*, in pollinating the flowers of *Trichostema lanceolatum*, the turpentine weed. He was struck not only by the morphological resemblance of this moth to a bumble bee, but also by its similarity in behavior, and the fact that it flies by day, while its relatives are mostly night fliers. Such a combination of morphological characteristics and instincts must have been built up through a complicated process of mutation and genetic recombination guided by natural selection.

Two sets of experiments on mimicry were cited. The first, by P. J. Darlington, consisted in placing specimens of the genus *Thonalmus* (Lycidae, Coleoptera) as well as certain of its mimics in the family Cerambycidae, namely *Calocosmus venustus*, *Trichrous divisus*, *T. pilipennis*, and *Heterops dimidiata*, in cages along with the insect-eating lizard, *Anolis sagrei*. In two experiments, each lasting 5 days, the lizard failed to eat any of 4 specimens of *Thonalmus aulica* or of 7 specimens of mimicking species of Cerambycidae, but did eat all of 20 specimens of non-mimicking

species introduced into the cage, including 10 different plain-colored species of Cerambycidae.

The second set of data cited were those of E. B. Ford on the distribution of mimic, non-mimic, and imperfectly mimicking forms of the African butterfly, *Papilio dardanus*. This author showed that at Entebbe, where all of the aposematic, brilliantly colored model species are abundant, there is a relatively large number of different mimic forms of *P. dardanus*, while at Nairobi, where models are relatively uncommon and some are absent, the mimics are less abundant, and many of them are imperfect, due to the presence of genetic modifying factors. The simple Mendelian inheritance and consequently the genic basis of these mimic forms has been demonstrated by raising broods from gravid females collected in the wild, and observing the segregation of different mimic forms from these broods.

The first observations cited on flower pollination were those of K. Mather at the John Innes Horticultural Institution, Merton, England, on two species of snapdragon, *Antirrhinum majus* and *A. glutinosum*. *A. majus* is normally self pollinated but *A. glutinosum* is self incompatible and must be cross pollinated. Mather grew these two species in alternating plots in his garden, and found that of seeds gathered from *A. glutinosum*, only 2.9 per cent of hybrid plants were recovered, while seed gathered from *A. majus* gave only 0-1.2 percent of hybrids. Artificial cross pollination is successful between these two species as between two plants of the same species. Hence Mather's results can be explained only on the assumption that on a particular pollen collecting trip, the bees which pollinate these flowers remain true to one or the other species. Both species are pollinated by the honey bee, and it is possible that the same bee may visit *A. majus* on one pollen collecting trip and *A. glutinosum* on another, but bees which started their activity on one of the two species were observed to fly over the plots containing the second species in their search for more plants of the first species visited. Similar observations were made by Dr. Verne Grant on honey bees pollinating two different races of *Gilia capitata* cultivated in Berkeley.

The work of Pouyanne in North Africa, as cited by Ames, has shown that the orchid species *Orphrys fusca* and *O. lutea* are pollinated by male bees of the genus *Andrena*, through the process of pseudocopulation, while *Orphrys speculum* is pollinated by males of the wasp *Scolia ciliata* in a similar manner. The attitude of pseudocopulation is, however, different, since the *Andrena* species pollinate with their abdomens, and the *Scolia* with its head. The genus *Orphrys*, one of the most rich in species of the European flora, has undoubtedly been greatly stimulated in its evolution by the selective activity of the pollinating bees and wasps. Another example is the Australian orchid, *Cryptostylis leptochila*, which is pollinated by male flies of the genus *Lissopimpla*.

Grant has shown that in species of which the flowers are pollinated by Hymenoptera, Lepidoptera, or birds, a very large proportion of the characters used by taxonomists for differentiating species are based on the characters adapting them to insect pollination, namely the corolla, stamens, styles, and stigmas; while in those flowers pollinated by less discriminating insects, or by wind or water, a much smaller proportion of the valid taxonomic characters are found in these structures. In *Aristolochia*, however, a fly pollinated flower, the 250 species are differentiated largely on the basis of their tubular perianth, which is modified in different ways to form different types of fly traps. In *A. californica*, the perianth has its dark colored and transparent parts distributed in such a way as to make use of the fly's phototropism in guiding it into the location of the stigma and anthers.

Finally, the speaker speculated on the suggestion of Diels, that the earliest Angiosperms were pollinated by Coleoptera. In this connection it is notable that the herbaceous species of *Paeonia* native to the Old World are pollinated by bees, and have conspicuous white, pink, crimson, lavender, or yellow flowers, which are sometimes scented; while the two species native to the New World have dull brownish or maroon flowers, much smaller and inconspicuous, and without scent. Their pollinating agents are not known, but Delpino has reported that the shrubby species *P. suffruticosa* of China is pollinated by Cetoniae, which lick the fleshy disk at the base of the carpels. In this connection it is important to note that the disk of the American species, *P. Brownii* and *P. californica*, is the most highly developed of any species in the genus. In the Old World species, the disk is progressively reduced as the species become more advanced in their phylogenetic position. Since *Paeonia* is one of the most primitive genera of Angiosperms, the establishment of beetles as regular pollinators of primitive species of this genus would have great evolutionary significance.

After a discussion of the paper, the meeting was adjourned.—D. D. JENSEN, *Secretary*.

Two Hundred and Fifth Meeting

The two hundred and fifth meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on April 2, 1949, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Ross in the chair. The following members were present: E. L. Kessel, E. S. Ross, R. L. Doutt, B. Brookman, K. D. Snyder, N. D. Waters, E. O. Essig, A. E. Michelbacher, F. X. Williams, W. C. Day, E. C. Van Dyke, H. B. Leech, J. W. MacSwain, W. W. Wirth, P. D. Hurd, Jr., K. E. Frick, P. A.

Harvey, R. C. Miller, C. P. Hoyt, P. Arnaud, W. L. Hoyt, T. W. Cook, A. G. Applegarth, J. R. Walker, Ferne E. Atkins, C. I. Smith, R. F. Smith, R. E. Beer, R. van den Bosch, D. E. Bryan, E. G. Linsley, F. Leigh, K. S. Hagen, J. P. Gillaspy, and D. D. Jensen. The following visitors were also present: Mrs. Lucy M. Bryant, Owen Bryant, Edwin Cook, Al Landi, Donald L. Shuman, Hal W. Brydon, Kenneth F. Innes, Jr., William W. Allen and H. H. Abram.

The minutes of the meeting held March 5, 1949, were read and approved.

The membership committee proposed and the Society unanimously elected the following as members of the Society: Ediom F. Cook, Claude I. Smith, A. G. Applegarth, Owen Bryant, William L. Hoyt, Mrs. Ferne E. Atkins and Dr. Harold Elishewitz.

Mr. Hurd reported that Taylor State Park, in Marin County, had been selected by the field day committee as the site for the annual field meeting to be held May 8, 1949.

The president then called for notes, exhibits and remarks. Mr. Armitage reported that in March, 1949, the Federal Government had established a quarantine prohibiting the importation of Vanda orchids from the Territory of Hawaii. This was done because the Oriental fruit fly, *Dacus dorsalis* Hendel, had been found in the egg and larval stages on the flowers of this orchid. The larvae were found feeding on the petals. For some time this fly had been known to injure the flowers by means of its egg punctures.

Dr. Kessel exhibited an interesting mechanical fly trap used in the Orient to catch houseflies.

President Ross reported that on April 7, 1949, Dr. E. C. Van Dyke will celebrate his 80th birthday and extended to Dr. Van Dyke the congratulations, best wishes and appreciation of the Society for his long and distinguished service in the field of entomology and in the Society.

Mr. Owen Bryant was introduced and commented briefly on his experiences collecting insects in the Arctic region.

President Ross then introduced Dr. Richard L. Doutt, of the University of California, who spoke on the subject: "Polyembryony in the Parasitic Hymenoptera." Dr. Doutt's discussion, which was illustrated with lantern slides, is abstracted below.

Polyembryony refers to the production of two or more embryos from a single egg. This phenomenon is known to everyone in the cases of identical (monozygotic) human twins.

Experimental embryologists have artificially induced polyembryonic development in species typically monembryonic by isolating blastomeres. The natural occurrence of polyembryony may be either sporadic (human twins) or specific and the habitual mode of reproduction (Armadillos, certain parasitic Hymenoptera).

The most striking examples of polyembryonic development are found among the parasitic Hymenoptera. In this group there is

strong evidence that the development of polyembryony has undergone an evolutionary process.

Among the polyembryonic Encyrtidae it is suggested that polyembryony results primarily from a change in the cytoplasmic-nuclear balance of the egg cell when a polar region is formed from about half of the egg cytoplasm. This polar region gives rise to a protective envelope, the trophamnion, which ultimately constricts around each germ and effects its isolation. The abundant nutriment source provided by the host apparently stimulates development.

Peculiar, precocious, asexual larvae are produced from blastomeres which do not receive the germ cell determinant. The normal embryos in the polygerminal mass become intimately associated with the fat body and tracheae of the host.

A significant sexual differential in the amount of polyembryonic division exists in the Hymenoptera. This is explained by the influence of sperm nuclear material in fertilized eggs. This hypothesis is strengthened by results of radiation experiments in which androgenetic development was obtained.

After a discussion of Dr. Doutt's address, the meeting was adjourned.—D. D. JENSEN, *Secretary.*

Two Hundred and Sixth Meeting

The annual field meeting of the Pacific Coast Entomological Society was held at Taylor State Park, Marin County, California, May 8, 1949, and honored Dr. Edwin C. Van Dyke, charter member of the Society and one of its most active and distinguished members, for his 80th birthday which he celebrated April 7.

The recorded attendance was 73 persons, including 27 members, 20 adult visitors and 26 children. The following members were present: E. C. Van Dyke, E. S. Ross, H. B. Leach, E. O. Essig, W. W. Middlekauff, A. E. Michelbacher, M. W. Allen, D. P. Furman, A. E. Pritchard, R. F. Fritz, D. C. Thurman, E. B. Thurman, P. H. Arnaud, Jr., C. H. Spitzer, E. A. Smith, J. W. Tilden, M. Marquis, R. G. Wind, W. H. Lange, S. Dorman, F. P. Keen, N. W. Hazel, V. M. Stern, J. W. MacSwain, P. D. Hurd, Jr., J. E. Gillaspy, and D. D. Jensen. Visitors were present as follows: Mrs. E. S. Ross and daughter, Mrs. H. B. Leach and family, Mrs. Martha Michelbacher, Mrs. Marie Mauerhan, Mrs. M. W. Allen, Mrs. W. W. Middlekauff and family, Mrs. D. P. Furman and family, Sylvia R. Hildebrant, Mrs. E. A. Smith and family, Mrs. Marquis and family, Mrs. R. G. Wind, Mrs. W. H. Lange and family, Mrs. S. Dorman and family, Mrs. N. W. Hazel and family, Mrs. V. M. Stern, Mrs. J. W. MacSwain and family, Mrs. P. D. Hurd and family and Mrs. J. E. Gillaspy.

Although the region was wet from recent rains the day of the field meeting was generally fair. Some insect collecting was done along the stream and in the nearby hills but most of the time was spent in visiting and playing games.—D. D. JENSEN, *Secretary.*

Two Hundred and Seventh Meeting

The two hundred and seventh meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on October 29, 1949, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Ross conducted the meeting. The following members were present: R. L. Usinger, G. F. Ferris, J .W. Tilden, P. H. Arnaud, F. X. Williams, C. P. Hoyt, J. W. MacSwain, R. W. L. Potts, R. C. Miller, K. D. Snyder, T. W. Cook, P. A. Adams, H. H. Blakemore, L. W. Quate, A. E. Pritchard, L. R. Gillogly, E. L. Kessell, Berta B. Kessel, Victor Stombler, Wm. Hazeltine, C. D. Duncan, J. G. Edwards, N. W. Frazier, K. S. Hagen, R. L. Doutt, E. C. Van Dyke, R. F. Smith, H. Elishewitz, K. F. Innes, Jr., C. W. Hildebrand, H. B. Leech, D. D. Jensen, and A. E. Michelbacher. The following visitors were present: James R. Loder, Sam E. Hall, Jr., M. D. Morris, R. W. Nicholls, F. P. Morishita, Barbara Hovanitz, William Hovanitz, E. A. Olson, D. R. Thomas, H. L. Thomas, J. G. Edwards, Jo Ann E. White, Don Wilton, Jerry Roberts and W. M. Hoskins.

The minutes of the meeting held April 2 and the minutes of the field meeting held May 8, 1949, were read and approved.

The membership committee proposed and the Society elected the following as members: Herbert H. Ross, C. Don MacNeil, Frank S. Morishita, Evert I. Schlinger, John N. Simons, Robert L. Sisson, C. W. Hildebrand, K. F. Innes, S. E. Hall, and Sherman L. Thomas.

President Ross appointed the following members to serve as a nominating committee to prepare a slate of proposed officers for 1950 to be elected at the next meeting: J. W. Tilden, Chairman, E. L. Kessel and E. G. Linsley.

The following were appointed by the president to audit the financial records of the Society and submit a report at the next meeting: Hugh B. Leech, Chairman, Paul Arnaud, Jr., and Paul Hurd.

Copies of a paper entitled "Embedding insects in plastic" by Wm. Hazeltine were distributed to the members present.

President Ross called on Dr. Usinger to comment on his activities while in Europe on sabbatical leave and where he served as the official representative of the Society at the 13th International Congress of Zoology at Paris during July and at the 8th International Congress of Entomology at Stockholm during August, 1948.

Dr. Usinger gave a brief report of the far reaching action taken by the International Commission on Zoological Nomenclature at the Paris meetings and mentioned some of the institutions he visited for entomological study.

The President then called on Professor Ferris who spent most of the past year in the Orient. Professor Ferris explained that he had been in China and Formosa most of the time where he made approximately 1000 collections of scale insects.

In response to a call for notes, exhibits and remarks Dr. Tilden exhibited specimens of *Oxygrillus ruginasus* (Lec.) (Scarabaeidae), which were causing damage to service stations in Arizona by digging in the asphalt between cement blocks, thus loosening the blocks. Dr. Tilden also displayed specimens of *Xylotrechus undulatus* (Say) (Cerambycidae) which emerged through the beechwood floor of his home in San Jose. They originated in coniferous wood beneath the beechwood floor.

Mr. Leech reported that last July his sons collected a wasp nest in Mill Valley. From the brood in the nest Mr. Leech reared out several hymenopterous parasites. One of the cells in the comb was opened October 28 and the pupa was still alive. Mr. Leech suggested that a diapause may explain the long survival of the wasp in the pupal state.

Dr. W. M. Hoskins, Professor of Entomology at the University of California, Berkeley, was introduced by the President and spoke on the subject: "The Significance of Chemosensory Responses to Insect Biology."

Dr. Hoskin's paper is summarized below.

There is general agreement that the choice of food by insects, as by man and animals, is strongly influenced by odors. However, gal 15—bug book—jan 1950 .... it has been claimed by some experimenters that the finding of mates from a distance, as in the case of the Oak Eggar moth studied by Fabre, cannot possibly be an attraction to an odor because of the great dilution of the odorous substance in diffusing to a distance of a mile or more. Calculation of the amount of a substance, e.g., skatol, which the human nose can detect at great dilution, shows that if insects are equally sensitive to the sexual attractions, then it is entirely possible for them to react to the odor coming from a distance. This assumption of equal sensitivity is substantiated by many tests which prove that man and many insects are roughly equally sensitive to a variety of odors and tastes and also are able to discriminate between similar substances with about equal accuracy.

A number of attempts to isolate and identify the compounds with which female insects attract males have not succeeded completely but in several instances, they appear to be complex alcohols. On the other hand, feeding attractants are very varied in nature. For example, wireworms are attracted to extremely low concentrations of various organic acids and amino acids, the Jap-

anese beetle comes to the terpene alcohols geraniol and eugenol, the Colorado Potato beetle to a complex phenotic compound accruing in potato leaves, the larvae of the cabbage butterflies to mustard oils, and tent caterpillars to the glucoside amygdalin.

The above examples illustrate the significant fact that food attractants are either useless nutritionally or present in too small amounts to be of any value as foodstuff. The insect finds food by reacting to them and hence they may be called "tokens." It has long been known that insects (and animals) may be trained to respond to artificial tokens. The effect generally is short lived, e.g., the honey bee continues to associate an essential oil with food for a few days only.

Egg laying on unnatural hosts is of frequent occurrence and this results in prolonged exposure of the resulting larvae to unnatural tokens. If they are able to mature on the new host and the cycle is repeated a few times, a new race conditioned to select this host may result. Thus psysiological races or even species may arise. It is interesting to note that sorting out of the resistant individuals in a community by using an insecticide is a phenomenon of the same type and results in several proven instances in the establishment of a new physiological race.

Dr. Hoskins' talk was followed by considerable discussion before the meeting was adjourned.—D. D. JENSEN, *Secretary*.

Two Hundred and Eighth Meeting

The two hundred and eighth meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on December 3, 1949, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Ross in the chair. The following members were present: E. S. Ross, J. W. Green, E. L. Kessel, W. W. Middlekauff, A. E. Michelbacher, P. D. Hurd, Jr., R. F. Fritz, P. H. Arnaud, Jr., P. A. Adams, E. C. Van Dyke, J. R. Hart, J. W. MacSwain, F. X. Williams, W. C. Day, H. B. Leech, W. D. Murray, E. O. Essig, G. F. Ferris, E. A. Smith, Mrs. E. B. Thurman, D. C. Thurman, J. P. Harville, H. R. Greenfield, S. L. Thomas, T. W. Cook, R. F. Smith, R. L. Usinger, J. W. Tilden, R. W. L. Potts, W. W. Sampson, L. R. Gillogly, H. H. Blakemore, W. F. Barr, M. Marquis, A. M. Heimpel, D. W. Davis, K. D. Snyder, O. W. Graf, and D. D. Jensen, The following visitors were present: D. E. MacNeil, D. P. Wilton, and Galil Abul-Hab.

The minutes of the meeting held October 29, 1949, were read and approved.

The membership committee proposed and the Society elected the following as members: Donald W. Davis, A. M. Heimpel, Donald D. Linsdale, R. F. Stansbury, L. P. Coy, Otto W. Graf, Jr., and J. W. Green.

Dr. Usinger, representing the Nomenclature Committee, called the attention of the members present to the article, "Basic issues in the controversy on zoological nomenclature" which appeared in the December 2, 1949 issue of Science.

At the request of Dr. Linsley, Chairman of the special committee appointed to recommend amendments to the constitution of the Society, President Ross released Dr. Linsley as chairman and appointed Mr. Hurd to be the chairman. Dr. Linsley was retained as a member of the committee.

President Ross released Mr. Potts and himself from their temporary appointments as members of the nomenclature committee. They had served during the past year in the absence of Professor Ferris and Dr. Usinger, regular members of the committee.

The chairman announced that the term of appointment on the Publication Committee had expired for Dr. Duncan and Mr. Keiffer and they were released with a vote of thanks for their service over the many years. Dr. Kessel and Mr. H. B. Leech were appointed as the new members of the committee.

In response to a call for notes, remarks and exhibits, Mr. P. Adams exhibited a specimen of the Ithonid, *Oliarces clara* Banks together with representatives of the other North American families of Neuroptera. The Ithonid is the second of its family to be taken in the Western Hemisphere.

Mr. Gillogly exhibited a directory of South American naturalists.

Mrs. Ernestine B. Thurman reported the occurrence in California of an additional species of mosquito, *Aedes pullatus* (Coq.). Specimens were collected by Phyllis T. Johnson at Tuolumne Meadows, Yosemite National Park, on June 27, 1949. The determination was confirmed by C. M. Gjullin and W. W. Yates of the U.S. Bureau of Entomology and Plant Quarantine, Corvallis, Oregon. Details of the biology will be presented in a later paper.

Professor Ferris displayed illustrations of some of the curious scale insects which he collected in China.

The chairman appointed Dr. Middlekauff to be in charge of the Society's supply of surplus pamphlets and reprints which are available to the members at a low cost.

Dr. Tilden, representing the nominating committee, proposed and the Society elected the following officers for 1950: G. F. Ferris, President; R. L. Usinger, Vice President; D. D. Jensen, Secretary; and R. C. Miller, Treasurer.

The chairmanship of the meeting was turned over to the president-elect, Professor Ferris, who called on Dr. Ross to give his retiring presidential address entitled "The Role of the Entomological Museum." (This address appears in full in the present issue of the PAN-PACIFIC ENTOMOLOGIST.) After a discussion of the paper the meeting was adjourned.—D. D. JENSEN, *Secretary.*

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Vol. XXVI, No. 2 April, 1950

DESCRIPTIONS OF NEW SPECIES OF STAGBEETLES FROM FORMOSA AND THE PHILIPPINES

(Coleoptera: Lucanidae)

BY BERNARD BENESH

North Chicago, Illinois

(Continued from last issue, p. 18)

Gnaphaloryx haddeni Benesh, new species

Figures 2, 2a, ♂

Male. Head transverse, twice as broad as long, nearly straight anteriorly; clypeus produced, tricusped; anterior angles obtuse, diverging diagonally to opposite the eyes; postocular section produced, but not attaining the width of the canthus, thence narrowing towards the base; face declivous; vertex produced into a conical, forward directed protuberance which is glabrous at apex; ocellate punctate throughout, each puncture bearing fasciculate brownish squamae. Eyes fairly large, incompletely divided by the canthus and postocular expansion, which are separated by a hiatus. Mandibles porrect, acute, gently arcuate, strongly keeled above from base to apical third, densely clothed with elongate squamae; flat below, with punctures which are distant and fasciculate; keel on right mandible terminated by a rounded tubercle, left keel gradually evanesces towards the apex; inner margin with a broad basal tooth, the midsection endentate and terminated by a broad tri-cuspid tooth, which on the left mandible has the anterior cusp rounded, the median smaller and acute, the basal larger, rounded and tuberculate on top; right mandible somewhat similar, with anterior and median cusps equal in size and rounded, the posterior largest and tuberculate. Antennae slender, black, opaque, scape as long as the funicle and clava together, funicular segments progressively diverging to front and covered with several rows of golden setae; clava tri-lamellate and shorter than the funiculus, the first and second segment lobate, the ultimate circular, flattened, pubescent.

Prothorax similar to that of *Aegus horridus*, with anterior margin less sinuate, sides more parallel, with two basal circular depressions, adjacent to the basal angles. Disk with a median, longitudinal depression, without distinct demarkation; punctured throughout like the head, each puncture bearing a tuft of squamae.

Scutellum twice as broad as long, apex broadly arcuate, densely squamose. Elytra reddish-brown, opaque, one and one-half times

as long as broad, humeri rectangular, sides parallel, apices regularly rounded, cribripunctate throughout, fasciculate, with sutural area and posterior declivity nearly nude.

Legs slender, punctured, squamose; anterior tibiae furcate apically, furcation glabrous and bent downward, outer margin tridentate, the intervals serrulate; intermediate and posterior tibiae armed with an obsolete median denticle; tarsi slender, shorter than the tibiae, finely setose.

Underside of silvery-gray aspect, punctured throughout, each puncture fasciculate. Mandibles shining. Mentum transverse, three times as broad as long, sides converging to apex, anterior margin broadly excised, antero-lateral angles arcuate; cribripunctate, squamose, strongly setose anterad. Subclypeus (epistoma) produced to a subtuberculate point, bent downward and fully enclosing the mentum in front. Prosternal process simple. Metasternum along the median line strongly impressed; trochanters posteriorly with tufts of yellowish-gray setiform squamae. Posterior margins of abdominal sterna emarginate, that of last sternum strongly setose.

Female. Unknown.

Measurements (in millimeters):

	Length	Width
Head	3.2	6.2
Mandibles: right	3.8	
left	4.0	
Prothorax	3.1	6.2
Elytra	8.9	6.1

Holotype: 1♂, KABASALAN, ZAMBOANGA, MINDANAO, PHILIPPINE ISLANDS, II, 1-18, 1932, Fred C. Hadden, Collector, in the Collection of the California Academy of Science (ex coll. F. C. Hadden).

Allied to *Gnaphaloryx squalidus* (Hope) and *G. tricuspis* Rits.; differing from *squalidus* in the disposition of the squamose vestiture, in that the mandibles are not broadened at middle and dentate, and in having a broader tricuspid clypeus (in *squalidus* the clypeus is narrower, truncate and tuberculate laterally); separated from *tricuspis* by the form of the clypeus (in *tricuspis* the central cusp is produced), mandibles (doubly bent in *tricuspis*) and prothorax (*tricuspis* distinctly narrowed or constricted in middle).

I take pleasure in naming this species after the collector, Mr. Fred C. Hadden of Santa Paula, Calif.

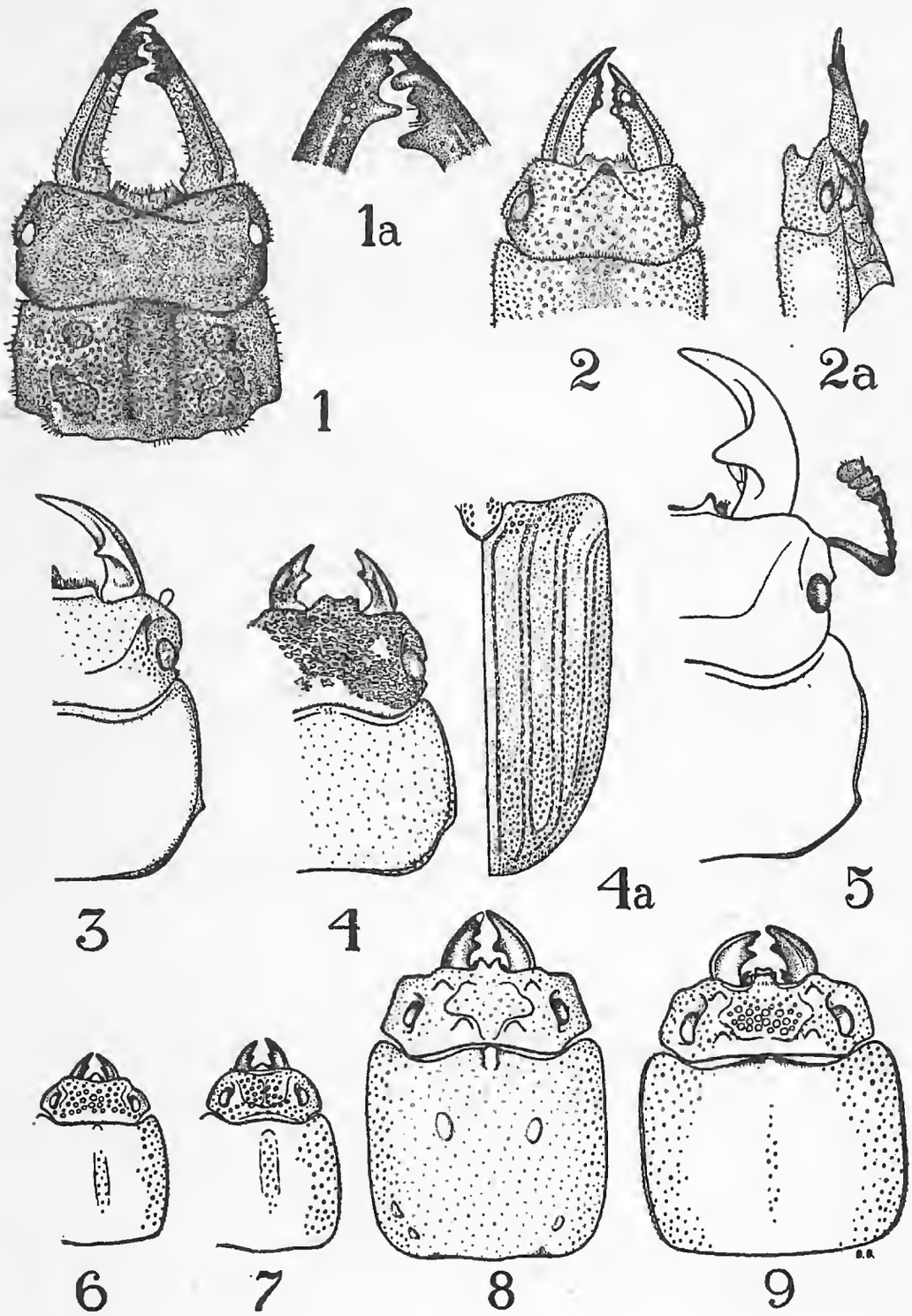

PLATE I: Figs. 1, 1a. Pronotum, head and mandibles of ♂, *Aegus horridus*. Figs. 2, 2a. Same, ♂ of *Gnaphaloryx haddeni*. Fig. 3. Same, ♂ of *Dorcus gracilicornis*. Fig. 4 Same, ♀ of *D. gracilicornis;* Fig. 4a. Elytron of *D. gracilicornis*. Fig. 5. Pronotum, head and mandible of ♂, *Dorcus clypeatus*. Figs. 6-9. Same parts *Figulus manillarum, F. fissicollis, F. orthognathus,* and *F. curvicornis*.

Genus NIGIDIUS MacLeay
Horea Ent., 1:108, 1819

NIGIDIUS LEWISI Boileau
Le Naturaliste, 27:61, 1905

Two examples taken by J. L. Gressitt on Hainan Island: Ta Han, VI, 23, 1935; Chung Kon, VII, 18, 1935.

Described by Boileau from the Loo choo (Ryukyu) Islands. The present record extends the range of the species several hundred miles closer to the Asiatic mainland. Identification by Dr. Gilbert J. Arrow.

NIGIDIUS LICHTENSTEINI Ritsema
Notes Leyden Museum, 1:129, 1879.

Described from Celebes and so recorded by Van Roon in the Junk-Schenckling's Catalogus Coleopterorum. New records noted here are from material collected at several Philippine localities by Mr. F. C. Hadden. The specimens are in the Collection of the California Academy of Science. Although all the localities here cited are from only one island — Luzon — the writer has seen examples in other collections from various islands of the Philippine archipelago.

Mabatobato Pili, Camarines Sur, Luzon, V, 16, 1931 (8 examples); Payambugan, Mountain Province, Luzon, VII, 9, 1931 (1 example); Mt. Makiling, Laguna, Luzon, elevation 400′, V. 1, 1932; elevation 5,000 ft., VIII, 16, 1932, I, 16, 1932 (1 example each date noted).

Genus FIGULUS MacLeay
Horae Ent., 1:109, 1819.

Burmeister's statement[2] that in Lucanidae the antennae are always composed of ten segments certainly does not hold true in the Figulinae. In *Figulus* the number of segments varies from nine to ten, and in the variable *Penichrolucanus*, from seven to nine. Of the species of *Figulus* treated here, *manillarum* Hope and *fissicollis* Fairmaire have nine-segmented antennae, while *punctatostriatus* Deyrolle and the three new species described herein have ten-segmented antennae.

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[2]"Ihre Gliederzahl ist immer zehn." Handbuch der Entomologie, 5:305, 1847.

FIGULUS PUNCTATOSTRIATUS Deyrolle
Trans. Ent. Soc., London, p. 413, 1874.

Two examples from Garakayo, Palau Islands, VIII, 8, 1945, E. Hagen, in the Collection of the California Academy of Science.

Described from Timor, and also known to inhabit Larat; Kriesche[3] considered *punctatostriatus* to be a race of *confusus* Westwood. Identification by Dr. G. J. Arrow, British Museum (Nat. Hist.), London.

FIGULUS MANILLARUM Hope
Cat. Lucanoid Coleoptera, p. 26, 1845.

Nine examples from various localities in the Philippines: Alabang, Luzon, V, 29, 1929, ex coll. Van Dyke; Kabasalan, Zamboanga, Mindanao, V, 4, 1932; Mabatobato Pili, Camarines Sur, Luzon, V, 16, 1931; Mt. Makilling, Laguna, VI, 29, 1931; San Jose, Mindoro, IV, 1945, E. S. Ross; Tacloban, Leyte, XII, 1945, E. S. Ross.

F. manillarum occurs also on Guam, whence it was recorded by Zimmerman[4] as *F. lilliputanus* Westw.; the example upon which the Guam record was based, was examined by me through the kindness of Mr. O. H. Swezey, to whom thanks are here extended for helping to clarify a doubtful identification. Figure 6 represents a specimen of *manillarum* which Dr. Arrow compared with the type of *manillarum* in the Hopean Museum (Oxford) and pronounced typical. In so doing, Dr. Arrow discovered that the species previously identified at the British Museum as *manillarum* is entirely different; it is described herein under the specific name *curvicornis* (fig. 9).

FIGULUS FISSICOLLIS Fairmaire
Rev. Mag. Zool., 1:414, 1849.

Fifteen examples: Asingan, Pangasinan, V, 2, 1931, E. O. Sayos; Kabasalan, Zamboanga, V, 1, 1932; Mabatobato Pili, Camarines Sur, Luzon, V, 16, 1931, F. C. Hadden; Malabringo, Mt. Lobo, Batangas, VI, 1, 1932; Negros, P. L., 1,400′, ex coll. Van Dyke.

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[3]Stettiner Entomologische Zeitung, 83:133, 1922.

[4]Insects of Guam, Bull. 172, Bishop Museum, p. 218, 1942.

The preceding species and *fissicollis* are closely related, and at first glance appearing identical, but are readily separated when examined more closely. In *manillarum* the ocular canthus is emarginate behind the anterior angle, and its posterior edge is diagonal; in *fissicollis* the canthus is uniformly arcuate from the obtuse anterior angle and the posterior portion is nearly rectangular. Through correspondence with two of the foremost workers on Lucanidae in Europe, Dr. G. J. Arrow of London and Dr. R. Didier of Paris, it has been ascertained that the original description of *fissicollis* is erroneous and misleading; Fairmaire inadvertently described the mandibles as edentate, when in fact they are monodont. The species is also here recorded from Fiji, Gilbert Islands (ex coll. British Museum), Palau Islands, and Guam, the latter two localities based on material taken by Mr. Henry S. Dybas, Chicago Natural History Museum. A fine series of approximately seventy examples taken at various localities in Fiji, from the Bernice P. Bishop Museum, Honolulu, disclosed two synonymies. The most developed Fijian specimen of the species was recently described by Didier[5] under the name *monochromus*, whilst a like example from Palau Islands Kriesche[6] named *lupinus*. Although the pronotum is shown (fig. 7) without a frontal tubercle, larger examples have the pronotum elevated in front, tuberculate and laterally constricted, with two latero-marginal depressions on each side.

Figulus orthognathus Benesh, new species

Figure 8.

Black, nitid. Head transverse, broader than long (3.1 x 1.1 mm), straight anteriorly; antero-lateral angles obtuse, feebly emarginate to the canthus. Canthus broad, without a hiatus, completely dividing the eyes; anteriorly arcuate, obliquely diverging posteriorly to basal angles, the latter rounded, thence diagonally converging to posterior margin of the head. Clypeus produced, bilobate. Disk of head hollowed, delimited in front by two broadly spaced anteocular, and two more closely placed occipital tubercles. Head sparsely sculptured by small distant punctures, which are more pronounced and closer around the eyes. Mandibles porrect, externally slightly arcuate and rounded, upper surfaces laterally with a feeble ridge and shallowly canaliculate; right mandible with a single median tooth, the left mandible bidentate, with a

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[5]Etudes sur les Coleopteres Lucanides du Globe, fasc. 7, p. 171, 1930.

[6]Stettiner Entomologische Zeitung, 83:131, 1922.

large median upper tooth and an anterior lower denticle. Antennae ten-segmented, of characteristic figuline aspect, cherry-red, with margins of clava and scape, darker, shining.

Prothorax longer than broad, convex, anterior margin gently sinuate, antero-lateral angles produced and obtusely arcuate, sides parallel, basal angles broadly arcuate, base nearly straight, feebly bisinuate; anterior declivous, tuberculate at middle; strongly punctured laterally; disk remotely punctured by fine, hardly discernible pin-point punctures, and with two latero-median and two latero-basal impressions.

Scutellum indistinct, wedge-shaped. Elytra parallel, nearly twice as long as broad (7.0 x 4.0 mm), narrower at base, humeri mucronate, apices regularly rounded; strongly tumulate and declivous, regularly punctato-striate by six, equi-distant striae, that attain the humerus; linearly punctured at side, the punctures ovate, shallow, interstices even; sutural stria outwardly bent on posterior declivity, second and third, and fourth and fifth striae incompletely united.

Legs short and stout. Anterior tibiae broadly furcate, with six marginal serrations which gradually diminish in size; intermediate tibiae trispinose, posterior tibiae bispinose in distal half.

Underside. Mentum slightly broader than long, sides sinuate, anterior margin feebly excised, antero-lateral angles rounded, basal margin straight; with two large, circular, closely placed pits, which are abreast of one another and whose interiors are finely granulate. Abdominal sterna sparsely punctured, their posterior margins emarginate. Length (mandibles included) 12.1 mm; width 4.1 mm.

Holotype: 1 example of undetermined sex, SANTA FE, BUKIDNON, *Alt.* 2,300 - 4,000 ft., MINDANAO, V, 15, 1935, ex coll. Van Dyke, in the Collection of the California Academy of Science.

Paratopotype: 1 example, in the collection of the writer.

Figulus foveatus Benesh, new species

In habitus resembling the preceding species, but with the following differentiating characters:

Disk of head closely ocellately punctate towards the base; clypeus less produced and less lobate; anteocular tubercles more prominent and closer to the eyes, basal or occipital tubercles more distant than in *orthognathus;* mandibles monodont. Pronotum broader than long, frontal tubercle more prominent and acute, disk with a median longitudinal punctate fovea, which has shallow basal impressions, somewhat resembling a clover leaf. Scutellum broader and canaliculate. Elytral interstices more convex. Underside more shining. Mentum more rugulose, pits not circular but ovate, and with smooth interiors. Metasternum with a median longitudinal, deeply impressed line. Posterior margins of abdominal sterna beset with short setae; abdominal sterna somewhat impressed laterally, the impressions pronounced on the terminal

segment. Length (mandibles included): 10.4 mm., width 4.00 mm.

Holotype: 1 example of undetermined sex, MT. PULAY, MOUNTAIN PROVINCE, 7,000 ft., VII, 6, 1931, ex coll. F. C. Hadden, in the Collection of the California Academy of Science.

Paratypes: 1 example, Mt. Makiling, Laguna, P. I., VIII, 9, 1931, in the collection of the California Academy of Science; 1 example, Mt. Pulay, Mountain Province, 7,000 ft., VII, 6, 1931, in the collection of the writer.

Figulus curvicornis Benesh, new species

Figure 9.

Head transverse, twice as broad as long (3.4 x 1.5 mm), black, front with a reddish tinge, emarginate alongside the clypeus, antero-lateral angles produced and obtuse, slightly emarginate anterior to the canthus; disk with a broad, somewhat diamond-shaped depression, ocellate punctate within, quadrituberculate, basal tubercles smaller than the anterior and further apart than in the two preceding species; front and canthus sparsely and finely punctured; clypeus produced, feebly bilobate; canthus broad, with anterior and basal angles arcuate, side of right canthus broadly rounded, on the left less so, the center inconspicuously emarginate; base of canthus diagonal, converging to base of head. Mandibles shorter than the head, strongly curved and in apical half upward bent, rounded laterally, obscurely keeled on top; right mandible unidentate, left bidentate, similar to that of *orthognathus*. Antennae as in the preceding species.

Prothorax broader than long (4.2 x 3.3 mm), somewhat flattened, anterior margin nearly straight, antero-lateral angles produced and broadly arcuate; sides parallel, feebly crenulate on basal half, basal angles broadly rounded, basal margin nearly straight; anteriorly elevated and feebly tuberculate at middle, disk impunctate, with a shallow, longitudinal, punctate fovea; anterior angles and sides closely punctured, punctures diminishing in size and intensity towards the disk.

Scutellum wedge-shaped, plain. Elytra more convex than the pronotum, one and one-half times as long as broad (6.7 x 4.1 mm); striation as in the preceding species, but more sharply defined, the punctuation more narrower or constricted, interstices impunctate, convex basally, flattened towards middle and posterior.

Legs short and robust; anterior tibiae keeled above, furcate, outer margin tridentate in distal half, the rest to geniculation roughly serrate; intermediate and posterior tibiae unispinose, this however may vary, as the left intermediate tibia shows indication of another smaller spine above the regular media spine; tarsi shorter than the tibiae, glabrous on top, with one or two setae on the first and fourth segment.

Underside. Mentum broader than long (1.2 x 0.9 mm); anterior margin concave, sides rounded, base straight; roughly sculptured, with a transverse pit, which is deeper laterally and punctured basally. Lacinial brush or comb curved and directed inwardly, not pointing forward as in most lucanids, apical setae forming a distinct hook, resembling somewhat a digitus. Front of prosternum and sides of metasternum fairly closely punctured by medium size punctures. Femora finely punctured. Punctuation of abdominal segments distant, closer on apical segment. Length (mandibles included) 11.8 mm; width 4.2 mm.

Holotype: 1 example of undetermined sex, MT. MAKILING, LAGUNA, P. I., VIII, 9, 1931, V. Madrid, collector, in the Collection of the California Academy of Science.

Paratypes: 1 example, Mabatobato Pili, Camarines Sur, V, 16, 1931, in the collection of B. Benesh (ex coll. F. C. Hadden); 2 examples, Marikima, Rizal Province, Luzon, P. I., June 1946, Dr. Wm. Rose, collector, in the Chicago Natural History Museum.

This description was originally based on two examples from the collection of the California Academy of Science that were labelled *laticollis* Reiche; subsequently two additional examples, without determination, were discovered in the Chicago Natural History Museum. As far as is known to the writer *F. laticollis* is a *nomen nudum,* no description of the insect being extant. Through diligent research it was discovered that the name *laticollis* first appeared in entomological literature in Dejean's Catalogue des Coleopteres, 3rd edition, p. 194, being credited to Eschscholtz; Reiche[7] alluded to *laticollis* in his criticism of Burmeister's Handbuch der Entomologie, without describing the insect, hence any reference to Reiche's name as being the protologist of the species is positively erroneous. It appears again in the Thomson's Catalogus[8] wherein Eschscholtz is given as the originator of the name; the last record of the name appears in Miwa's Catalogus Coleopterorum Japonicorum, Pars 2, p. 11, 1936, where the purported *laticollis* is recorded from Kotosho, Formosa. Dr. Arrow, who reviewed the specimens from the California Academy of Science, stated that the British Museum has four examples of *curvicornis,* which were identified by the late Chas. O. Waterhouse as *manillarum,* corrected subsequently by Arrow after comparison of examples of *manillarum* from the collection of the writer.

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[7]Ann. Soc. Ent. France (3) 1:84, 1853.

[8]Ann. Soc. Ent. France (4) 2:402, 1862.

Book Notice

American Spiders, by Willis J. Gertsch. D. Van Nostrand Company, Inc., New York, N. Y., xiii + 285 pages, 1949. $6.95.

This is a book by an eminent authority in the field of spider lore. In it he has presented an accurate and extremely interesting general background of information on the spiders of the temperate American region. The book is capably written and largely popularized, although at times the uninitiated will be puzzled by the terminology used. A short glossary aids in clarifying the text.

The most outstanding feature of the book is its voluminous series of color plus black and white photographic reproductions of spiders and their works. The excellence of these plates alone would make the work a valuable possession not only for the libraries of those professionally interested in the field of Araneology but perhaps even more so for the non-professional.

In following the frequent text references to the illustrations, one could wish that the plates had been arranged in a single section or that a single system of numbering both types of plates as well as figures had been used.

The average reader will recognize in the revealing plates and descriptions many of the spiders he has seen in his own environment and will at the same time understand more fully the natural history of the species. Although the title is "American Spiders", the author has wisely included forms not represented in the American fauna where such inclusions seemed to provide better insight into the interrelationships of spiders as a whole.

The reader will find answers to varied types of questions such as: How did spiders evolve and when? Of what economic use are spiders? How long do spiders live? What are the mating habits of spiders? Are spiders commonly poisonous? What role does silk spinning play in the lives of the various spider groups?

The author has given a brief but clear account of the medical importance of spiders, in which is exploded the popular myth about the venomous nature of most spiders to man. The known species dangerous to man are considered. Among these the truly venomous endowment of the black widow spider is emphasized together with a description of symptoms following the bite and

the status of present-day treatment. Naturalistic control methods of this species are briefly discussed; however, the subject of chemical control is only mentioned.

As an informative, well illustrated and interesting account of the American spiders the book is highly recommended.—DEANE P. FURMAN.

CLAUDE "I" SMITH
1922 - 1949

With the tragic loss of Claude "I" Smith on November 4, 1949, entomology has been deprived of a very promising lepidopterist and insect biologist. Claude was born January 13, 1922, in Chicago, Illinois. He moved a year later with his family to Los Angeles, California where, in the following years, he attended the San Pasqual Grammar School, the Luther Burbank Junior High School, and the Benjamin Franklin High School.

At the age of three, Claude made the acquaintance of an elderly butterfly collector who furthered the interest in entomology which had first become manifest during family camping trips. Under the guidance of this gentleman, Claude began his first collection of Lepidoptera. That his early interests in insects were not entirely confined to dried specimens may be seen in his attempt at the age of four to biologically control aphids. His mother had mentioned the relationship existing between aphids and ladybird beetles whereupon Claude mass collected the beetles and transferred them to aphid infested plants.

While in high school he became close friends with Frank Sala, also a student, and Chris Henne, a professional collector and owner of a large collection of Lepidoptera. This association led to Claude's membership in the Lorquin Natural History Club of the Los Angeles County Museum, which through his active participation heightened his interests in entomology. Frequent collecting trips were made with these and other collectors which resulted in the formation of a large and excellent collection of Lepidoptera.

Upon his graduation from high school and with the advent of the war his formal education was interrupted and he sought employment in the aircraft industry. In October of 1942 he entered

the service of the United States Navy and saw action in the British Solomon Islands. He was discharged in 1945 and resumed his studies at Los Angeles City College in 1946 where he began to major in entomology. Claude transferred to the Berkeley Campus of the University of California in the fall of 1948 and was completing his Bachelor of Science degree in entomology, which has since been conferred posthumously, when the untimely accident occurred.

In addition to meeting the requirements of the degree, Claude was engaged in a revisionary study of the Phalaenid (=Noctuid) genus *Annaphila*, and was conducting breeding experiments in the hope of obtaining collateral information for defining the levels of speciation of these moths, a study which is being completed by Dr. F. H. Rindge of the American Museum of Natural History. Also he was greatly interested in host-parasite relationships, particularly of the Lepidoptera, and was accumulating for publication such records secured by him in the rearing of parasitized material.

Claude is survived by his wife Ida, two sons, Mikael and Rodney, and his mother, Mrs. Laura Smith. Through the generosity of his wife, Claude's entire collection was presented to the University of California where it forms a very important part of the Division of Entomology and Parasitology collection of Lepidoptera and stands as a memorial of his contribution to science.—PAUL D. HURD, JR.

SYNANTHEDON SAXIFRAGAE IN CALIFORNIA

Among some Aegeriids collected in the Sierra Nevada by C. D. MacNeill of the University of California, was a perfect female of *Synanthedon saxifragae* (Hy. Edwards). The specimen was taken in flight, June 28, 1948, at China Flat, (Silver Fork of the American River, 5400 feet), Eldorado County, California.

Engelhardt[1] gives the distribution of *S. saxifragae* as "Rocky Mountains, Colorado, and Utah, 8,000 to 12,000 feet, Alaska, Labrador, and Hudson Bay." He mentions that only a few worn specimens have been taken to date in separated sections of the continent, all at high elevations or in Arctic regions. There are no published records of this species in the United States west of Utah.—CLAUDE I. SMITH.

[1]Englehardt, Bull. U. S. Nat. Mus., 190:98, 1949.

NOTES ON CANTHARIS III

(Coleoptera, Cantharidae)

BY DOROTHY MC KEY-FENDER

McMinnville, Oregon

(Continued from last issue, p. 33)

CANTHARIS (CULTELLUNGUIS) AMERICANA LARVALIS LEC.

Telephorus larvalis Leconte, 1860, U.S.P.R.R. Exp. and surveys, Zool., 47th parallel, Coleoptera, p. 48.

This subspecies differs from the typical in its paler coloration. Elytra testaceous or dusky, margins piceous, short elytral pubescence flavous or luteous, erect hairs dusky to piceous, head and pronotal spots brunneous to black. Otherwise as in the typical form. Specimens examined: 48.

This pale form is northern in distribution, specimens of *americana* from Washington, Oregon and Northern California consistently being of this subspecies. The San Francisco Bay region appears to be where its distribution overlaps that of the typical form. Specimens from Marin county at hand all belong to this subspecies while some of the Santa Cruz and San Mateo county material is typical and some of the subspecies *larvalis*. South of San Francisco in the Monterey region a similar but distinct subspecies is found:

Cantharis (Cultellunguis) americana montereyensis McKey-Fender, n. subsp.

Elytra usually lighter than in the typical form, testaceous or dusky (piceous in one specimen), margined with piceous; legs testaceous with tarsi infuscate as in the typical form, but knees black, otherwise as in the typical form.

Range: California, Monterey county.

Holotype: male, CARMEL, MONTEREY CO., CALIFORNIA, June 15, 1915, L. S. Slevin [Calif. Acad. Sci.].

Allotype: female, Carmel, Monterey Co., May 12, 1911, L. S. Slevin [Calif. Acad. Sci.].

Paratypes: 6 males, 9 females. Monterey Co., June 24, 1941, D. J. and J. N. Knull, 2 specs.; Carmel, Monterey Co., May 10 to June 9, 1908, L. S. Slevin, 9 specs.; Carmel, August 5, 1923,

L. S. Slevin, 1 spec.; Monterey, June 21, 1898, A. Fenyes, 1 spec.; Pacific Grove, June 5-8, 1904, 4 specs.

The diagnostic feature of this subspecies is the black knees. All the specimens of this species at hand from Monterey and Carmel show this character and it appears in no other specimens of this species yet examined. All the types have the elytra testaceous or dusky as in *larvalis* except one, which has the elytra piceous as in the typical form. The types were collected in a rather restricted locality, but over a period of forty-three years.

Cantharis (Cultellunguis) hatchi McKey-Fender, n. sp.

Elytra piceous, head, pro-thorax and scutellum flavous, basal segment of antennae flavous with apex black, remainder of antennal segments testaceous to dusky; legs flavous with knees black, tarsi often testaceous; ventral surface of head, pro- and mesosternum flavous, metasternum and medial portion of abdominal sternites piceous or brunneous, the latter bordered laterally and apically with flavous. Form slender.

Male: Width at base of elytra 2 mm., length 8.5 mm., antennae 6.5 mm. Clypeas moderately long (for this group), emarginate, evenly arcuate on either side. Antennae exceeding two-thirds of body length, eyes large. Thorax subquadrate, a little longer than wide, anterior angles prominent, obtuse, anterior edge evenly, shal-

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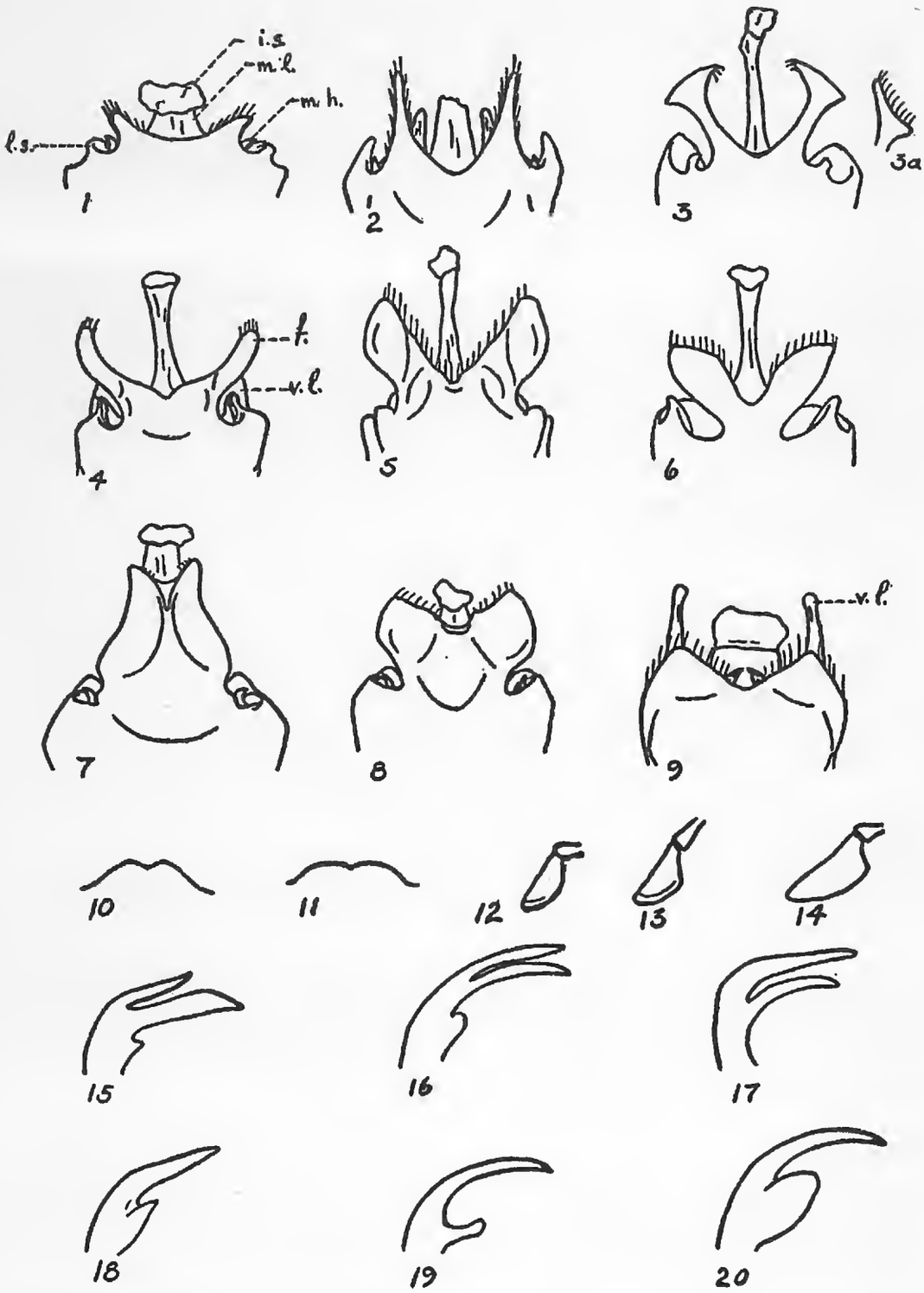
Plate Legend

Figs. 1-8. Dorsal view of tip of aedeagus of *Cultellunguis* spp.: l.s.—lateral sinuations; i.s.—internal sac; m.l.—median lobe; m.h.—median hook; f.—bifurcation of dorsal plate of tegmen; v.l.—ventral lobe. (All drawn to approximately the same scale.) 1. *americana*, 2. *hatchi*, 3. *macnabiana*, 3a. detail of tip of fork of *macnabiana*, 4. *mackenziei*, 5. *ochropa*, 6. *perpallens*, 7. *ingenua*, 8. *ingenua knulli*. Fig. 9 same of *Absidia sierrae* (magnification relatively greater than Figs. 1-8). Fig. 10. Anterior edge of clypeus of *Cultellunguis macnabiana*. Fig. 11. same of *C. ochropa*. Figs. 12-14. Last two segments of maxillary palpi: 12. *Absidia insipida?*, 13. *Cantharis* sp. *oregona* complex, 14. *Cultellunguis americana*. Figs. 15-20. Types of claws: 15. *Cultellunguis*, anterior protarsal claw of males, drawn from *americana;* 16. *Cyrtomoptera*, characteristic of anterior claws of all feet, drawn from *divisa* (basal tooth less developed in *dentata*); 17. *Carolina* group, characteristic of all claws, drawn from *carolina;* 18. *Ancistronycha*, drawn from anterior claws of *bilineata*; 19. *Cantharis* (*s. str.*), a bluntly toothed type, drawn from anterior protarsal claw of female, same species as Fig. 13; 20. *Cantharis* s. str.; lamellate type, drawn from anterior protarsal claw of male of same species as Fig. 13.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lowly convex from the anterior angles; sides sub-parallel slightly constricted just behind anterior angles; slightly narrowed posteriorly, posterior angles distinct, a little over a right angle, posterior margin very shallowly convex, slightly sinuate; edges of prothorax reflexed, disc with a broadly concave area anteriorly over one-fourth of width of thorax on each side and tapering postero-laterally to nothing at about the posterior fourth or fifth, edge uniformly reflexed, disc tumid on each side posteriorly leaving a shallow median depression. Elytra slender, length three times combined width; longitudinal sculptured lines apparent; short pubescence cinereous, erect hairs dusky testaceous to brunneous. Anterior claw of protarsi cleft, the outer cleft portion cultellate, the two parts of equal length; all others simple. First protarsal segment expanded, width equals two-thirds its length, second and third segments equal one-half the width of the first, width of the second segment equals two-thirds its length, width of third segment equals four-fifths its length. Metacoxae with a posteriorly directed conical projection on ventral surface. Posterior margin of last sternite simple.

Male genital armature testaceous, dorsal forks of tegmen moderate in length, slender, acute, posteriorly directed, scarcely divergent; lateral sinuations pronounced, broadly lobular; median lobe short, moderately stout, shorter than the dorsal forks; tips of ventral lobes produced, compressed in a slightly more lateral plane than basal part, moderately long (Fig. 2).

Female: Differs in its relatively more robust form, smaller eyes, shorter antennae, basal protarsal segment not expanded, claws all simple, and the conical projection of the metacoxae lacking; width 2 mm., length 8 mm., antennae 5 mm.

Range: California: Coastal counties and offshore islands, San Jacinto Mts. north to Monterey.

Holotype: male, KEEN CAMP, RIVERSIDE CO., CALIFORNIA, June 6-12, 1917, E. P. Van Duzee [Calif. Acad. Sci.].

Allotype: female, same data [Calif. Acad. Sci.].

Paratypes: 8 males, 14 females; Cuyamaca Rancho State Park, May 19, 1941, D. J. and J. N. Knull, 1 spec.; Oak Grove, June 5, 1941, D. J. and J. N. Knull, 1 spec.; Arroyo Seco, July, 1937, 1 spec.; Mt. Wilson, May 29, 1947, June 7, 1941, G. P. Mackenzie, 4 spec.; Keen Camp, May 24-June 14, 1946, D. J. and J. N. Knull, 10 specs.; Frazier Mt., Ventura Co., May 20, 1919, Hopping, 4 specs.; S. Madre, June, A. Fenyes, 1 spec.; Keen Camp, Riverside Co., June 6-12, 1917, E. P. Van Duzee, 4 specs.; Waterman Canyon, May 27, 1916, 8, v, 1 spec.; Bryson, April 24, 1917, white oak, 1 spec.; Lytle Creek, San Bernardino Co., June 7, 8,

1928, Van Dyke, 2 specs; Forest Home, San Bernardino Co., June 14, 1928, Van Dyke, 2 specs.; Santa Cruz Island, May 17, 1919, E. P. Van Duzee, 1 spec.; Catalina Island, May, No. 91 and 92, A. Fenyes, each pin bearing also a yellow disc, 2 specs. (these specimens atypical).

The two specimens from Catalina Island, both female, differ from the typical in having elytra and antennae entirely testaceous. It is very likely these represent a good subspecies, but until more specimens are available for study it seems unwise to give it a name. This species, both male and female, is readily distinguishable from *C. americana montereyensis* which it most closely resembles by the more slender form and uniformly yellow head and thorax (maculate in *americana*). The best single diagnostic characteristic is the peculiar conical projection on the male metacoxae. This is the only *Cantharis* showing this structure known to the author. It differs from *perpallens* in its bicolored legs (uniformly pale in *perpallens*) and in the distinct pronotal angles (anterior angles not evident in *perpallens*). The conformation of the male genital armature places this species nearest *C. americana.*

This distinctive species is named in honor of Dr. Melville H. Hatch, whose suggestions in regard to this study are sincerely appreciated.

Cantharis (Cultellunguis) macnabiana McKey-Fender, n. sp.

Elytra, prosternum and posterior part of head black or piceous, front of head from a little before the center of the eyes, prothorax, base of antennae, scutellum and legs rufo-testaceous; antennae otherwise piceous, tarsi infuscate, meso- and metasternum and venter piceous. Form moderately slender.

Male: Width at base of elytra 2 mm., length 8.75 mm., antennae 6.25 mm. Clypeus short, with a distinct triangular median notch, margin oblique either side. Antennae attaining two-thirds of the body length, eyes large. Pronotum subquadrate, anterior angles present but very broadly obtuse and the anterior edge moderately convex from the anterior angles; sides subparallel, slightly narrowed posteriorly; posterior angles distinct, a little over a right angle, posterior margin shallowly convex, sinuate, edges of pronotum reflexed, disc with a broadly concave area at anterior angles occupying one-fifth of width on each side and tapering posteriorly, leaving a thin margin at posterior fourth which joins the reflexed portion of the posterior margin; posterior margin uniformly reflexed, disc tumid either side posteriorly, a wide, shallow median

depression extending anteriorly nearly to the anterior margin. Elytra slender, length equaling or slightly exceeding three times combined width, longitudinal sculptured lines moderately strong, short pubescence cinereous, erect hairs black. Anterior claw of protarsi cleft, outer cleft portion cultellate, slightly exceeding the inner, apex obliquely truncate internally, all others simple. First tarsal segment broadly expanded, width equals two-thirds its length, width of second equals three-fourths its length which equals the width of the first; width of the third equals its length which equals the width of the second. Posterior margin of last ventral simple.

Lobes of dorsal bifurcation of tegmen slender, widely separated, tips securiform; lateral sinuations short, acutely pyramidal; median lobe slender, long-exserted; ventral lobes dorso-ventrally compressed, secondarily lobed apically, lobe directed mesad (Fig. 3).

Female: Differs in stouter form, smaller eyes, shorter antennae, claws all simple, protarsi not expanded. Width at base of elytra 2.25 mm., length 8.25 mm., antennae 5.75 mm.

Range: California; San Diego County.

Holotype: male, SAN DIEGO, CALIFORNIA, May 10, 1914, E. P. Van Duzee [Calif. Acad. Sci.].

Allotype: female, same data [Calif. Acad. Sci.].

Paratypes: 8 males, 4 females; San Diego, May 10, 1914, E. P. Van Duzee, 4 specs.; San Diego, April 24, 1920, W. M. Giffard, 1 spec.; San Diego, C. N. Sanford, 1 spec.; San Diego Co., F. E. Blaisdell, 5 specs.

This species is named in honor of Dr. Jas. A. Macnab, one of those all too rare individuals, a really inspiring teacher.

Very like *ochropa* (v. sub.) but slightly more robust, usually darker, the pronotum wider rather than narrower anteriorly, the clypeus strongly notched (biarcuate in *ochropa*) and differs in the male abdomen and genitalia. The possibility that *lauta* 1851 could be the female of this species cannot be completely discounted, but available evidence indicates it is not.

CANTHARIS (CULTELLUNGUIS) LAUTA LEC.

Telephorus lautus Leconte, 1851, Synopsis of the Lampyrides of Temperate N. America; Proc. Ac. N. S. Phila. (2) 5: 340.

non T. lautus Leconte, 1881, Synopsis of the Lampyridae of the United States, Trans. Am. Ent. Soc. 9: 54.

In his 1851 paper, Leconte described *Telephorus lautus* from a single specimen as follows:

"T. lautus Lec., niger, cinero-pubescens, ore pedibus thoraceque laete flavis, hoc quadrato, antrorsum subangustato, undique angusto marginato, elytris scabris, substriatis. Long. .3. San Francisco, Calif."

In between 1851 and 1881 when he published his synopsis of the U. S. Lampyridae, he associated a number of specimens with the 1851 type and evidently drew up his 1881 characterization from these specimens, representatives of a black-legged species, since his 1881 description reads:

"Black, head in front of the eyes, prothorax, sides and apex of abdomen yellow. Length 7-10 mm.; Cal."

The type series of *lauta* as it stands at present consists of a complex, mostly the dark-legged species referred to above, and which has recently been described by this author as *Cantharis* (*Cyrtomotera*) *dentata* McKey-Fender (1944). Fall (1936) also recognized that this was a different species. In his next key point in the 1881 paper (p. 54) Leconte described as new a species, *T. ochropus*, which he characterized only as:

"Similar to lautus but legs also ferruginous, length 9 mm., Cal., San Diego (Bolter)."

This inadequate description differentiates *ochropa* only from *lauta* as construed in the 1881 synopsis, not from the original (1851) description. According to C. A. Frost, the type of *lauta*—i.e., the first specimen in Leconte's series, a female, has the tip of the abdomen pale, resembling *ochropa* (in litt.), and the pronotum of *lauta* is stated to be narrowed anteriorly, as is that of *ochropa;* thus eventually *ochropa* may prove to be the male of *lauta*. For the present, however, the name *lauta* is applied only to the 1851 type female. If the type *lauta* can be shown to agree with the female *ochropa*, particularly in the shape of the clypeus which appears to be diagnostic, the name *ochropa* will have to be suppressed in its favor, a step which the author does not wish to take, however, without further study of the type *lauta*.

CANTHARIS (CULTELLUNGUIS) OCHROPA LEC.

Telephorus ochropus Leconte, 1881, Synopsis of the Lampyridae of the U. S., Trans. Am. Ent. Soc., 9: 54.

Elytra piceous, head from a little before center of eyes, prothorax, scutellum and legs flavous; basal segment of antennae flavo-testaceous, apical segments piceous; sides and apex of abdomen dusky testaceous, ventral surface otherwise piceous, head black behind center of eyes. Form moderately slender.

Male: Width at base of elytra 2 mm., antennae 6 mm., length 8.75 mm. Clypeus rather short, scarcely emarginate or merely slightly flattened at center, shallowly arcuate on each side (Fig. 11); antennae attaining two-thirds of body length; eyes large. Pronotum subquadrate, anterior angles very broadly obtuse and anterior margin moderately arcuate from the anterior angles; sides subparallel, slightly narrowed anteriorly; posterior angles distinct, a little over a right angle; posterior edge sinuate, broadly indented medially; anterior and posterior edges reflexed, disc with a broadly concave area on each side anteriorly over one-fifth of width of thorax on each side and tapering laterally to about posterior third; posterior edge uniformly reflexed. Elytra slender, combined width approximately one-third length, longitudinal sculptured lines faintly evident, short pubescence cinereous, erect hairs piceous. Anterior claw of protarsi cleft, the outer cleft portion cultellate, longer than the inner, apex obliquely truncate; all others simple; first protarsal segment only slightly expanded, width a little less than one-half length, second segment a little narrower, width equaling four-fifths of its length which equals width of first segment. Posterior margin of last sternite deeply, broadly emarginate, floor of the margination sinuate, the sides apically produced, the edges of the produced portion flattened.

Lobes of dorsal bifurcation of tegmen broadly rounded, incurved, inner surface clothed with long pubescence, median lobe slender, long-exserted, ventral lobes dorso-ventrally flattened, moderately short, slightly exceeding lateral sinuations of dorsal plate when viewed laterally, secondary lobe on apical third internally, lateral sinuations short, a blunt lobe (Fig. 5).

Female: Eyes relatively smaller than those of male, form a little stouter, width at base of elytra 2.25 mm., length 8.75 mm., antennae 5.5 mm., sides and apex of abdomen dusky testaceous, or testaceous color restricted to tip, claws simple, protarsi not expanded.

Range: Southern California, type Santa Monica; all those examined by the author, San Diego county.

Homeotype-plesiotype: male, SAN DIEGO, CALIFORNIA, June 6, 1914, E. P. Van Duzee. [Calif. Acad. Sci.] This specimen was compared with the unique male type of *ochropa* and the diagnostic abdominal characteristics found to agree. Comparison was made by Dr. P. J. Darlington, Jr., whose assistance is sincerely appreciated.

Other specimens examined: 2 males, 11 females, San Diego, Mission Valley, May 1, 1928, on *Lonicera*, Geo. Smith 1 spec.; San Diego, F. E. Blaisdell, 3 spec.; San Diego, C. N. Sanford, 1 spec.; S. Cal. (no further data, but contemporary with the following), 4 specs.; Smith's Springs, S. Cal., 3300 ft., April 19, 1879, 1 spec.; San Diego, April 23, 1879, 3 specs.

This species is rare—at least in collections.

Cantharis (Cultellunguis) mackenziei McKey-Fender, n. sp.

Elytra black, head before middle of the eyes, pronotum and scutellum flavous, antennae black except anterior surface of the first two segments testaceous shading to brunneous apically; legs black except procoxae testaceous, profemora brunneous basally and meso-coxae brunneous; prosternum testaceous, mesosternum brunneous and metatsternum and abdomen black. Form slender.

Male: Width at base of elytra 2 mm., length 8.5 mm., antennae 6.5 mm. Clypeas short, emarginate, margin gently oblique on either side; antennae exceeding two-thirds of body length; eyes large. Thorax subquadrate, a little longer than wide, narrowed anteriorly; anterior angles broadly obtuse, evenly rounded into the shallowly convex anterior edge, sides slightly sinuate, widest at middle, posterior angles distinct, a little over a right angle, posterior edge gently convex, sinuate; edges of pronotum reflexed, disc with a broadly concave area occupying the anterior third on each side, narrowing postero-laterally to the posterior fourth, posterior edge uniformly reflexed, disc tumid on either side posteriorly, a shallow median depression extending to the anterior third. Elytra slender, length nearly three times combined width, sculptured lines scarcely evident, short pubescence cinereous, erect hairs golden or fulvous (brunneous in one specimen), never black. Anterior claw of protarsi cleft, the outer cleft portion cultellate, exceeding the inner, rounded at extreme tip, oblique internally, all others simple. First protarsal segment slightly expanded, width equals one-half its length; length of the second equals width of the first, width of the second equals half its length, length of third equals width of the second, width of third equals half its length. Posterior edge of seventh sternite deeply emarginate, floor of the emargination sinuate, sides produced postero-laterally and expanded apically, a raised ridge extending anteriorly from the produced sides parabolically across the lateral part of the last segment to the center of the sixth visible (next to the last visible) segment.

Dorsal bifurcation of tegmen moderately long, lobes slender, rounded at tips, tips widely separated, projecting diagonally downward and backward, ventral lobes dorso-ventrally flattened, long, secondary lobe near tip, directed mesad, median lobe slender, long-exserted, lateral sinuations prominent, narrowly lobular (Fig. 4).

Female: Stouter than male, antennae shorter; width at base of elytra 2.5 mm., length 9 mm., antennae 5.75 mm.; all claws simple; protarsi not expanded.

Range: California; San Bernardino National Forest (L. Arrowhead and San Jacinto Mts.)

Holotype: male, L. ARROWHEAD, CALIFORNIA, July 3, 1941, G. P. Mackenzie [Calif. Acad. Sci.].

Allotype: female, same data [Calif. Acad. Sci.].

Paratypes: 22 males, 25 females. Forest Home, San Bernardino Co., June 14, 1928, 9 specs., June 15, 1928, 3 specs., June 10, 1926, Van Dyke, 1 spec.; Tahquitz Cn., Riverside Co., June 30, 1928, Van Dyke, 1 spec.; Idyllwild, July 3, 1928, June 21, 1940, Van Dyke, 5 specs.; San Jacinto Mts., 1932, F. E. Winters, 1 spec.; Santa Rosa Mt., San Jacinto Mts., May 31, 1940, *Quercus* Fred H. Rindge, 1 spec.; June 15, 1946, D. J. and J. N. Knull, 1 spec.; L. Arrowhead, July 3-5, 1941, July 11, 1942, July 23, 1944, July 2-6, 1945, G. P. Mackenzie, 34 specs.

This species very closely resembles *C. ingenua* but the elytral pubescence distinguishes it even from *C. ingenua knulli,* which it most closely resembles, the erect hairs of the elytra being golden or fulvous (invariably black in *ingenua*). Males may also be separated by the deeply emarginate last ventral segment (very shallowly emarginate in *ingenua*). This character, though difficult to express in words is very striking. *C. ochropa* has the terminal sternites similarly modified, though less strongly. The male protarsi are not very broad, thus differing from typical *ingenua,* though not from *ingenua knulli.* The male genital armature indicates a relationship to both *ingenua* and *ochropa,* that of *ingenua* being a more expanded development of the same plan as the other two species.

The author is pleased to name this fine species after Mr. G. P. Mackenzie, through whose efforts most of the extensive type series was obtained.

CANTHARIS (CULTELLUNGUIS) INGENUA LEC.

Telephorus ingenuus Leconte, 1881, Synopsis of the Lampyridae of the United States, Trans. Am. Ent. Soc., 9: 55.

Black except head before eyes and pronotum flavous to rufotestaceous, prosternum and anterior surface of first and second antennal segments brunneous. Form relatively robust.

Male: Width at base of elytra 2.25 mm., length 9 mm., antennae 6 mm. Clypeus short, shallowly emarginate apically, evenly arcuate on either side, antennae appreciably less than two-thirds

of body length; eyes moderate in size. Pronotum subquadrate, a little longer than wide, slightly narrowed anteriorly; anterior angles evident, broadly rounded into the moderately convex anterior margin, sides nearly straight, posterior angles distinct, a little over a right angle, posterior margin sinuate, shallowly convex, disc broadly concave either side before the middle tapering to sides at posterior one-third, posterior margin uniformly reflexed; disc tumid on either side posteriorly, a shallow median depression extending anteriorly to anterior one-fifth. Elytra moderately slender, combined width approximately one-third length, longitudinal sculptured lines faint, short pubescence cinereous, erect hairs black. Anterior claw of protarsi cleft, the outer cleft portion cultellate, slightly exceeding the inner, obliquely arcuate internally; all others simple. First protarsal segment long and broadly expanded, width equaling nearly three-quarters of the length; width of second equals its length which equals one-third the length of the first; width of the third equals one and one-fourth times its length and equals the length of the second. Posterior margin of seventh sternite broadly, very shallowly emarginate, the floor of the emargination very slightly convex medially, a slightly swollen ridge extending a short distance from the prolonged sides anteromedially.

Male genital armature black; entire structure broadly expanded, in the dried specimens, crumpled, dorsal bifurcation of tegmen very broad, investing tip of median lobe, lateral sinuations uncomplicated, median lobe moderately stout basally, slender apically, ventral lobes dorso-ventrally compressed, short, broad, secondarily lobed internally, lobe small, nearly apical (Fig. 7).

Female: Stouter, width 2.5 mm., length 9.25 mm., antennae 6 mm., all claws simple, protarsi not expanded.

Range: California; Western Riverside Co., north to San Francisco (typical). The type is said to be from Nevada.

Specimens examined; 60.

Homeo-plesiotype: male, Belvedere, California, May, 1937 [Calif. Acad. Sci.].

This specimen was compared with the Leconte type of *T. ingenuus* by Dr. P. J. Darlington, Jr.

C. ingenua is the darkest of this group of *Cantharis*. The black elytral pubescence distinguishes both sexes readily from *C. mackenziei*, its nearest relative. Typically the male first protarsal segment is very broad and long and the succeeding segments are also very wide. A subspecies lacking the broadened protarsi and differing in certain other respects is described below:

Cantharis (Cultellunguis) ingenua knulli McKey-Fender, n. subsp.

Smaller and form more slender than typical; width of male 1.75 mm., length 6.5 mm., antennae 5 mm.; female a little stouter than male. Color as in the typical form except scutellum, prosternum and procoxae also flavous, tegmen brunneous rather than black, less strongly chitinized, lobes of dorsal plate not strongly expanded and not collapsed; median lobe slender, more of its length exposed than in typical form (Fig. 8). First protarsal segment of male not at all expanded in dried specimens and only slightly so even in relaxed, moist specimens.
so even in relaxed, moist specimens.

Holotype: male, JACUMBA, CALIFORNIA, May 18, 1941, D. J. and J. N. Knull [Ohio State University].

Allotype: female, same data [Ohio State University].

Paratypes: 8 males, 6 females, Jacumba, May 18, 1941, D. J. and J. N. Knull, 7 specs.; Cuyamaca Rancho State Park, May 19, 1941, D. J. and J. N. Knull, 1 spec.; Oak Grove, June 5, 1941, D. J. and J. N. Knull, 2 specs.; Banning, May 20, 1941, Van Dyke, 4 specs.

Collected at several points in the Cleveland National Forest area of southern California, all of these specimens fitting the above analysis very closely. Specimens from Whittier, Alhambra, and Corona approach this form in coloration, the scutellum and prosternum being light and the genital apparatus paler and somewhat less strongly expanded than in specimens from other Los Angeles area localities and the San Francisco Bay region, but with the robust form and broadly expanded male protarsal segment of male not at all expanded in dried specimens and only slightly so even in relaxed, moist specimens.

Unlike the other variants of the species of *Cultellunguis, knulli* departs from the typical not so much in pigmentation as in degree of development of certain structures. In the opinion of the author, it is of subspecific rank, the restricted geographic range strengthening this view. The male genital armature differs from the typical only in the parts being less broadened.

CANTHARIS (CULTELLUNGUIS) PERPALLENS FALL

Cantharis perpallens Fall, 1936, On certain species of *Cantharis* (*Telephorus*), Pan. Pac. Ent., 22: 179.

The original description of this insect is readily accessible and quite complete, therefore it will not be redescribed. The characters included in the key and figures of this study should serve to separate it. The shape of the pronotum is very distinctive, the an-

terior margin being more strongly convex than in any of the species and the anterior angles obliterated.

The male genital armature is undescribed: Lobes of dorsal bifurcation of tegmen moderately broad, wider at tip than base, divergent, tips not appreciably curved downward, lateral sinuations pronounced, acutely pyramidal; ventral lobes dorso-ventrally flattened, short, secondarily lobed at tips internally; median lobe slender, long-exserted (Fig. 6).

Range: California west of the Sierras, north to Monterey and south to Baja California, Mexico (Ensanada and Catavina).

The single specimen from Catavina, like the typical form, is very pale and slender, but differs in having a faint brunneous M-shaped pronotal maculation.

Cantharis (Cultellunguis) perpallens sanctaeclarae McKey-Fender, n. subsp.

Although the pale coloration of *perpallens* has been considered one of the more important diagnostic characters, specimens from some localities represent a melanic subspecies: Elytra black, piceous or brunneous and the underparts dark; a dark occipital spot may be present; head, pronotum, scutellum, legs and lateral and median portions of the abdominal sternites yellow; long elytral pubescence brunneous rather than pale. This subspecies agrees with the typical in other respects, including the male genitalia.

Range: California; Santa Clara county and Monterey area.

Holotype: male, CUPERTINO, SANTA CLARA CO., CALIFORNIA, June 11, 1939, K. S. Hagen [Calif. Acad. Sci.].

Allotype: female, same data [Calif. Acad. Sci.].

Paratypes: 4 males, 8 females. Los Gatos, Aug. 15, 1933, J. A. Kneche, 2 specs.; Los Gatos, June, 10, 14, A. Fenyes (each bears a yellow disc), 3 specs.; Pacific Grove, June, 16, '04, A. Fenyes (a blue disc), 2 spec.; Monterey, June 24, 1916, 81, 1 spec.; Monterey, July 15, 1923, L. S. Slevin, 1 spec.; Pacific Grove, Moonterey Co., Sept. 4 F. E. Blaisdell (a red rectangle), 1 spec.; Carmel, Monterey Co., June 21, 1915, L. S. Slevin, 1 spec.; Carmel, July 20, 1935, L. S. Slevin, 1 spec.; Monterey June 24, 1916, J. O. Martin, 1 spec.

The seven specimens from Santa Clara county show this subspecies at its best development, while specimens from the Monterey area depart less from the typical form, the melanic areas being of a lighter tone (brunneous). The Monterey area apparently is the point at which this subspecies intergrades with the

typical, since of the fourteen specimens of *perpallens* from Monterey county at hand for this study, seven, those mentioned above, are *perpallens sancataeclarae,* while the remainder are typical *perpallens.* Typical *perpallens* has not yet been seen from north of Monterey Bay, nor has the new subspecies appeared in collections from the southern part of the range of the species.

Subgenus Cantharis L. s. str. 1758

This remains the largest group in Division II. While it might be broken into several sections, the species are so well connected as to preclude such subdivision at present. The species include *Cantharis rotundicollis* Say, 1825, *consors* Lec., 1851, *curtisii* Kby., 1837, the European *C. livida* L. and *rufa* L. which have been taken on the North Atlantic coast; *C. transmarina* Mots., 1859, *grandicollis* Lec., 1851, *fidelis* Lec., 1851, *oregona* Lec., 1866, *scopa* Lec., 1866, *alticola* Lec., 1881, *marginellis* Lec., 1851, *lecontei* Fall, 1936, *tuberculata* Lec., 1851, *loweri* Pic, 1906 (*decipiens* Horn, 1894), and probably *simpliunguis* Blatch., 1910 and *westwoodii* Kby., 1837. *C. vittata* Fab., 1801 remains unknown, not having been certainly identified by any worker since its description. Its exact position is therefore uncertain. The first five species listed above are not difficult to recognize and a partial key covering these species is herein included, while most of the remainder defy analysis at present. The author has at hand several readily recognizable new species in this complex, to nearly all of the names more than one species being referrable. There are also some points of synonymy in question. Revision of this complex group is deferred to a later study. In this group the posterior claw of each pair is invariably simple while the anterior varies from lamellate to simple. The arrangement of the claws, however, usually holds to a rather definite formula. In most species the anterior claw of the protarsi is mostly broadly toothed, often lamellate (Fig. 20), and the anterior meso- and metatarsal claws are successively less broadly toothed. The ungual teeth are less broad in the females (Fig. 19), even being lacking on the meso- and metatarsi of some species (*alticola* group) and on all feet in at least one species (an undescribed species from the Midwest). *Simpliunguis* apparently is of this type. The male genital armature has the ventral lobes strong, slender and uncomplicated, the dorsal plate emarginate to bilobed.

C. loweri Pic (*decipiens* Horn), placed by Horn with *dentiger* Lec., has the ungual formation rather of *Cantharis.* (It appears

to be a variety of *oregona.*) According to Mr. J. W. Green, who examined Horn's types, two males, the anterior claws of the pro- and mesotarsi are lamellate, the posterior simple, while the metatarsal claws are missing in both specimens (in litt.).

On the basis of the original description, it is unlikely that *C. westwoodii* Kby., 1837 is a synonyn of *curtisii* Kby., 1837 (*samouelli* Kby, 1837). *Curtisii* does not have the thorax transverse nor the legs dark. Horn (1876) recognized it as distinct from *curtisii,* while Leconte in his North American synopsis (1851) included it among his unknowns and in his U. S. synopsis (1881) failed to mention it at all, presumably because of the extreme northern locality of its capture (lat 65°). In the following key, *westwoodii* would key out to *livida* L. (*andersoni* Frost 1922):

1. Color predominantly pale or dusky 2
– Color predominantly black .....(species not treated here)
2. Eyes small, pronotum nearly as broad as elytra 3
– Eyes large, pronotum appreciably narrower than elytra 4
3. Pronotum definitely transverse, anterior angles evident, color entirely pale; or legs, antennae and ventral segments dusky, a dark M-shaped spot on thorax; size moderate—9 mm. (Maine and Novia Scotia) .....*rufa*
– Pronotum subquadrate or slightly transverse, in effect suborbicular, margin deeply convex anteriorly, the anterior angles evenly rounded, obscured; an occipital spot, tibiae and apical parts of hind femora and outer two-thirds of antennae black, elytra often dusky apically, size large—11-13 mm. (Massachusetts) .....*livida*
4. Legs unicolorous, testaceous or dusky, (eastern U.S. and Canada), size moderate to large 5
– Knees, tibiae and tarsi piceous, elytra testaceous to dusky, ventral segments sometimes piceous, size very large—14-19 mm. (Western California, San Diego north to San Francisco Bay) .....*consors*
5. Size large—12-14 mm., yellow, legs testaceous, ventral segments sometimes dusky, rarely piceous, elytra often dusky, male metatibiae produced in a spiniform process (Northeastern U.S. south to Virginia, west to Illinois and Minnesota) .....*rotundicollis*
– Size moderate—10 mm., elytra and ventral segments regularly piceous, legs testaceous, tarsi sometimes dusky, metatibiae of male not produced (Extreme northern U.S. and Canada west to Minnesota and Peace R., B.C.) .....*curtisii*

C. rufa L. has not been heretofore included in the North American fauna, being a rather common European species. There are no differences between N. A. and European captures.

North American localities: Maine; Millinocket, June 25, 1930, 2 specs.; June 28, 1930, Siepmann, 1 spec.; Lincoln Co., June 22, 1940 and June 18, 1946, D. J. Borror, 3 spec.; Medomak, June 9, 1938, 2 specs.: Nova Scotia; Truro, June 18, 1915, 1 spec.; Middleton, June 22, 1914, W. E. E., 1 spec.

Subgenus Absidia Muls.

Two species, *C. insipida* Fall, 1907, and *C. sierrae* herein described, are provisionally placed in this subgenus. *Insipida* is evidently related to the new species and, by comparison with European material, these species were found to be quite near *Absidia pilosa* Payk. and *A. prolixa* Mark., the only representatives at hand. In addition to the key characters, they agree with European material in the head being rather long behind the eyes and in the obsolete inner angle of the maxillary palpi (Reitter 1911), as well as in the form of the genitalia. The Cantharidae section of the Junk *Coleopterorum Catalogus* (1939) gives *Absidia* subgeneric rank under the genus *Podistra*, but for the present the author prefers to retain this group in the genus *Cantharis*, leaving the study of the generic position for later treatment.

Cantharis (Absidia) sierrae McKey-Fender, n. sp.

Male: Form slender, length 6.5 mm., width at base of elytra 1.5 mm., antennae 4 mm. Elytra, ventral segments, antennae except basal segment, sides of head and tarsi piceous, thorax and scutellum yellow, otherwise dusky. Clypeus short, anterior margin biarcuate, surface of head shining, vertex closely punctured; antennae less than two-thirds body length, moderately stout, first and third antennal segments subequal, second approximately one-third the length of the third; eyes large, separated by a distance very slightly greater than the length of the eye, width of head including eyes slightly less than the width of the thorax. Thorax subtransverse, anterior margin very shallowly convex medially, anterior angles indistinct, uniformly rounded into front and sides, hind angles distinct, approximately right angles, posterior margin very gently convex, plain, sides slightly wider anteriorly, sinuate, slightly constricted just behind anterior angles and again just before posterior angles, edges reflexed; disc shining, virtually impunctate except very finely punctate anteriorly, disc tumid either side posteriorly, broadly impressed at anterior angles, a moderate impressed line between the convexities, pubescence fine and scattered, testaceous. Elytra moderately slender, combined width about one and one-half times width of the thorax, scabrously sculptured, longitudinal lines evident, edges a little thickened, pubescence suberect, rather sparse, dusky-testaceous. Last sternite broadly,

moderately emarginate, floor of emargination simple, apparent eighth sternite narrow, scarcely covering aedeagus. Tarsi slender, claws simple, only slightly expanded at base.

Genitalia feebly chitinized, median hooks articulated on dorsal face of median lobe, directed dorsad, meeting at center of anterior edge of dorsal plate and on the same level; space between ventral lobes wide and deep exposing most of median lobe, basal plates feebly developed, lateral sinuations undeveloped (Fig 9).

Female: Unknown.

Type locality: CALIFORNIA, LAKE ARROWHEAD.

Holotype: male, Lake Arrowhead, July 3, 1941, G. P. Mackenzie [Calif. Acad. Sci.].

Paratype: male, Keen Camp, June 14, 1946, D. J. and J. N. Knull.

The paratype is quite dark, the elytra and antennae except basal segment being deep black and legs except femora and trochanters of pro- and mesotarsi piceous, elytral pubescence dusky. In general body proportions, shape and sculpture of thorax, length and thickness of antennae it agrees well with the type.

CANTHARIS (ABSIDIA) INSIPIDIA FALL

Telephorus insipidus Fall (w. Cockerell), 1907, The Coleoptera of New Mexico, Trans. Am. Ent. Soc. 33: 235.

Two specimens of a species provisionally determined as *C. insipida* Fall are at hand. This species differs *C. (A.) sierrae* n. sp. in its paler, more uniform coloration and is more slender and with longer antennae. The length of the distal antennal segments is over five times their width against a length less than four times the width in *sierrae*, while the antennal length is but slightly less than the total length of the insect (less than two-thirds the total length in *sierrae*). The thorax is longer than wide with more deeply convex anterior margin, sides equidistant (wider anteriorly in *sierrae*), and the longitudinal sculptured lines of the elytra are a little less evident. These points all agree with Fall's description of *insipida*. What casts doubt on this species truly being Fall's species is the great disparity in measurements. One of the California specimens is only 5 mm. long and the other only 6.5, while the type of *insipida* is 9.5 mm. However, it is not uncommon in *Cantharis* for individuals of a species to vary widely in size (v. ant., *C. divisa*). The species at hand is dusky testaceous throughout, as is *insipida*, but the elytra, antennae and tarsi are darkest, the elytral apices approaching piceous. The second antennal segment is scarcely one-third the length of the third (barely

half as long as three in *C. insipida* Fall). In spite of these differences the author does not wish to erect a new species on the basis of only two specimens and without checking the Fall type.

Specimens examined: California, Lake Arrowhead, July 6, 1941, G. P. Mackenzie; Forest Home, San Bernardino Co., June 14, 1928, Van Dyke.

Type locality of *C. insipida* Fall—New Mexico.

The male genitalia of the species examined by the author differ in no tangible characters in the dried specimens available. They are of a very simple, weakly sclerotized type and only from relaxed and cleared specimens can a satisfactory study of such types be made. These species appear to be very rare, only four specimens having come to light in the thousands of *Cantharis* seen by the author.

Though five specimens (including Fall's type) scarcely offer room for speculation, the fact that all five are males is interesting. The female of the European *A. prolixa* Mark. is said to have the elytra much abbreviated.

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ACADEMY RECEIVES FLEA COLLECTION

Dr. C. Andresen Hubbard of Tigard, Oregon, well known for his exhaustive work "The Fleas of Western North America," has made up a series of twenty depository collections of fleas of the Pacific Northwest. These have been very generously presented to various museums in this country and abroad. In addition, a master collection is deposited in the U. S. National Museum.

The collection recently received by the California Academy of Sciences is second in completeness only to that of the U. S. National Museum. It comprises 108 slides, each usually with a male and female, of 108 species or subspecies of fleas from the Western States. Included are paratypes of sixteen species or subspecies described by Hubbard. The collection is a model of neatness, completeness and uniformity of labelling, and of good preparation.

The collection will be permanently maintained as a separate unit and will be available to qualified students visiting the Academy.—E. S. Ross.

Book Notices

THE LIFE OF WILLIAM T. DAVIS. By Mabel Abbott. Cornell University Press, Ithaca, New York, xv + 321 pp., frontispiece and 18 figs. 1949. $3.50.

In this day, in which it is commonly thought that money alone will buy the "fuller life," this book should be widely read. The life of William T. Davis was simple, but full of the high adventure and deep pleasure available to anyone who cares to examine and study the natural history marvels of his immediate environment. Davis' environment, Staten Island, New York, can in effect, be duplicated by almost any suburban area of this country and his full life can readily be emulated by others.

Davis' work on the cicadas gave him his widest reputation and we thus tend to claim him as an entomologist. A story of his life, however, cannot be strictly entomological for he was a naturalist in the broad sense. Nevertheless this book is recommended reading for entomologists, especially those who have become so involved in the laboratory and economic phases of the science that they can no longer be called naturalists.

The book is skillfully and entertainingly written. Its pages carry frequent, well selected excerpts from Davis' "Natural History Note Book" which give the reader a keen insight into his character and personality. A complete list of Davis' published writings at the end of the book will be most useful.—E. S. Ross.

THE SIPHONAPTERA OF CANADA. By George P. Holland, Publication 817, Tech. Bul. 70, Canada Dept. Agric., Ottawa. 306 pp., including 42 pls. of 350 figs., 44 maps, September, 1949.

This paper is well planned, ably written, fully illustrated, and nicely printed. The clarity and uniformity of treatment show that much thought has been given to making it easily used by readers. The tabulations, maps, documentation, and index are excellent for quick reference.

The first 52 pages include a checklist and distribution by provinces, notes on life history and ecology, host specificity, geographical distribution, relationships of nearctic and palaearctic fleas, economic importance of fleas in Canada, and their anatomy as applied to systematics. A key to the genera is given on pp. 53-57, and keys to the species in the text (pp. 59-182). Maps show distributional records, often superimposed on the ranges of the hosts. Pages 183-195 give a host-flea index.—HUGH B. LEECH.

UNDESCRIBED SPECIES OF TIPULIDAE FROM THE WESTERN UNITED STATES Part IV

(Diptera)

BY CHARLES P. ALEXANDER

University of Massachusetts, Amherst

The preceding part under this title was published in the Pan-Pacific Entomologist, 23: 91-96; 1947. The species discussed herewith are all from California and Oregon and were collected by Mr. Kenneth M. Fender and the writer, chiefly during 1948. The types of the species are preserved in my collection. My deepest thanks and appreciation are extended to Mr. Fender for his most enthusiastic and successful efforts to make known the rich Tipulid fauna of Oregon.

Dicranoptycha melampygia Alexander, new species

General coloration dark gray, including the pleura; praescutum with four poorly defined darker stripes; tips of the femora and tibiae darkened; wings brownish yellow, the prearcular and costal fields a little clearer yellow; abdomen, including hypopygium, brownish black; outer dististyle of male hypopygium gradually narrowed into a slender apical spine, the outer margin of style with numerous strong spines extending almost to the base.

Male. Length about 8.5-9 mm.; wing 8-8.5 mm.

Rostrum black, pruinose; palpi black. Antennal scape and pedicel obscure yellow, flagellum black. Head uniformly dark gray.

Thorax dark gray, the praescutum with four darker stripes, the intermediate pair more distinct; posterior sclerites of notum and the entire pleura clearer gray. Halteres with stem yellow, knob weakly infuscated. Legs with coxae yellow, the fore pair a trifle darker; trochanters yellow; femora yellow basally, with about the outer third more darkened, gradually becoming brownish black; tibiae pale brown, the tip narrowly darkened, the base less evidently so; tarsi passing into black. Wings weakly brownish yellow, the prearcular and costal fields a little clearer yellow; veins pale brown, the trichia darker brown; costal fringe of male relatively long and dense. Venation: Sc1 ending just beyond level of fork of Rs, Sc2 near its tip; Rs slightly less than twice the basal section of R4+5; m-cu about two-thirds its length beyond the fork of M.

Abdomen, including hypopygium, brownish black. Male hypopygium with the tergal arms of moderate length, the flange on the concave margin back from the acute tip relatively short, only about one-third the total length of the arm. Outer dististyle grad-

ually narrowed into a slender apical spine, the outer margin with numerous strong spines that extend almost to the base. Inner dististyle entirely darkened, its apex obtusely rounded. Phallosome without conspicuous projections, the general outline obtuse.

Holotype, ♂ PRAIRIE CREEK STATE PARK, HUMBOLDT CO., CALIFORNIA, August 11, 1948 (C. P. Alexander). *Paratypes*, ♂ ♀, Peavine Ridge, Yamhill Co., Oregon, July 12, 1945, July 3, 1946 (K. M. Fender); ♂, Zena, Eola Hills, Polk Co., Oregon, June 5, 1948 (K. M. Fender).

The only generally similar regional species is *Dicranoptycha nigrogenualis* Alexander, which differs in the coloration of the wings and legs, and in the structure of the male hypopygium, particularly of the outer dististyle and phallosome.

Dicranoptycha stenophallus Alexander, new species

Thoracic dorsum almost uniformly gray, the praescutal stripes virtually lacking, the sternopleurite paler; wings with a brownish tinge; costal fringe of male short but dense; abdominal tergites brown, the subterminal segments scarcely more darkened, hypopygium yellow; male hypopygium with the outer dististyle relatively short and stout; aedeagus unusually small and slender, smooth, the tip decurved.

Male. Length about 8-10 mm.; wing 8-10 mm. *Female.* Length about 11-12 mm.; wing 9.5-10 mm.

Rostrum dark brown; palpi black. Antennae with the scape and pedicel yellow, flagellum black; flagellar segments cylindrical, shorter than the verticils. Head gray.

Thoracic dorsum almost uniformly gray, the praescutal stripes lacking or very indistinct. Pleurotergite and dorsal pleurites light gray, the latter with a short brown mark on the ventral anepisternum; ventral pleurites, especially the sternopleurite, paling to brownish yellow, sparsely pruinose. Halteres yellow, knob infuscated. Legs with the coxae yellow, pruinose; trochanters yellow; remainder of legs obscure yellow, the outer tarsal segments darkened. Wings with a brownish tinge, the costal border slightly more saturated, brownish yellow; veins pale brown. Costal fringe of male short but dense. Venation: Rs a little longer than cell 1st M2; m-cu one-half to two-thirds its length beyond fork of M.

Abdominal tergites brown, the sternites a little paler, the subterminal segments slightly to scarcely darker; hypopygium yellow. Male hypopygium with the tergal arms pale, unusually long and slender, the tips acute and microscopically roughened. Outer dististyle relatively short and stout, the apical spine moderately long; spines of outer margin subappressed but conspicuous, including approximately the distal two-thirds, weak to obsolete on

the lower face of style. Inner dististyle flattened, the tip obtuse; surface, and especially the lower margin, with long pale setae, the longest only a little shorter than the diameter of the style. Phallosome distinctive, including an oval central structure and a low, weakly divided lobe with several pale punctures; aedeagus small but elongated and slender, smooth, the decurved tip pale.

Holotype, ♂, MADRONA CAMP, SISKIYOU NATIONAL FOREST, DEL NORTE CO., CALIFORNIA, August 1, 1946 (C. P. Alexander). *Allotype*, ♀, Little Phillips Creek, above Elgin, Blue Mts., Umatilla Co., Oregon, 2850 ft., July 2, 1948 (C. P. Alexander). *Paratypes*, ♂, with the allotype; ♂♀, Langdon Lake, Blue Mts., Umatilla Co., Oregon, 4995 ft., August 17, 1948 (C. P. Alexander); ♂♀, Peavine Ridge, Coast Range, Yamhill Co., Oregon, Stations 1, 2 and 3, July 11-12, 1945, May 20, June 20, July 3, August 13-20, and September 13, 1946; July 3, 1947; July 16, 1948 (K. M. Fender); Humbug Mountain State Park, Curry Co., Oregon, August 11, 1948 (K. M. Fender); State Line Creek, Curry Co., Oregon, August 9, 1948 (Alexander & Fender); Castle Crags State Park, Shasta Co., California, 2050 ft., August 13, 1948 (C. P. Alexander).

While similar in its general appearance to species such as *Dicranoptycha occidentalis* Alexander and *D. spinosissima*, new species, the present fly is quite distinct in the structure of the male hypopygium, as described.

Dicranoptycha spinosissima Alexander, new species

General coloration of head and thorax gray, the praescutum with two poorly indicated brown stripes; legs yellow, the outer tarsal segments brownish black; wings narrow, yellowish gray, costal fringe of male long; abdomen brown, the subterminal segments brownish black; male hypopygium with the lateral tergal arms unusually slender; outer dististyle long and slender, at tip narrowed into a black spine, the outer surface of apical third with microscopic spines; apex of inner dististyle obliquely truncated; phallosome produced into two slender rods that are expanded into pale membrane densely set with minute spinous points.

Male. Length about 9-10 mm.; wing 9 x 2 mm. *Female*. Length about 10 mm.; wing 10 mm.

Rostrum gray; palpi black. Antennae with the scape infuscated, pruinose, pale at outer end; pedicel yellow, flagellum black; flagellar segments cylindrical, shorter than the verticils. Head light gray.

Pronotum gray, the scutellum more obscure yellow. Mesonotum gray, the praescutum with faint indications of two pale brown intermediate stripes; humeral region paler gray, enclosing the

black pseudosutural foveae. Pleura gray, the dorsal pleurites darker than the ventral sternopleurite; dorsopleural membrane buffy. Halteres pale brown, the base of stem yellow. Legs with the coxae yellow, the fore and middle pairs slightly more pruinose; remainder of legs yellow, the outer tarsal segments brownish black. Wings narrow, tinged with grayish yellow, the prearcular and costal fields slightly clearer yellow; veins pale brown. Costal fringe of male relatively long and conspicuous. Venation: Rs shorter than cell 1st M2; -cu gently sinuous, at near one-third the length of cell 1st M2.

Abdomen brown, the subterminal segments deepening to brownish black; hypopygium obscure yellow. Male hypopygium with the lateral lobes of the tergites low and tumid, the tergal arms unusually slender, their tips paling into membrane. Outer dististyle unusually long and slender, the tip abruptly narrowed into a straight black spine, the outer surface of the apical third with microscopic suberect to appressed spinulae. Inner dististyle shorter, the tip obliquely truncate. Phallosome distinctive, at apex produced into two slender rods that expand into pale membrane that is densely set with acute spinous points, these directed clockwise, those of the inner edge being directed outward, those of the outer margin more retrorse.

Holotype, ♂, HATCHET PASS, near Burney, SHASTA CO., CALIFORNIA, 4000 ft., July 9, 1947 (C. P. Alexander). *Allotype*, ♀, Little Phillips Creek, above Elgin, Blue Mts., Umatilla Co., Oregon, 2850 ft., July 2, 1948 (C. P. Alexander). *Paratype*, ♂, with allotype.

The most similar regional species are *Dicranoptycha occidentalis* Alexander and *D. stenophallus*, new species, which, while generally similar in appearance, differ very conspicuously in the structure of the male hypopygium.

Limnophila amabilis Alexander, new species

Praescutum gray pruinose, with a narrow black median stripe; basal two segments of antennae blackened, the flagellum with the more basal segments brownish yellow; halteres yellow; legs yellow, the femoral tips and tibial bases and tips blackened; wings pale yellow with a heavy brown spotted pattern; abdomen black; male hypopygium with the outer dististyle dilated at base, gradually narrowed into a long apical spine, before midlength on ventral side bearing a lateral tooth or flange, the style entirely glabrous.

Male. Length about 7-7.5 mm.; wing 6.5-7 mm.; antenna about 1.2 mm. *Female*. Length about 9-10 mm.; wing 8-8.5 mm.

Rostrum black, grayish pruinose; palpi black. Antennae short; scape black, pedicel brownish black, flagellum brownish yellow, the outer segments darker; basal flagellar segments subglobular to short-oval, with short verticils; outer segments more elongate,

more or less dilated at near midlength where they bear long conspicuous verticils. Head dark, more pruinose on front and orbits.

Pronotum brownish black, pruinose. Mesonotal praescutum grayish pruinose, with a narrow but conspicuous black median stripe, narrowed behind; pseudosutural foveae black, relatively large. Pleura black, sparsely pruinose; dorsopleural membrane dusky. Halteres pale yellow. Legs with the coxae black, sparsely pruinose; trochanters obscure yellow; femora light yellow, the tips abruptly blackened, the amount subequal on all legs and involving about the distal eighth; tibiae yellow, the extreme base and slightly broader apex black; basal three tarsal segments yellow, the tips narrowly darkened; outer two tarsal segments brownish black; tibial spurs black. Wings pale yellow, the costal region clearer yellow; a heavy brown spotted pattern, arranged much as in certain species of *Elaeophila*, the markings restricted to the vicinity of the veins, as follows: Arculus; origin of Rs; midway between the two latter; a more or less developed spot on Rs; cord and outer end of cell 1st M2; fork of M1+2; and as a series of marginal spots, largest over Sc and at the wing tip where the individual spots tend to become confluent; paler brown washes in cells M, Cu and the Anals; axilla narrowly darkened; veins brown, yellow in the clearer yellow parts. Venation: Sc1 ending about opposite the fork of Rs, Sc2 at its tip; Rs long, angulated and slightly spurred at origin; inner ends of cells R4, R5 and 1st M2 in approximate transverse alignment; R2+3+4 subequal to basal section of R5; vein R2+3 perpendicular at origin, with a short spur at the bend; cell M1 subequal to or shorter than its petiole; M-cu at from one-third to midlength of cell 1st M2; anterior arculus preserved.

Abdomen, including hypopygium, black. Male hypopygium with the central region of the tergite only moderately produced. Basistyle unarmed. Dististyles terminal in position, the outer dilated at base, gradually narrowed into a long slender apical spine, before midlength on ventral side bearing a lateral tooth or flange, the style entirely glabrous. Inner dististyle broadly flattened, dark colored. Aedeagus long, provided with a subtending flange. Gonapophyses appearing as simple flattened clubs.

Holotype, ♂, HATCHET PASS, near Burney, SHASTA CO., CALIFORNIA, 4000 ft., July 9, 1947 (C. P. Alexander). *Allotopotype*, ♀. *Paratopotypes*, 4♂ ♀,

This unusually beautiful and distinct fly is named for Mrs. Charles P. Alexander, using the Latinization of her given name, Mabel. While superficially resembling some species of the subgenus *Elaeophila*, especially in the wing pattern, the fly is entirely distinct from all other members of the genus *Limnophila* so far described. Of the various subgenera the species fits most nearly into Phylidorea but from the basic plan of the male hypopygium can scarcely be placed therein.

THE DIPTERA COLLECTED ON THE COCKERELL AND HUBBELL EXPEDITIONS TO HONDURAS

Part I: STRATIOMYIDAE, TABANIDAE, AND ACROCERATIDAE[1]

BY MAURICE T. JAMES

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During the winter of 1946-47, Professor and Mrs. T. D. A. Cockerell visited the Escuela Agricola Panamericana, Zamorano, Honduras, for the purpose of studying the insect fauna. Through their own efforts and those of students of the school, whom they interested in the project, they collected widely in the various orders. The present paper is based on a part of their Diptera, augmented by collections which T. H. Hubbell sent me for study. Dr. Hubbell visited various areas in Honduras in 1923, and in 1948 he revisited that country, on which occasion some time was spent at Zamorano.

STRATIOMYIDAE

Hoplitimyia mutabilis (Fabricius), 1787, Mantissa Insectorum, vol. 2, p. 331 (*Stratiomys*). Zamorano, thicket, 2650 ft., July 29, 1948 (T. H. Hubbell), no. 162, 1 female; Dept. Choluteca, 3776 ft., El Chinchayote, Sa. de Colón, E. of San Francisco, July 31, 1948 (Hubbell).

Hermetia illucens (Linnaeus), 1758, Systema Naturae, 10th ed., p. 589 (*Musca*). Zamorano, November, 1946 (Vidales), Nov. 23, 1946 (G. Cisneros), and Aug. 6 and 22, 1948 (Hubbell), 5 females; Tela, Lancetilla, July 28, 1948 (Hubbell), 1 female.

Hermetia flavipes Wiedemann, Aussereuropaische Zweiflügelige Insekten, 1830, vol. 2, p. 26. Tela, Guaimas Dist., May 2, 1923 (Hubbell), no. 442, 1 male.

Hermetia albitarsis Fabricius, 1805, Systema Antliatorum, p. 63. Tela, Lancetilla Creek, March 11, 1923 (Hubbell), 1 female; Tela, Lancetilla, July 28, 1948 (Hubbell), 1 specimen, damaged.

Chrysochlorina varia (Curran), 1929, Amer. Mus. Novitates, no. 339, 1 p. 3 (*Chrysochlora*). Ridge between La Montañita and

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[1]I am grateful to Dr. Cornelius B. Philip for reviewing the Tabanidae section of this paper and for making some valuable suggestions on it.

C. Uyuca, about 5 kilometers southwest of Suyapa, Morazán Dept., 5200 to 5400 ft., Aug. 5, 1948 (Hubbell), no. 195, 1 female; Mt. Caculatepe, 4200 to 4500 ft., Aug. 6, 1948 (Hubbell), no. 203, 1 female.

Sargus thoracicus Macquart, 1834, Histoire Naturelle des Diptères, vol. 1, p. 261. Zamorano, 2600 ft., at light, July 3, 1948 (Hubbell), no. 19, 1 female.

Sargus speciosus Macquart, 1846, Diptères Exotiques, suppl. 1, p. 56. Zamorano, 2600 ft., at light, July 3, 1948 (Hubbell), no. 19, 1 female.

Pedicella notata (Wiedemann), 1830, Aussereuropaische Zweiflügelige Insekten, vol. 2, p. 34 (*Sargus*). Zamorano, Oct. 26, 1946 (Cisneros), 1 female.

Merosargus cingulatus Schiner, 1868, Novara Reise, Diptera, p. 62. Zamorano, October, 1946, (A. Carr), Nov. 18, 1946 (A. A. Arca), July 15, 1948 (Hubbell), no. 79, and Dec. 17, 1946, 4 females; Tela, Lancetilla, July 28, 1948 (Hubbell), 1 female; Tela, Dakota Farm, May 17, 1923 (Hubbell), no. 515, 1 specimen, damaged; Rio Sangrelaya, April 19, 1923 (Hubbell), no. 312, 1 female (?), damaged.

Merosargus bequaerti Curran, 1928, *in* Gowdey, Ent. Bull. Dept. Agric. Jamaica, 4, p. 31. Tela, Lancetilla, July 28, 1948 (Hubbell), 1 female.

Microchrysa bicolor (Wiedemann), 1830, Aussereuropaische Zweiflügelige Insekten, vol. 2, p. 41 (*Sargus*). Tela, May 31, 1923 (Hubbell), no. 694, 1 female.

Ptecticus testaceus (Fabricius), 1805, Systema Antilatorum, p. 257, 6 (*Sargus*). Zamorano, 2600 ft., on citrus, Aug. 16, 1948 (Hubbell), no. 225.

Tabanidae

Assipala melanoptera (Hine), 1905, Ohio Nat., 6: 391 (*Chrysops*). Tela, April 6, 1923 (Hubbell), no. 187, 3 females; Tela, La Fragua Farm, March 8, 1923 (Hubbell), 2 females; Rio Paulaya, Barranco, April 17, 1923 (Hubbell), no. 303, 1 female.

Esenbeckia mejiai Fairchild, 1942, *Ann. Ent. Soc. Amer.* 35: 198. The male is previously undescribed. It differs from the female as follows.

Male. Eyes broadly contiguous, the ocellar triangle in consequence more pronounced and more distinctly elevated than in the female. Proboscis, to base of labella, about 1.25 times head height;

labella about 0.12 length of haustellum, slightly inflated, elongated-oval, and rounded at apex. Antenna as in female, the terminal segment of flagellum somewhat narrower than in Fairchild's drawing, the length in proportion to the basal and subapical widths respectively 11:1 and 15:1. Palpus with basal segment (Fig. 1) strongly inflated, more hairy than in female, with particularly long hairs below; apical segment more slender than in female. Pile of thorax and abdomen somewhat more pronounced than in female.

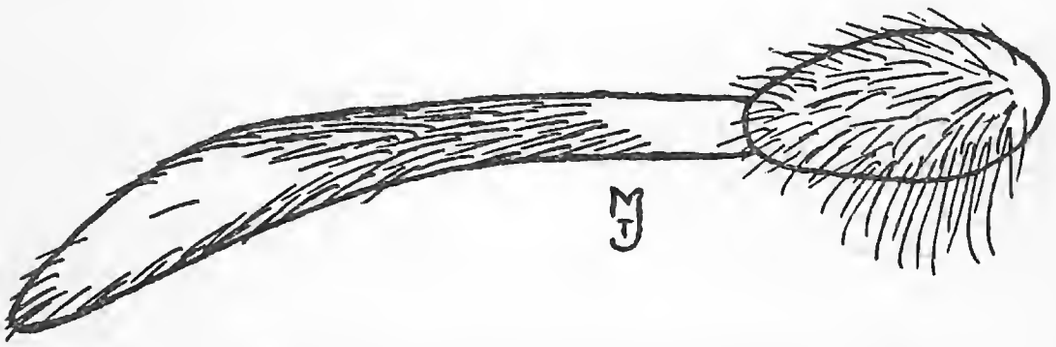

Fig. 1. *Esenbeckia mejiai* Fairchild, palpus of male.

Described from three males, Agua Amarilla, Honduras, Dec. 1, 1946 (Cisneros) and Dec. 15, 1946. Comparison made with one female, in good condition except for loss of the antennal flagellum, Agua Amarilla, Dec. 15, 1946.

Chrysops scalarata Bellardi, 1859, Saggio di Ditterologia Messicana, pt. 1, p. 72. Palajas, near Agua Azul, brushy slope, Lake Yojoa, Dept. Cortés, Aug. 14, 1948 (Hubbell), No. 217, 1 female (det. Philip).

Dichelacera pulchra Williston, 1900, Biologia Centrali-Americana, Vol. I, suppl., p. 263. Zamorano, October, 1946 (A. Carr), 2 females.

Dichelacera fulminea (Hine), 1920, Ohio Jour. Sci., 20:187 (*Tabanus*). Dept. Cortés, Palajas, near Agua Azul, east side Lake Yojoa, Aug. 14, 1948, (Hubbell), No. 212, 1 female.

Lepiselaga crassipes (Fabricius), 1805, Systema Antliatorum, p. 108 (*Haematopota*). Rio Claura, April 13, 1923 (Hubbell), No. 259, 1 female; Tela, May 9, 1923 (Hubbell), No. 499, and May 2, 1923 (Hubbell), No. 440, 2 females.

Diachlorus ferrugatus (Fabricius), 1805, Systema Antliatorum, p. 111 (*Chrysops*). Tela, May 31, 1923 (Hubbell) No. 696, 1 female.

Hybomitra quadripunctata var. *amabilis* (Walker), 1848, List of . . . Dipterous Insects in the . . . British Museum, pt. 1, p. 154 *(Tabanus)*. Zamorano, March 30, 1946 (M. Morales), 1 female.

Tabanus lineola var. *carneus* Bellardi, 1859, Saggio di Ditterologia Messicana, pt. 1, p. 62. Zamorano, Oct. 12 (G. Vidales) and Oct. 13, 1946 (L. O. Williams), 2 females.

Tabanus unistriatus Hine, 1906, Ohio Naturalist, 7:28. Tela, Jilamo farm, May 28, 1923 (Hubbell), No. 654, 1 female (det. Philip).

Stenotabanus longipennis Kröber, 1930, Encyclopédie Ent., B, Diptera, V (1929), p. 127. Ruinas de Copán, 3500 ft., Dept. Copán, Aug. 4, 1948 (Hubbell), No. 191, 1 female (det. Philip).

Amphichlorops sp. near *venenatus* (Osten Sacken). Palajas, near Agua Azul, east side of Lake Yojoa, Aug. 14, 1948 (Hubbell), No. 212, 1 teneral male (det. Philip).

Hine (1925, Occ. Papers Mus. Zool. Univ. Michigan, no. 162, pp. 1-35), has recorded the following species on the basis of specimens obtained by the Hubbell expedition of 1923.

Esenbeckia prasiniventris (Macquart) (recorded as *Pangonius*)—Progresso.

Scione aurulans (Wiedemann)—Progresso; Tela.

Chrysops scalarata Bellardi (recorded as *C. lateralis* Wiedemann, misidentification; cf. Fairchild, 1946, Ann. Ent. Soc. Amer., 39: 565)—Tela.

Chrysops latifasciatus Ballardi—Tela.

Tabanus claurensis Hine—Rio Claura.

Tabanus unipunctatus Bigot (recorded as *T. jilamensis* Hine; synonymy fide Philip, from Hine's manuscript notes).

Tabanus unistriatus Hine—Tela.

Tabanus subruber Bellardi—Tela.

Tabanus bigoti Bellardi—Tela.

Leucotabanus leucaspis (Wiedemann) (recorded as *Tabanus*) —Tela.

ACROCERATIDAE

Ocnaea cisnerosi James, new species

Male. Vertex black, shining laterally, dulled by greyish pollen between the two rather large yellow ocelli; front about 1.5 as

long as the diameter of an ocellus, brownish, shining, becoming yellowish next to base of antennae; short facial triangle and most of occiput yellowish, with concolorous pollen. Eyes black, with rather dense hairs which are mostly as long as the first antennal segment and which range from blackish above to yellow below. Pile of vertex and occiput concolorous. Antennae yellow on scape, somewhat darkened on pedicel, distinctly blackish on flagellum, especially on outward surface; ratio of segments 9:4:95, comparable head height 75; flagellum curved, about as broad on basal third or two-fifths as pedicel, thence tapering to a narrowed though blunt apex; antennae bare except for a prominent tuft of yellow hairs dorsally on the pedicel. Proboscis almost completely obscured by lower part of head; pile yellow.

Thorax mostly yellow; three broad brownish stripes on mesonotum, the lateral ones abbreviated anteriorly, the median one reaching the anterior margin but stopping short of the scutellum; most of sternopleura and lower part of pteropleura brownish, bare; thorax otherwise mostly clothed with yellowish pile. Legs yellow, the femora and tibiae brownish-yellow; pile yellow. Wings hyaline; vein R_{4+5} furcate, the branches forming practically a right angle at the fork and both reaching the wing margin; cell R_5 broadly open.

Abdomen yellow; broad posterior margins of terga, especially laterally, brownish.

Length, 11-12 mm.

Holotype, male, Zamorano, Honduras, Dec. 9, 1946 (G. Cisneros); State College of Washington Type Coll. No. 169. Paratype, male, Zamorano, Honduras, Feb. 26, 1947 (Archie Carr).

In Aldrich's key (Proc. U. S. Nat. Mus., 81 (9) : 3, 1932) this species runs to *auripilosa* Johnson or, if the femora are considered as infuscated, to *trivittata* Aldrich. The lack of black abdominal markings will easily distinguish it from both those species. Other color characters, particularly the black thoracic stripes, will further distinguish *trivittata,* also described from Honduras. *O. micans* Erichson, in which the abdomen is wholly "fuscous" or "testaceus", is described as having a clavate flagellum. The two North American species which have been described subsequent to the publication of Aldrich's key, namely *O. smithi* Jenks and *O. sequoia* Sabrosky (cf. Sabrosky, Amer. Midl. Nat., 39:385-387, 1948), both have the thorax shining black and the abdomen marked with black or bluish-black.

A NEW SPECIES OF ERIBOLUS FROM CALIFORNIA

(Diptera, Chloropidae)

BY CURTIS W. SABROSKY

Bureau of Entomology and Plant Quarantine,
Agricultural Research Administration,
United States Department of Agriculture

A revision of *Elachiptera* and related genera, including *Eribolus* Becker, was recently published by the writer (1948, Jour. Wash. Acad. Sci. 38(11): 365-382) with a key to the Nearctic species. Since then several specimens of both sexes of a new species of *Eribolus* have been discovered. The species is an interesting example of the difficulty often observed in Chloropidae, of finding consistent characters to separate groups of closely related species. Absence of the characteristic pair of well-developed fronto-orbital bristles and the slenderness of the arista would ordinarily have placed this species in *Oscinella* rather than in *Eribolus*, but the structure of the head and thorax, the chaetotaxy, and its close similarity to *E. nearcticus* Sabrosky all cause me to consider it as merely an aberrant *Eribolus*.

Eribolus californicus Sabrosky, new species

♂, ♀. Almost entirely black, the third antennal segment bright yellow in the male, but orange with narrow infuscation along dorsal and distal margins in the female, palpus yellow to orange, and halter knob bright yellow; entire head dark gray to leaden gray pollinose, the frontal triangle only weakly distinct from the front; mesonotum, scutellum, metanotum, and upper portions of meso- and pteropleuron gray pollinose, the lower half of pleuron smooth and polished black; abdomen rather shining, though sparsely and inconspicuously pollinose.

Front at vertex nearly half the width of head (0.46) and nearly as broad as long (0.86-0.90); frontal triangle three-fourths the length of front; length and height of head subequal; eye diagonal, the longest axis approximately 45° from vertical axis of head; cheek strongly slanting mesad, in profile its height only half the breadth of third antennal segment; arista slender, not thickened except for basal segment; no fronto-orbital hairs outstanding, though the middle hairs in the fronto-orbital row are

somewhat longer than the others. Mesonotum relatively smooth, with scarcely any obvious punctures and only minutely roughened on the flattened posterior slope; bristles moderate to short, not conspicuous, the posterior dorsocentrals especially weak; 1+1 notopleural; only the apical pair of scutellars evident, strong though short, erect, and black; subapicals pale, weak, and not appearing as distinct bristles. Second and third costal sectors subequal, the second barely longer (1.02-1.07 times). Length, 2 mm.

Holotype female, SAN DIEGO, CALIF., Nov. 18, 1916 (H. G. Dyar), U. S. National Museum, Type No. 59283. Allotype; Martinez, Calif., July 11, 1917 (J. M. Aldrich) [Malloch Colln.]. Paratypes: ♂, same data as allotype [Malloch Colln.]; ♀, San Simeon, Calif., Sept. 25, 1938 (M. Cazier) [Amer. Mus. Nat. Hist.].

The entirely black legs, with no color even at the knees, and the marked contrast between the entirely or predominantly yellow to orange third antennal segment and the black basal segments, easily distinguish this species from its congeners.

KEY TO THE FOUR NEARCTIC SPECIES OF ERIBOLUS

1. Legs predominantly bright yellow, including fore coxa, fore femur entirely or predominantly, and mid and hind femora basally; palpus yellow in male, more or less infuscated in female; eastern North America.....*E. longulus* (Loew)

–. Legs entirely or predominantly black, including fore coxa and all femora except sometimes knees narrowly; northern and western North America.....2

2. Antenna entirely black, or virtually so; palpus black in both sexes.....*E. sudeticus* Becker

–. Antenna entirely or in large part yellow to orange; palpus yellow to orange in both sexes.....3

3. Basal antennal segments black, contrasting strongly with the bright yellow to orange third segment; legs entirely black..... .....*E. californicus* Sabrosky

–. Basal antennal segments testaceous; legs with yellow tibiae and tarsi, at most the distal tarsal segments infuscated and the hind tibia with a median brown band.....*E. nearcticus* Sabrosky

A LONG LOST APHIS SPECIES

(Homoptera: Aphididae)

BY F. C. HOTTES

Grand Junction, Colorado

The writer recently had occasion to look up the works of John Curtis in *Index Litterature Entomologicae* by Horn and Schenkling. While doing so I came across the following citation, "On *Aphis borealis* from the Polar Sea. In Parry, Narrative of an Attempt to reach the North Pole. 1828. Appendix." Not having heard of an aphid species by that name an attempt was made to find it in aphid literature without success. A copy of the work by Parry was located in the Library of Congress and photostats of the title page and of page 201 on which *Aphis borealis* was described were obtained. The title as given by Horn and Schenkling, while highly descriptive, is theirs and not that of Parry or Curtis, for the species is described under the simple title "Insect", and one finds that it was the only insect taken during the voyage. The original description follows:

"Order, Hemiptera, Linn., &c. Omoptera, Leach.

Fam. Aphidae, Lat. Leach.
Genus, Aphis, Linn., &c.
A. Borealis, Curtis's MSS.

"Corpus magnum, atrum, hirsutum, femoribus basi ferrugineis: alis magnis, subfuscis, ad costam atris.

"At first sight this insect might be mistaken for *A. Piceae* of *Panzer*, which it resembles in size and colour. Upon a closer examination, however, it will be seen that the whole surface, excepting the wings, is covered with rather long and somewhat hoary tomentum or pubescence; and the base only of the thighs is ferruginous; whereas, in *A. Piceae*, the whole insect is naked, and the antennae, thighs, and tibiae are ferruginous or reddish at their base."

The circumstance of *Aphis borealis* having been found on floating floes of ice in the Polar Sea, at one hundred miles distance from the nearest known land, and as far north as 82¾°, renders it in a more than ordinary degree interesting.

Its very near resemblance to *Aphis piceae*, which feeds on the silver fir (*Pinus picea* Linn.), whence it derives its name, would induce the belief that the floating trees of fir, that are to be found so abundantly on the shores and to the northward of Spitzbergen, might possibly be the means by which this insect has been transported to the northern regions. It was never seen on the wing, and the few specimens that were obtained were in a very languid state, but revived by the heat of the hand. The last paragraph of observations was written by Parry.

Aphis borealis Curtis 1828 is most likely a synonym of the species *Schizolachnus pineti* (Fab.) which is the same species described by DeGeer as *Aphis* (*tomentosa*) *pini* and often incorrectly credited to him.

It is of interest to report that Elton (1925) records the finding of *Dilachus piceae* Panzer (now placed in the genus Cinara) in great numbers on the snow on Spitzbergen where the nearest land source is the Kola Peninsula of Russia some eight hundred miles away. Elton reports finding one aphid every thirty or forty yards and eighty percent of these were alive, on an eight mile trip.

References Cited

Elton, C.S. 1925. The Dispersal of Insects to Spitzbergen. Trans. Ent. Soc. London. pp. 289-299.

Parry, William Edward, Captain R. N., F. R. S. 1828. Narrative of an Attempt to Reach the North Pole, in boats fitted for the purpose, and attached to His Majesty's Ship Hecla, in the Year MDCCCXXVII. John Murray, Publisher to the Admiralty, and Board of Longitude. appendix p. 201.

CARTODERE FILUM IN CALIFORNIA

(Coleoptera: Lathridiidae)

Examples of this tiny elongate beetle were reared from a small log of California laurel (*Umbellularia californica* Nutt.), collected in the woods in Mill Valley, Marin Co., California. *C. filum* Aubé feeds on the spores of fungi, and is more commonly associated with human dwellings. Dr. E. C. Van Dyke has taken it from herbarium specimens in Berkeley, Calif.—H. B. Leech.

NEW DISTRIBUTION RECORDS FOR SOME NEARCTIC TABANIDAE

(Diptera)

BY WOODROW W. MIDDLEKAUFF[1] AND LARRY W. QUATE[2]

University of California, Berkeley

During the recent growth and reorganization of the family Tabanidae in the California Insect Survey collection at the University of California, a number of new records have come to light. The authors gratefully acknowledge the courteous assistance rendered by Dr. Cornelius B. Philip for identifying and confirming many of the following specimens. The new records are as follows:

Stonemyia pigra (O. S.). 1♀ Atlanta, Ga., 1 July, 1943. (W. Middlekauff).

Chrysops callida O.S. 1♀ Pryor Springs, Decatur, Ala., 9 June, 1941. (J. N. Belkin).

Chrysops celeris O.S. 1♀ Londonville, Ohio, 6 June, 1915.

Chrysops cuclux Whitney. 1♀ Plainfield, Vt., 23 June, 1941. (R. H. McCauley, Jr.).

Chrysops flavida flavida Wied. 3♀♀ Ship Island, Miss., 15 August, 1943.

Chrysops flavida reicherti Fairchild. 1♀ Pryor Springs, Decatur, Ala., 13 July, 1941. (J. N. Belkin).

Chrysops nigra Macquart. 1♀ Plainfield, Vt., 17 June, 1941. (R. H. McCauley, Jr.).

Hybomitra tetrica rubrilata (Philip). 1♀ White Mts., Ariz., 5 July, 1935.

Tabanus acutus (Bigot). 1♀ Biloxi, Miss., 3 September, 1943.

Tabanus endymion O.S. 1♀ Biloxi, Miss., 18 September, 1943.

Tabanus fulvulus pallidescens Philip. 1♀ Eagletown, Okla., 12 June, 1939. (Kaiser - Nailon).

Tabanus fuscicostatus Hine. 1♀ Broken Bow, Okla., 19 June, 1934. (J. Stankavich).

Tabanus gladiator Stone. 1♀ Biloxi, Miss., 3 September, 1943.

Tabanus molestus Say. 1♀ Camp Croft, S. C., 21 June, 1942. (W. W. Middlekauff).

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[1]Assistant Professor of Entomology and Assistant Entomologist in the Experiment Station, Division of Entomology and Parasitology.

[2]Research Assistant, Division of Entomology and Parasitology.

Eagletown, Okla., 12 June, 1939. (Kaiser - Nailon).

Tabanus nigrescens nigrescens Palisot de Beauvois. 1 ♀ Pike Co., Mo., 2 July, 1945. (G. M. Dodge).

Tabanus vittiger schwardti Philip. 1 ♀. Urbana, Ill., 16 June, 1938. (G. T. Riegel).

Tabanus vittiger schwardti Philip. 1 ♀, 1 ♂. Urbana, Ill., 16 June, 1938.
9 September, 1938. (G. T. Riegel).

Book Notice

Insects Affecting Forest Products and Other Materials. By W. J. Chamberlin. Oregon State College Co-operative Assoc. Corvallis, Ore. 159 pp., 100 text figs. 1949. $2.75.

This Photo Offset publication is intended as an introductory work for students, woodsmen and others who wish to learn something about the more important insects and related organisms which attack the forests and forest products. The various groups are defined and selected examples discussed and well illustrated along with examples of their methods of work and types of injury. Emphasis is placed upon the economic phase of the subject and the various methods of control are dealt with. A fairly extensive bibliography of the more important works dealing with forest insects is given as well as a most useful index.

The work should serve as a useful guide and reference book for those who are interested in the forests, their protection, and the preservations of all such products as are derived from them.

—Edwin C. Van Dyke.

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Vol. XXVI, No. 3 July, 1950

STUDIES ON THE COLEOPTERA OF THE PACIFIC NORTHWEST

II: Carabidae: Bembidiini

MELVILLE H. HATCH

University of Washington, Seattle

The specimens on which this paper is based are in the collection of the author at the University of Washington.

Bembidion (Metallina)[1] keechelus Hatch, sp. n.

Shining black, without aeneous lustre, the first four segments of the antennae below and the legs piceous; head with frontal striae sinuate, divergent behind the anterior supraorbital seta, the eyes large; pronotum about three-fifths as long as wide, widest just in front of middle, the base equal in width to the apex, the side margin strongly arcuate in front, sinuate in front of the nearly rectangular carinate hind angles, the basal impressions deep and bistriate and connected by a feebly impressed feebly rugose transverse impression; elytra with first and eighth striae entire and impressed, the second through the sixth striae feebly impressed, obsolete towards apex, the first through the seventh striae and the scutellar stria coarsely punctate, the eighth distinct from the margin, the third interval with two dorsal punctures distant from the third stria, the marginal line obtusely angulate at the humerus and inwardly prolonged to the base of the fourth stria; mentum with a large entire tooth; length 3.75 mm.

Type: L. KEECHELUS, WASHINGTON, May 3, 1935, Hatch and Wilson. Distinguished from *aleneanum* Csy., *perturbatum* Csy., and *atrolucens* Csy. by its lack of aeneous lustre, and from *dyschirinum* LeC. (*agitabile* Csy.) by the coarser punctures of the elytral striae that become obsolete behind the middle rather than at the middle as in that species.

Bembidion (Trechonepha) rainieri Hatch, sp. n.

Shining black, the trochanters feebly picescent; head, pronotum, and elytra above strongly aeneous and strongly alutaceous, the elytra especially coarsely deeply and opaquely alutaceous; pronotum transversely quadrate, about two-thirds as long as wide, the

[1]For the status of the subg. *Metallina* Mots. in America see Hatch, Jour. N. Y. Ent. Soc. LVII, 1949, pp. 145-146.

apex about six-sevenths as wide as the base, the sides broadly arcuate in front, sinuate and subparallel before the slightly obtuse and carinate hind angles, the median line present at middle and deeply impressed, the apical and basal transverse impressions feeble, the basal impressions large and feebly bistriate and more coarsely alutaceous than the rest of the pronotum; elytra with a scutellar and eight discal striae, the eighth stria deeply impressed, the others feebly impressed except the first, second, and fifth which are well impressed at extreme apex, the striae not or very vaguely punctate, the third stria with two dorsal punctures in large impressed foveae; length 5-5.75 mm.

Type and five paratypes: MT. RAINIER, WASHINGTON, Sunrise Park, Sept. 6, 1934, M. H. Hatch. Six paratypes: Sunrise Park, (Aug. 27, 1931), Paradise Park (Aug. 20, 1934; Sept. 27, 1934; July 18, 1937; July 28, 1946), both on Mt. Rainier. The types and paratypes were taken between five and six thousand feet. Differs from previously described North American species of the subgenera *Trechonepha* and *Plataphus* (*Micromelomalus* Csy.) by its coarsely deeply opaquely alutaceous elytra.

Bembidion (Trechonepha) stillaguamish Hatch, sp. n.

Shining black, above finely alutaceous, the basal antennal segment and legs rufous, the elytra rufo-flavous with the lateral margins and epipleurae piceous or rufous, the antennae and abdomen black to rufous; pronotum about three-fourths as long as wide, apex about nine-tenths as wide as base, the carinate hind angles rectangular, the side margins in front of the hind angles subparallel and then sinuate, the median line impressed at middle, obsolete at either end, the anterior and posterior transverse impressions feeble, the large basal impressions vaguely bistriate; elytral striae with eighth strongly impressed, the others feebly but distinctly impressed except the first, second, and fifth, which are strongly impressed at extreme apex, the striae not or very vaguely punctate, the third stria with two dorsal punctures in large impressed foveae, the marginal line arcuate at humerus and extending inward to the fifth elytral stria only; length 3.7-4.6 mm.

Type and eight paratypes: KING CO., WASHINGTON, Snoqualmie R., Snoqualmie Falls, May 13, 1928, M. H. Hatch. 48 additional paratypes from the following western Washington localities: Chehalis, Duvall, Green R., North Bend (Maloney's Grove), Snoqualmie Falls, Soda Springs (Snohomish Co.), Stillaquamish R., Van Horn, White R. (Mt. Rainier). Two paratypes from Silver Cr. Falls and White R. (Mt. Hood), Ore.

Distinguished from other members of the subgenus by its pale color, narrow elytra, and less extensive basal elytral marginal line.

BEMBIDION (PLATAPHUS[2]) PLANIUSCULUM MANN.

I denominate specimens with pale elytra, legs, and basal antennal segment *Bembidion planiusculum* Mann., ab. *pallidum* nov. Type and five paratypes: PIERCE CO., WASHINGTON, White River, White River Camp, Aug. 27, 1927, M. H. Hatch. 52 paratypes: American R., Ellensburg, Longmire, Mt. Baker, Parkway, Snoqualmie Falls, Sullivan L., Sultan, Swauk C., Wenatchee, White R. Camp, Yakima R. (near Ellensburg), in Washington; Morrissey, B. C.; Cornucopia and Multnomah Falls, Ore. There is some evidence of intergradation with the typical form, but typical examples of the aberration give every evidence of being fully matured rather than teneral individuals. They are distinguished from the pale *B.* (*Trechonepha*) *stillaguamish* described above by the feebly or unimpressed dorsal punctures.

Bembidion (Plataphus) farrarae Hatch, sp. n.

Shining black, the elytra very faintly iridescent, above very finely alutaceous, the extreme bases of the legs picescent; pronotum about two-thirds or slightly more as long as wide, the apex about nine-tenths as wide as base, the side margins in front of the carinate subrectangular hind angles very briefly subparallel and then sinuate, the median line impressed, obsolete at either end, the apical and basal transverse impressions well marked to feeble, the basal impressions bistriate; elytra with striae well impressed, the sixth and seventh more feebly so, the striae vaguely but more or less evidently punctate, the third stria with the two dorsal punctures not or very feebly impressed, the marginal line arcuate at apex and extending to the base of the fourth stria; length 3.2-4.7 mm.

Type and 11 paratypes: MT. RAINIER, WASHINGTON, Sluskin Falls, July 29, 1932. 36 paratypes from the following localities on Mt. Rainier; Longmire, N. Puyallup R., Paradise Park, Ricksecker Point, below Sluskin Falls, Tipsoo L. Named for Mrs. Elizabeth Farrar Kinney who pointed out to me many years ago

[2]Examination of an example of the Palaearctic *B. prasinum* Duft., the type of the subgenus *Plataphus* Mots., convinces me that Casey's *Micromelomalus* is synonymous with *Plataphus*. I have not recognized any of the species (*blanditum* Csy., etc.) that Casey assigned questionably to *Plataphus*, but suspect they belong in his *Trechonepha*.

that our series of "*planiusculum*" was composite. Distinguished from *planiusculum* Mann. by the humeral line attaining the base of the fourth rather than the fifth elytral stria and from *parvulum* Notman by its subrectangular posterior pronotal angles.

Bembidion (Trachelonepha) kincaidi Hatch, sp. n.

Shining black, above finely alutaceous, the legs and elytra and sometimes the occiput and abdomen piceous; head with tempora well developed but not particularly elongate; antennae elongate, about nine-tenths as long as the elytra; pronotum about four-fifths as long as wide, the base not quite as wide as the apex and broadly arcuate, the basal margin within the sharply obtuse hind angles evidently oblique, the side margins in front of the hind angles subparallel and then sinuate, the median line impressed at middle and obsolete at either end, the anterior transverse impression well developed, the basal transverse impression absent, the hind angles obscurely carinate, the basal impressions obscurely bistriate; elytra together about four-sevenths as wide as long, the striae impressed, vaguely punctate, the third stria with two unimpressed dorsal punctures; male with first two tarsal segments dilated and spongey pubescent beneath; length 5.4-5.8 mm.

Type and five paratypes: Mt. Baker, Washington, IX-5-1912, T. Kincaid. Two paratypes: Seattle, Wash., July 30, 1929 and S. F. Skykomish R., Wash., July 4, 1928. Distinguished from *falsum* Blais. and *electum* Csy. by its piceous elytra and from *extensum* Csy. by its shorter elytra (twice as long as wide in *extensum*). Named for my good friend and former chief, Prof. Trevor Kincaid, who has had so many animals named after him that I am sure he will not object to one more!

Bembidion subj. Pseudoperyphus Hatch nov.

Type of genus: *Bembidion chalceum* Dej. Established for those species of Casey's subgenus *Peryphus* Steph. in which the seventh elytral stria is better developed, being subequal in its development to the sixth stria and either deeply sulcate and moderately punctate as in *chalceum* Dej. and *reticolle* LeC. or coarsely punctate and feebly impressed as in *nigrum* Say, *concolor* Kby., *quadrulum* LeC., and *longulum* LeC. In general the group appears to include the species in the second part of Hayward's *honestum*-group (the humeri not being truly angulate) and in his *concolor*-group, and appears to include the species between 512 and 531 inclusive and between 589 and 593 inclusive in the Leng catalogue. As a

result, *Peryphus* is restricted to species with the seventh elytral stria reduced to an unimpressed sometimes subobsolete series of minute punctures.

Bembidion (Peryphus) immaculosum Hatch, sp. n.

Shining black, the elytra sometimes with faint piceous tinge, the legs picescent towards extreme base; pronotum about three-fifths as long as wide, the apex nearly nine-tenths as wide as the base, the carinate hind angles subobtuse or nearly rectangular, the side margins in front of the hind angles broadly sinuate curving out almost immediately, the anterior and posterior transverse impressions distinct, the latter coarsely vaguely punctate, the median line distinct behind the anterior transverse impression, the basal impressions large, bistriate, tuberculate; elytra with the striae moderately finely punctate for the basal two-thirds and finely impressed, the seventh stria an unimpressed series of punctures, the eighth stria deeply impressed and impunctate; length 4.2-5.8 mm.

Type and four paratypes: SPOKANE, WASHINGTON, July 15, 1927, M. C. Lane coll. 19 paratypes: Ewan, Hooper, Kahlotus, Newman L., Pullman, Ritzville, and Upper Grand Coulee in eastern Washington and Condon and Tygh Valley, Oregon. Related most closely to *nevadense* Ulke, from which it is distinguished by its immaculate elytra and of which it may be a color variety. Hayward (Trans. Am. Ent. Soc. XXIV, 1897, p. 76) says of *nevadense*: "Prothorax . . . as wide at base as apex," whereas I find the base about one-tenth wider than apex. This is mentioned to call attention to a systematic error in Hayward's monograph of over-estimating the width of the apex of the pronotum relative to the base, as revealed by a precise micrometer measurement from the crest of one anterior angle to the crest of the other.

Bembidion (Peryphus) wenatchee Hatch, sp. n.

Shining black, legs and antennae rufous, segments four to eleven of antennae with the apical portions more or less fuscous, elytra finely alutaceous and rufous, the scutellar region, a mediolateral area, and the apex darker, separate subapical and humeral spots flavate, abdomen sometimes rufous; pronotum nearly seven-tenths as long as wide, the apex about nine-tenths as wide as base, the side margins before the carinate subrectangular hind angles subparallel and then sinuate, the transverse apical impression feeble, the transverse basal impression moderate and feebly rugose, the impressed median line present between the transverse apical and transverse basal impressions, the basal impressions bi-

striate; elytral striae impressed, obsoletely so towards apex, moderately punctate towards base, more finely to obsoletely so behind middle; length 5.8-6.3 mm.

Type: WENATCHEE, WASHINGTON, August 22, 1932, M. H. Hatch. Three paratypes: Moses Coulee, Wash.; Vantage, Wash.; Gold Hill, Ore. Distinguished from northwestern specimens of *rupicola* Kby. (*lucidum* LeC., *substrictum* LeC.) by its larger size (length 4.6-5.2 mm. in *rupicola*) and black rather than rufous body color. *Ustulatum* L. is distinguished by its darker elytral ground color, its smaller size (length 5.4-6.0 mm.) and the subequal width of the pronotal apex and base.

Bembidion (Peryphus) fenderi Hatch, sp. n.

Dark rufopiceous to rufous, shining, the elytra finely alutaceous, the legs, antennae, and mouthparts rufous, the elytra with the subapical and humeral spots virtually confluent resulting in a flavate elytra with only a common scutellar triangle and the apices darker, the suture variably dusky; pronotum about five-sevenths as long as broad, the apex about ninety-five percent as wide as the base, the side margins in front of the carinate hind angles subparallel and then sinuate, the apical and basal transverse impressions evident, the basal impressions bistriate; elytral striae finely impressed, finely distinctly punctate especially before the middle; length 5.8-7.0 mm.

Type and eight paratypes: SEAVIEW, WASHINGTON, July 25, 1930. 22 paratypes: Fort Canby, Long Beach (Pacific Co.), Moclips, Ocean Park, Oysterville, Sea View, Snag Is. (Pacific Co.), all in Washington. 19 paratypes: Cannon Beach, Gold Beach, Sea Side, Tillamook, Woods, all in Oregon. Apparently confined to the sea beach. Named in honor of my friend and collaborator, Mr. Kenneth M. Fender of McMinnville, Ore. This species is distinguished from other northwestern species of the same subgenus by the virtually confluent subapical and humeral elytral spots. Its averagely larger size and finely impressed elytral striae are likewise highly diagnostic. I place it next to *rupicola* LeC. and *wenatchee* Hatch (see above) in the classification.

Bembidion (Notaphus) aberti Hatch, sp. n.

Dark rufous, shining, the head evidently alutaceous, the pronotum and elytra nearly smooth, the antennae, legs, and most of

the elytra somewhat paler, the latter with obscurely darker areas about the scutellum, towards the median lateral margins, and towards the apex; pronotum nearly three-fourths as wide as the elytra together, about seven-eighths as long as wide, the apex not quite as wide as the base, the side margins in front of the somewhat variably minutely rectangular carinate hind angles briefly and feebly sinuate, the median line fine, the transverse apical impression feeble, the transverse basal impression rugose, the basal impressions bistriate; elytra with striae distinctly impressed and entire, distinctly punctate basally becoming obsoletely punctate to impunctate behind the middle, the third interval with two dorsal punctures; length 3.8-4.4 mm.

Type and eight paratypes: L. ABERT, OREGON, June 16, 1938, M. H. Hatch. Distinguished from *obtusangulatum* LeC. by its general rufous color. It most closely resembles *scudderi* LeC., from which it is distinguished by the third elytral interval possessing two rather than three dorsal punctures, its smaller size, more rufous body, and less distinctly alutaceous elytra.

Bembidion (s. str.) alutaceum Hatch, sp. n.

Black, shining, the legs except the apices of the femora piceous; head and pronotum very finely alutaceous; pronotum cordate, nearly four-fifths as long as wide, the base about nine-tenths as wide as the apex, the side margins narrowly reflexed, the sides in front of the minutely prominent carinate hind angles briefly subparallel and then sinuate, the hind margin just within the hind angles emarginate, the anterior transverse impression vague, the median line entire in front of the basal transverse impression which is deep and rugose with foveiform impressions between the rugae; elytra evidently alutaceous with a nebulous small subhumeral testaceous spot, the striae coarsely punctate and evidently impressed to apical fourth or fifth behind which both striae and punctures become obsolete; length 3 mm.

Type: BLUE MTS., OREGON, MOTTET MEADOW, Sept. 19, 1937, M. H. Hatch. Runs to *mutatum* G. and H. and *vegetum* Csy. in Casey's key (Mem. Coll. VIII, 1918, p. 151), from which it is distinguished by its more evidently alutaceous elytra with smaller subhumeral spot and more coarsely punctate more evidently impressed striae.

The two following new species of *Bembidion* subgenus *Diplocampa* Bedel belong to the *digressum*-group of Casey (Mem. Col. VIII, 1918, p. 155) characterized by alutaceous elytra. Hayward

(Trans. Am. Ent. Soc. XXIV, 1897, pp. 124-127) did not refer to this character in his treatment of the group, but I find the elytra nearly smooth in his *acutifrons* LeC., *cautum* LeC., and *assimile* Gyll. Casey found them smooth in *connivens* LeC. and *habile* Csy.

Bembidion (Diplocampa) elizabethae Hatch, sp. n.

Black, sometimes tinged with piceous, the basal antennal segment and the legs paler, the elytra usually with a brownish tinge, a lateral anteapical spot flavate, the apex and sometimes the suture and a vague humeral area variably and vaguely paler; elytra evidently microreticulate, the head and pronotum nearly smooth with only the faintest trace of microreticulation; pronotum about four-fifths as long as wide, the base subequal to the apex in width, the sides narrowly reflexed, usually briefly subparallel in front of the rectangular carinate hind angles, the basal impressions deep and bistriate, the anterior transverse impressions vague, the median line distinct, abbreviated towards apical and basal margins, the basal transverse impression deep, coarsely punctate; elytral striae impressed, coarsely punctate, the intermediate striae and the punctures more or less obsolete at apical third or fourth; length 2.8-3.2 mm.

Type and 7 paratypes: KING Co., WASHINGTON, LICTEN SPRINGS, May 27, 1932, E. Farrar. 63 paratypes: Bay Center, Bothell, Cedar Mt., Chase L. (Snohomish Co.), Chehalis, Duvall, Evans Creek (King Co.), Enumclaw, Fall City, Fidalgo Is., Friday Harbor, Lewis and Clark State Park, Loveland, Martha L. (near Edmonds), Mt. Rainier (Paradise Park), Nasel R., Olympia, Plantation Pond (Seattle), Seattle, Silver L. (Snohomish Co.), Snoqualmie Falls, Sterling, and Vashon, all in western Washington. 3 paratypes: Dayton and McMinnville (K. M. and D. M. Fender, coll.), in western Oregon. I take pleasure in naming this species likewise for Mrs. Elizabeth Farrar Kinney.

From previously described species of the *digressum*-group *elizabethae* is distinguished by its smaller size, from *digressum* Csy. by its black ventral surface, and from *digressum* and *concretum* Csy. by its less transverse pronotum. From *anguliferum* LeC. it is further distinguished by its nearly smooth head and pronotum, its subequal pronotal base and apex, and by its distribution, being confined as far as at present known to the region west of the Cascade Mountains.

Bembidion (Diplocampa) microreticulatum Hatch, sp. n.

Black, the elytra frequently piceous or rufo-piceous with the apex sometimes vaguely paler, the basal antennal segment and legs piceous or rufo-piceous; elytra microreticulate, more finely so in male, the head and pronotum nearly smooth; pronotum about three-fourths as long as wide, the base and apex about equal in width, the sides of the pronotum narrowly reflexed, the side margins in front of the slightly obtuse carinate hind angles slightly to scarcely divergent and broadly sinuate, the basal impressions deep and bistriate, the anterior transverse impression vague, the median line fine, abbreviated towards the anterior and posterior margins, the basal transverse impression deep and punctate; elytral striae impressed, more feebly so towards side, moderately punctate, the intermediate striae and the punctures obsolete at apical fourth; length 3.3-3.8 mm.

Type ♂ and 2 paratypes (♂ and ♀): STICKNEY L., WASHINGTON, May 8, 1931, M. H. Hatch. 12 paratypes: Bothel, Dry Falls (Grand Coulee), Evans Cr. (King Co.), Martha L. (near Edmonds), Mt. Adams, Satus Creek, Seattle, Stickney L., Tieton Dam. Distinguished from other members of the *digressum*-group by its immaculate elytra. From *anguliferum* LeC. and *elizabethae* Hatch it is further distinguished by its somewhat more elongate form. From *acutifrons* LeC., which is likewise immaculate, it is distinguished by its microreticulate elytra and its more finely punctate elytral striae.

TACHYS (TACHYURA) PARVULUS DEJ.

This species is a native of south middle and southern Europe including southern England (Jeannel, Faune de France 39, 1941, p. 437), and has not before been recorded from North America. I have five specimens collected in western Washington: two from the University of Washington campus, Seattle, April 9, 1940; two from Cedar Mt., southeast of Seattle, May 22, 1941, and one, same locality, May 15, 1945. It is distinguished from other European and American species of the subgenus (Group IV of Hayward) by its entire impressed marginal elytral stria, and may be described briefly as follows:

Dark rufous, shining, the basal antennal segments and legs paler, the elytral apex evanescently paler; pronotum about seven-tenths as long as wide, the apex nearly as wide as base, the sides oblique in front of the briefly carinate hind angles, the anterior transverse impression vague, the basal transverse impression deep,

punctate, with three enlarged punctures at middle, the basal impressions obsolete; elytra with an entire impressed sutural and a marginal stria, the latter with one or two seta-bearing punctures anteriorly and about four such punctures posteriorly, the disc with four or five finely impressed striae abbreviated at about apical third, the striae not or obscurely punctate, the third stria with two dorsal punctures; length 2 mm.

SOME COLLECTIONS RECENTLY ACQUIRED BY THE CALIFORNIA ACADEMY OF SCIENCES

THE DUDLEY MOULTON COLLECTION OF THYSANOPTERA (Purchase). During the past year the Academy was fortunate enough to secure this important collection together will all of Moulton's literature and papers pertaining to the thrips. This collection is world-wide in scope, rich in Moulton types, and in those of other leading thysanopterists. It comprises some 25,000 slides.

THE HEWES COLLECTION OF LEPIDOPTERA (Bequest). Comprising 6572 neatly mounted and completely labelled specimens, this collection results from a nearly successful lifetime effort to acquire every kind of butterfly listed for America north of Mexico. Included in this number is a smaller collection of moths and one of foreign butterflies. The late Dr. Laurence I. Hewes was by profession one of the foremost U. S. highway engineers. His zeal as an amateur lepidopterist was well expressed in his article "Butterflies—Try and Get Them" (National Geographic Mag. 69:667-678, 1936).

THE MAEHLER COLLECTION OF COLEOPTERA (Gift). This is a general collection of North American beetles especially rich in Meloidae because of Mr. K. L. Maehler's special interest in the family. The collection totals 6159 specimens.

THE HUBBARD INDEX COLLECTION OF THE FLEAS OF NEVADA (Gift). Dr. C. Andresen Hubbard of Tigard, Oregon, has distributed among several institutions a number of index collection of the fleas of Nevada, to be used in reference to his publication on this subject (Bull. S. Cal. Acad. Sci., 48:115-128, 1949). The collection received by the Academy is made up of 46 slides representing as many species.—E. S. Ross.

THE OCCURRENCE OF AEDES (OCHLEROTATUS) PULLATUS (COQUILLETT), IN CALIFORNIA[1]

(Diptera: Culicidae)

BY PHYLLIS T. JOHNSON AND
ERNESTINE B. THURMAN

Entomologists, Bureau of Vector Control, California State Department of Public Health, Berkeley, California

The collection of *Aedes* (*Ochlerotatus*) *pullatus* (Coquillett), 1904 in Tuolumne Meadows, Yosemite National Park, Tuolumne County, on June 27, 1949, brings the total number of recognized species and subspecies of the mosquito fauna in California to 39[2] (Reeves, 1941; Bohart, 1948). *A. pullatus*, a dark-legged snow mosquito has a wide distribution, having been reported from the Alps of Europe (Dyar, 1922), Alaska, and the Yukon south along the Rocky Mountains to Colorado (Matheson, 1929; 1944), and in Montana (Mail, 1934), Utah (Rees, 1934; 1942), Idaho (Harmston and Rees, 1946), Oregon (Gjullin, personal communication), and Washington (Boddy, 1948).

Fourth instar larvae and pupae of *A. pullatus* were collected with third instar larvae of *Culiseta incidens* (Thomson) and *Culiseta* sp. from two small sunlit depressions which were void of vegetation in temporary water courses formed by melting snow. At this elevation, 8600 feet, the snow had melted by the 19th of June, and at the time of the collection only the depressions contained water. From 66 larvae collected, 6 males and 24 females were reared in correlated series and an additional 32 males and 22 females were reared from pupae. Females of *A. pullatus* were taken in biting collections in association with *Aedes ventrovittus* Dyar, *A. hexodontus* Dyar, *A. fitchii* (Felt and Young), *A. communis* (DeGeer), and *Culiseta incidens* from the Tuolumne Meadows Public Campground area.

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[1]From Bureau of Vector Control, California State Department of Public Health, and the Communicable Disease Center, Public Health Service, Federal Security Agency, Atlanta, Ga.

[2]Excludes *Anopheles pseudopunctipennis franciscanus* var. *boydi* (Vargas) (Reeves, 1941) and *Anopheles punctipennis* var. *perplexens* Ludlow collected at Hamilton Field, Marin County, July 28, 1944 (H. H. Dodge), determined by Dr. George H. Bradley, reference letter of November 25, 1944, unpublished record on file in the Bureau of Vector Control.

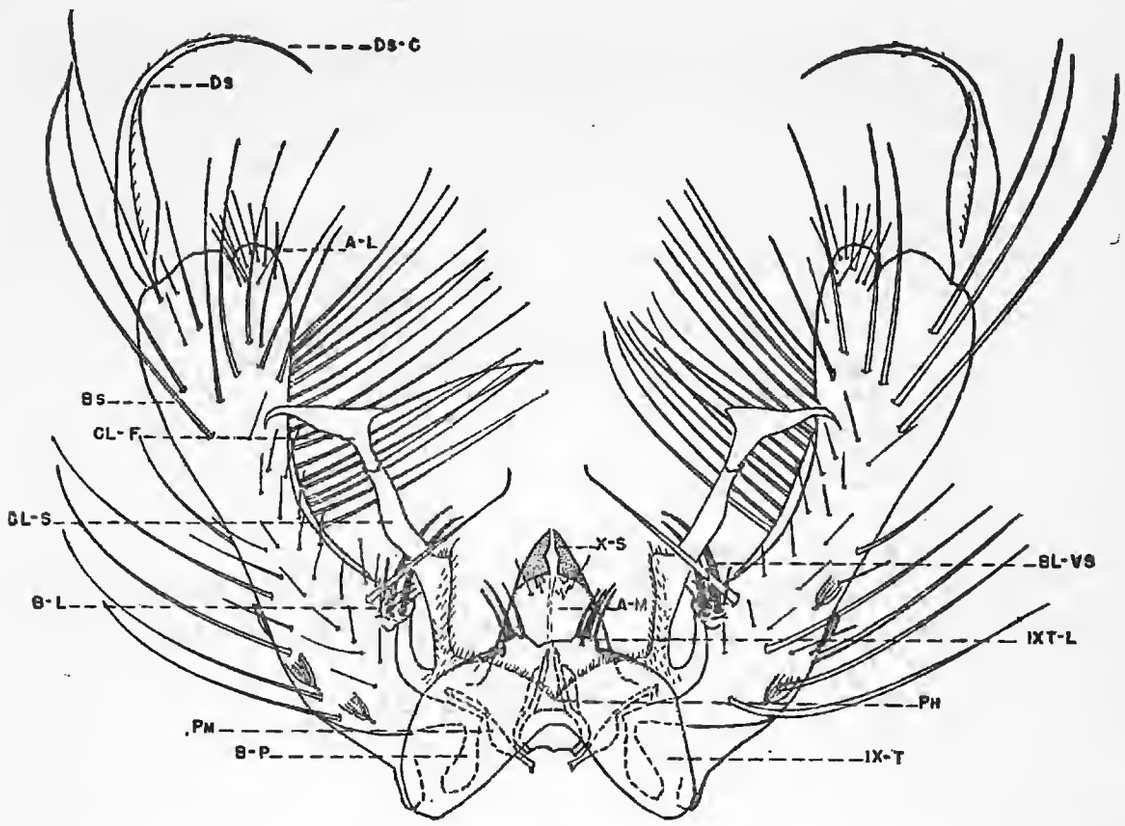

Figure 1. Diagram of the structures of the male terminalia of *Aedes pullatus* (Coquillett), 1904

Legend:*

A-L	apical lobe
A-M	anal membrane
B-L	basal lobe
BL-VS	ventral spines of basal lobe
B-P	basal plate
Bs	basistyle
CL-F	filament of claspette
CL-S	stem of claspette
Ds	dististyle
Ds-C	claw of dististyle
Ix-T	ninth tergite
IXT-L	lobe of ninth tergite
Ph	phallosome
Pm	paramere
X-S	tenth sternite

*Terminology follows that employed by Carpenter, Middlekauff and Chamberlain (1946, p. 34).

Specimens of *A. pullatus* have been deposited in the collection of the Academy of Sciences, San Francisco, California; the U. S. National Museum; and the Communicable Disease Center, Public Health Service, Atlanta, Georgia.

The structures of the male terminalia are refigured for the purpose of more accurately illustrating the position of the curved spines on the ventral surface of the basal lobe of the basistyle. Dyar (1928, Plate XXXVIII, No. 125) and Matheson (1944, Plate XVII, No. 6) figure the spines as arising in the same dorsal plane with the lobes of the ninth tergite. Dyar (1928, p. 171) is of the opinion that the basal lobe is obsolete, "but a large, strong spine remains, inwardly of which are two short curved spines connected by chitin." Matheson (1944, p. 178) describes the basal lobe as "small, with a prominent spine and 2 or 3 adjacent small ones and a few setae; the inner margin of the basal lobe turns ventrad, then outward and caudad, to end in a short, chitinous, stout stem which bears 2 apical, large, curving spines."

In a mounted specimen flattened by the weight of the cover glass and insufficient mounting medium, the folded basal lobe appears to be as previously figured. In a wet mount with the structures in normal position, the basal lobe appears to be small, rounded, with a single prominent spine and 3 or 4 smaller ones on the dorsal surface, a few setae scattered over the area curving ventrad. From the ventral apex arise two spines, somewhat shorter than the dorsal spine, curving dorsally from beneath the stem of the claspette. There does not appear to be a "short, chitinous, stout stem" from the ventral surface of the basal lobe.

An additional correction may be mentioned in the number of spines found on the lobes of the ninth tergite. Matheson (1944, p. 178) lists "7-9 stout spines" and figures only 3 (Plate XVII, No. 6). Dyar mentions and figures 5-6 spines in his description. Specimens involved in the current study have demonstrated from 3 to 6 spines on the lobes of the ninth tergite.

ACKNOWLEDGMENTS

The authors are pleased to extend special acknowledgments to Mr. C. W. Gjullin and Mr. W. W. Yates, U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine, Corvallis, Oregon, for the privilege of comparing the specimens with those in the collection in Corvallis and for confirming the identification of all *Aedes* species listed herein; to Dr. Martin W. Johnson, Scripps Institution of Oceanography, University of California, and Miss Mary Lou Beaty, University of California, for assisting in the collection of the specimens; and to D. C. Thurman, Jr., S. A. San, PHS, and to Harry D. Pratt, Scientist, PHS, for offering valuable suggestions in all phases of the study and reviewing the manuscript.

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PERSONAL NOTE: JAMES W. CHAPMAN

Dr. James W. Chapman, Chairman of Science Faculty, Emeritus, Silliman University, Dumaguete, Oriental Negros, Philippine Islands, and well known specialist on Philippine ants, has recently retired to the U. S. He is currently studying at the California Academy of Sciences. In September Dr. Chapman will move to Pasadena for the winter and plans then to take up residence near the Museum of Comparative Zoölogy at Harvard.

After 35 years of Philippine field work and teaching he expects to prepare for publication his comprehensive studies on the taxonomy and ecology of Philippine ants. Dr. Chapman was a member of Dr. William Morton Wheeler's first entomology class at Harvard and later supplied Wheeler with much of his study material from the Philippines.—E. S. Ross.

OBSERVATIONS ON SNOW MOSQUITOES IN CALIFORNIA

(Diptera: Culicidae)

BY RICHARD M. BOHART

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In the course of a general study of Californian mosquitoes a number of collections were made during the spring months of 1947, 1948 and 1949 in the central and northern Sierra. These included many of the so-called "snow *Aedes*", the larvae of which breed in pools resulting more or less directly from melting snow. These species are characteristic of the colder parts of North America including northern United States, and some of them extend their range south at progressively higher altitudes along the mountain ranges.

The snow *Aedes* are mainly in the subgenus *Ochlerotatus* which contains some of the most difficult species of mosquitoes taxonomically speaking. The females are separated largely on the scutal pattern and as this is subject to some variation, no existing key is entirely satisfactory. Differences in the male genitalia are mostly slight, particularly between closely related species. The larvae offer some of the best characters, but these are unfortunately plastic and few published descriptions have given the range of variation. Keys are frequently based on the exact branching of the head hairs or the number and shape of the comb scales which may result in exclusion of 10 to 25 per cent or more of a variable population. Some of these variations are discussed below.

Eight species have been known to occur in California and a ninth is herein added to the list. Also, personal locality and date records are given for the benefit of collectors in the future.

AEDES INCREPITUS Dyar

This species is the most widespread snow mosquito in California. It occurs in various parts of the state from 7,500 feet elevation to practically sea level. At lower elevations its outbreaks are worst following extremely cold winters. The larvae are found

in shade or sun, in meadows or roadside ditches, in pine-needle pools or water in dense willow thickets, in hoofprints or in large ponds. The adults are the chief open sun, day-biting mosquito of the Sierra at elevations of 6,000 to 7,000 feet.

The larvae are similar to those of *communis* except that the upper head hairs (C) are usually double or triple and the lower head hairs (B) are single or double. However, this distinction does not always hold. In 50 specimens selected at random from a collection made from a large willow-shaded pool near Alturas, Modoc Co., 52 of the upper head hair are single, 46 are double, and 2 are triple, giving an average of 1.5 branches. Furthermore, 17 of the 50 specimens have all 4 of the head hairs single. This same tendency toward singleness is present in a collection from a large willow-shaded pool near Susanville, Lassen Co. Here, a check on 21 specimens reveals 10 upper head hairs single, 29 double and 3 triple, giving an average of 1.8 branches. These figures can be compared with a coast range collection made in Sonoma Co. where 14 specimens have 27 upper head hairs double and 1 triple for an average of 2.0 branches. A further comparison can be made with Sierran material in which 18 larvae from several central Sierran localities have 13 upper head hairs double, 21 triple and 2 quadruple for an average of 2.7 branches. Furthermore, of the lower head hairs, which are almost invariably single from other localities, 6 out of 36 in the central Sierran material are double. The Susanville and Alturas specimens are distinguished by having most of the comb scales very broad, whereas only a few of the scales are of this type in the material from the other localities mentioned. The broadened comb scales and frequently single head hairs increase the chance of misidentifying single larvae as *communis*. However, the comb scales of *increpitus*, even when stout, are pointed instead of rounded at the tip as in *communis*.

Personal records of larval collections are as follows: Chimney Rocks near Alturas, Modoc Co., May 24, 1949; Canyon Dam, Plumas Co., April 30, 1947; Susanville, Lassen Co., May 8, 1948; Calpine, Sierra Co., April 29, 1947; Little Truckee River near Lake Tahoe, Eldorado Co., June 1, 1947; Grass Lake (Luther Pass), Eldorado Co., May 21, 1948; Meyers Meadows, Eldorado Co., May 21, 1948; Emigrant Gap, Placer Co., April 29, 1947; 7 miles west of Sonora Pass, Tuolumne Co., April 4, 1949; Cordelia, Solano Co., April 6, 1949.

AEDES FITCHII (Felt and Young)

This is one of the two snow mosquitoes in the state with banded tarsi, the other being *increpitus*. Adults can be distinguished by the more uniform distribution of white scales on the wing of *fitchii*. The species is relatively uncommon but when found, the females bite readily in light shade. The larvae seem to prefer sunlit ponds of moderate size, particularly if they contain tules. Personal collecting records of larvae are from Sierraville, Sierra Co., April 29, 1947; Little Truckee River near Lake Tahoe, June 1, 1947; and near Baxter, Placer Co., April 29, 1947.

AEDES COMMUNIS (DeGeer)

This species is abundant and widespread at elevations of 5,000 to 6,000 feet in the northern Sierra and 6,000 to 8,500 feet at the latitude of Tuolumne Co. The larvae are almost always restricted to shaded pine needle pools. The adults bite in deep shade during the day but are particularly troublesome at dusk. There is frequent association with *hexodontus* and both species in the female have a short pale basal costal spot, all dark palpi, front surface of the mid femur unevenly and not contrastingly speckled, and no hypostigial spot. Females of *communis*, however, usually have the outer surface of the torus yellowish; mixed pale and dark upright vertex scales (in California specimens); the scutum with a median, often split, golden line; and the supra-alar bristles dark.

Personal larval records are: Canyon Dam, Plumas Co., April 30, 1947; Calpine, Sierra Co., April 29, 1947; near Baxter, Placer Co., April 29, 1947; Cisco Grove, Placer Co., April 29, 1947; Camp Sacramento, Eldorado Co., May 17, 1947; Carson Pass, Alpine Co., April 29, 1947; Blue Lakes, Alpine Co., July 12, 1948; 7 miles west of Sonora Pass, Tuolumne Co., June 10, 1948.

AEDES HEXODONTUS Dyar

Although larvae of this species do not occur in the tremendous swarms in which *communis* are found, it is more catholic in its requirements both as to altitude and type of breeding place. It is often found in shaded pine-needle pools with *communis* but also in the open sun in meadow pools and hoofprints. I have collected it from 5,000 to 9,500 feet and it probably occurs at still higher elevations. Adult females are often confused with *com-*

munis but the torus in *hexodontus* is dark, the upright vertex scales are yellow, the scutum has a broad median brownish-yellow band and the supra-alar bristles are yellow.

In the larvae the complete sclerotized ring of the anal segment is unique among the California species of snow *Aedes*. Other characters are as follows: In 41 specimens (34 individually reared) from 10 different localities, 1 has 9 comb scales, 3 have 8 scales, 7 have 7 scales, 50 have 6 scales and 21 have 5 scales, giving an average of 5.94 scales. The upper head hairs vary from single to triple, the average being 1.9 branches. The lower head hairs are single or double, the average being 1.8 branches. The variation in siphon tuft branches is 4 to 9 with an average of 6.1 branches.

According to Matheson (1944), "*hexodontus* should probably fall as a synonym of *A. punctor*." Knight (1948) theorizes that *hexodontus* represents a western subspecies of *punctor* and that specimens which he studied from Umiat, Alaska represent an extreme of *hexodontus*. This problem evidently needs more study. Matheson's *punctor* has the head hairs (C and B) usually double, the comb of 8 to 17 scales in a double row and the siphon tuft with 3 or 4 branches. Knight's *punctor* (or *hexodontus*) from Alaska has the head hairs usually single, the comb of 5 to 13 (usually 7 to 8) scales, and the siphon tuft with 3 to 6 branches. As contrasted with these, California *hexodontus* have the head hairs usually double, the comb of 5 to 9 (usually 5 or 6) scales and the siphon tuft usually with 5 to 7 branches. Differences in female scutal pattern are also present, though somewhat variable. If it seems desirable to separate the Alaskan material, it will fall under either *cyclocerculus* Dyar or *punctodes* Dyar. In the meantime it appears best to place the Californian material under *hexodontus* as a distinct species.

Personal larval records are: Greenville, Plumas Co., May 8, 1948; Yuba Pass, Sierra Co., April 30, 1947; Calpine, Sierra Co., April 29, 1947; Hampshire Rocks Camp, Nevada Co., April 29, 1947; Little Truckee River, Eldorado Co., June 1, 1947; Meyers Meadows near Lake Tahoe, Eldorado Co., May 21, 1948; Camp Sacramento, Eldorado Co., June 10, 1947 and June 10, 1948; Grass Lake near Luther Pass, Eldorado Co., May 21, 1948; Carson Pass, Alpine Co., June 10, 1947; Winnemucca Lake, Alpine Co., 9500 feet, July 14, 1948; Silver Lake, Amador Co.,

June 10, 1947; Ebbett's Pass, Alpine Co., July 13, 1948; Sonora Pass, Tuolumne Co., 9500 feet, June 22, 1949.

AEDES CATAPHYLLA Dyar

The contrasting white and dark scales of the palpi in both sexes distinguish the adults of this species from those of *pullatus* which agree in having a long pale basal costal spot and a hypostigial spot of scales. Also, California *cataphylla* have the upright vertex scales of the female black or mixed black and pale, whereas in *pullatus* females these scales are golden.

The larvae of *cataphylla* are the only ones in California with pecten spines beyond the siphon tuft. The head hairs are commonly said to be single but this is not invariable. In 50 specimens collected in the Lake Tahoe region near the type locality, 6 of the upper head hairs are double, 1 is triple and 1 lower head hair is double. Thus, 93 percent of the upper head hairs are single and 99 per cent of the lower hairs are single. Similarly the statement is encountered in the literature that the pecten has 2 or 3 teeth beyond the pecten tuft (Matheson, 1944; Dyar, 1928), whereas the disposition of the pecten teeth is rather variable in my material. In 50 specimens, 11 have one or more detached teeth before the tuft and 5 have 4 or 5 detached teeth beyond the tuft. The total number of detached teeth varies from 2 to 5 with an average of 3.7. The comb is reported by Dyar (1928) to contain "about 15 scales." In my material the number varies from 10 to 21 with an average of 12.8 scales in 50 specimens.

The preferred larval breeding places seem to be in rather large ponds in the open meadows at altitudes from 6,000 to 9,500 feet. Adults bite in shade or at night. Personal larval records are: meadows south of Lake Tahoe, Eldorado Co., May 21, 1948; Meyers Meadows near Lake Tahoe, May 21, 1948; Hope Valley, Alpine Co., May 31, 1947 and May 21, 1948; Carson Pass, Alpine Co., June 10, 1947; Sonora Pass, Tuolumne Co., 9,700 feet, June 10, 1947.

AEDES PULLATUS (Coquillett)[1]

The only previous record of this species in California is that given by Howard, Dyar and Knab (1917), "Summit, Placer County, California, July 19, 1915 (H. G. Dyar)." Judging by

[1]Since this paper was submitted for publication, *Aedes pullatus* has been reported from Tuolumne Co., California, by P. T. Johnson and E. B. Thurman. See Pan-Pacific Ent. 26(3):107-110.

the date, the record was based on an adult female, and the identification was corrected to *A. communis tahoensis* in the appendix of the same volume. However, the species does occur in California as proven by my collection of larvae and reared adults of both sexes from Sonora Pass, Tuolumne and Mono Counties, about 9,500 feet, June 10, 1947. Larvae were taken from sunlit pools both in the large meadow west of the pass and a small meadow to the east. Associated larvae were *Aedes hexodontus, cataphylla* and *ventrovittis*. Attempts to find it in 1948 and 1949 were not successful. The adult female is the only one of the snow mosquitoes in California with the combination of a hypostigial patch of scales and all yellow upright scales on the vertex.

The larvae are similar to those of *communis* except for the more slender comb scales and the multiple head hairs. According to Dyar (1928) and Matheson (1944), the upper head hairs have 8 branches and the lower have about 4 branches. In my material from California, Colorado and Wyoming the upper head hairs rarely have as many as 8 branches. The California material, consisting of 15 specimens, have the upper head hairs with 5 to 8 branches, the average being 6.3, and only 1 of the 15 specimens has 1 hair on one side with 8 branches. The lower head hairs vary from 3 to 5 branches except 1 hair on one side with 8 branches, the average being 4.2 branches.

AEDES VENTROVITTIS Dyar

At certain times and places this small, dark mosquito occurs in great numbers. I have seen it so abundant at Young's Lake, Tuolumne Co., 10,300 feet, that the swarms dimmed the sunlight and hikers were forced to run through the infested areas. In spite of the abundance of the females at elevations from 6,000 to 11,000 feet in the central Sierra, the larvae are rarely seen. In fact the only published records are those of Dyar (1921, 1924) in which he recorded the larvae in snow-water pools in a meadow at 7,000 feet near Summit, Placer Co., and at Lake Tahoe at 6,000 feet in a roadside ditch fed with water from a snow bank. The 4 localities in which I have found larvae were all over 8,500 feet. These were a meadow above Winnemucca Lake, Alpine Co., 9,200 feet, July 14, 1948; a meadow near Blue Lakes, Alpine Co., 8,600 feet, July 13, 1948; and meadows on either side of Sonora

Pass, Tuolumne Co., 9,500 feet, June 10, 1947. In each case the larvae were associated with a lesser number of *hexodontus* in small, open, shallow pools, the water in which was warm to the touch. A single male was collected at the Blue Lakes locality flying near the breeding site. At the summit of Ebbetts Pass, Alpine Co., 8,700 feet, July 13, 1948, I collected larvae of *Culiseta incidens* (Thomson) in large pools and *Aedes hexodontus* in small meadow pools. A few *ventrovittis* females were biting and males of the same species circled above my head in singing swarms of several hundred individuals. As many as 50 were taken in one swoop of the net. According to Dyar (1928) and Matheson (1944) the larval head hairs are single, the comb has 7 (Dyar) or 6 to 9 (Matheson) scales, and the last 2 pecten teeth are more widely spaced. An examination of 50 specimens from Winnemucca Lake, Alpine County, gives the following figures: The head hairs are occasionally split toward the apex and 1 out of 100 upper head hairs is double. The comb scales vary in number from 6 to 18, are usually 8 to 12, and average 9.7. The detached pecten teeth vary from 1 to 4 with average of 1.9.

AEDES IMPIGER (Walker)

I have not collected this species, the larvae of which are supposed to occur with *cataphylla* according to Dyar (1928).

AEDES CINEREUS HEMITELEUS Dyar

The use of the subspecific name for Californian specimens of this species is probably justified by their generally darker body color. The small size and almost or entirely continuous line of white along the side of the abdomen are distinguishing features of the adult. Also, the male palpi are very short. The larvae have multiple head hairs, the comb in a partly double row, the siphon tuft situated at the apical one-third of the siphon and preceded by 2 or 3 detached teeth. In 22 specimens from the central Sierra the number of comb scales ranges from 9 to 14, with an average of 12.0. I have found larvae in meadow pools shaded by willows, the water often containing brown algae. The adults were observed to bite in the sun, but timidly and only near the ground. Personal larval records are: Little Truckee River, Eldorado Co., May 30, 1947; Meyers, Eldorado Co., May 28, 1949; Hope Valley, Alpine Co., May 31, 1947.

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A NEW DISTRIBUTION RECORD FOR PLEOCOMA BEHRENSII

(Coleoptera: Scarabaeidae)

BY PETER S. GRIMES

While on a field trip to Tomales Bay, Marin County, California, in October, 1948, the writer found a female specimen of *Pleocoma behrensii* LeConte[1] which has proved to be the most northernly confirmed record for the species. Previously it had been found only in the region immediately surrounding San Francisco Bay.[2]

The writer was examining the Pleistocene and Recent sediments in this area for fossils when the specimen was found about 15 feet below the top of the bank on the east shore of Tomales Bay, approximately 4 miles north of Point Reyes Station and nearly opposite the town of Inverness on the west shore of the Bay. The abdomen of the beetle was protruding from the bank out of a cavity which had apparently been exposed by wave action and recent rains. The bank was well rooted. The specimen was apparently dead when found.

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[1]Determination by E. G. Linsley.
[2]Linsley, E. G., 1938, Pan-Pacific Ent. 74 (2):56; (3):108.

OVIPOSITION AND BEHAVIOR OF *LIRIOMYZA PUSILLA* (MEIGEN)

(Diptera: Agromyzidae)

BY J. W. TILDEN

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Among the normal fauna of *Baccharis pilularis* D. C. is a leaf-mining agromyzid that produces blotch mines. Mr. C. T. Greene was so kind as to identify the fly as *Liriomyza pusilla* (Meigen). A difference of opinion exists as to the identity of *pusilla*, inasmuch as A. E. Pritchard (personal communication) has pointed out that certain records in the literature refer to *pusilla* as a serpentine miner, while K. E. Frick (personal communication) states that certain European writers apparently limit the name *pusilla* to a blotch miner of euphorbia. It is clear that there is some confusion in the literature on this matter.

The mines of this fly may be found on *Baccharis* from March through June, but activity declines rapidly with the onset of dry weather and the attendant slowing up or cessation of growth. The larvae reappear in the fall after the rains begin. In general, the activity of the larvæ coincides with the period of growth of the plant.

It has been noted, as for instance by Needham, Frost and Tothill (Leaf-mining Insects, 1928, pp. 231-278) that leaf-mining Diptera are often far from host specific, and it is very probable that *Baccharis pilularis* is not the only host of *L. pusilla*. However, no other species was reared from *Baccharis*, so it appears that in the Peninsula district of the San Francisco Bay region, this is the usual agromyzid leaf-miner of *Baccharis*. The damage done is negligible, the percentage of infested leaves per plant being small.

Freshly emerged adults were confined over a branch of *Baccharis pilularis* subspecies *consanguinea* D. C. on March 24. On the afternoon of the same day, the female was observed running rapidly over the leaves, pausing at times to stroke the surface with the labella. After considerable examination, a spot was selected and the ovipositor inserted into the leaf. Peristalsis of the abdomen followed, and to all appearances oviposition was taking place. After each puncture had been completed, the female re-

treated a few steps and smoothed the puncture with the labella, also feeding on the exudate. This caused the punctures to be very inconspicuous. The entire process was repeated many times, but it became increasingly apparent that no eggs were being deposited. After several days of this behavior, the female was removed and the leaves minutely examined, and as suspected, no eggs had been laid in any of the punctures.

Concurrent with this experiment, a feral female taken on April 25 was similarly confined over a branch of the plant. The same behavior, consisting of inspection, puncture, and feeding on the puncture, was observed in this field-taken female, but it was easily evident that an egg was being laid in each puncture. On April 28 the leaves were examined and many eggs were found.

The egg is oval, somewhat pointed at each end, and inserted into the tissue of the leaf just below the epidermis and parallel to the leaf surface, not vertical to it. The egg lies about its own length from the entrance to the puncture and at a magnification of 30x is easily visible as a swelling below the epidermis. Fifty-seven eggs were found quite evenly distributed over the surface of seven large leaves, and were about equally numerous on both upper and lower surfaces. Only large leaves were used for oviposition. Numerous other punctures did not contain eggs.

The eggs increased in size after oviposition, and it is believed that this is due to imbibition of fluids from the plant tissues. Certain of them increased to fully twice the dimensions of freshly laid eggs. Some necrosis of the plant tissue resulted from the insertion of the ovipositor, but in every case this was slight. The hatching of the eggs was unfortunately not seen since no method was devised to prevent the leaves from wilting in the laboratory.

However, several field-collected larvae were reared. It was found that they fed as do certain other leaf-mining diptera, (such as Anthomyiidae), moving the anterior end of the body in a lateral horizontal plane, from side to side. This was accompanied by scraping movements by the mouth hooks, the mesophyll of the leaf being removed and ingested. The mines were linear and inconspicuous at first, but became blotchy later, and eventually involved most of the leaf surface. Although eggs were laid on both upper and lower surfaces of leaves, there was no differentiation into upper and lower surface mines, all becoming similar in appearance as the larvae matured.

The larvae are able to leave one leaf and to enter another. This is done when the larva reaches the end of a leaf, even when material remains uneaten in other parts. It cuts a crescent-shaped slit in the epidermis and squeezes out. It then crawls across the leaf-surface by alternately elongating and telescoping the body. The anterior end of the body is advanced and a hold obtained with the mouth hooks. Then the posterior part of the body is advanced by contracting the intersegmental membranes. The anal disc is also used in pushing forward. To enter a leaf, the larva cuts a small gash in the epidermis and begins to feed in the usual manner, gradually working its way in. The surface of the body is moist and viscid and it leaves a track of slimy deposit.

At maturity, the larva exits from the leaf by a crescent-shaped opening and wanders around for some time, as much as several hours. Most of the larvae that were observed entered soil to pupate, but some individuals pupated on leaves, stems, or on the sides of rearing vials. The puparium is yellowish-brown, with the segmentation of the larval skin distinctly visible. There are two prominent dorsal projections and two much less well marked lateral posterior projections. These are the tubes mentioned in descriptions. The puparia average 2.0 mm. in length.

The reason for lack of success in obtaining eggs from females reared in the laboratory is not entirely understood, but it is assumed to be due to a lack of certain essential foods that are available to females under field conditions. The situation may be similar to that existing in *Callophora,* as cited by Brues (Insect Dietary, 1946, pp. 59-60), in which certain protein foods must be available to the female, and in which, moreover, a certain length of time is required for the eggs to mature.

Two species of hymenopterous parasites were reared, both emerging from the puparia. One was a species of *Opius,* a member of a genus known to parasitize Agromyzidae. The other was a species of *Melanips* (Figitinae) of a group, the members of which are frequently hyper-parasites. It is likely that *Melanips* is secondary on *Liriomyza* through some primary parasite.

I am indebted to Dr. C. F. W. Muesebeck for the determination of the *Opius* species, to Dr. L. H. Weld for the determination of the *Melanips* species, and to Mr. C. T. Greene for examining some of the adult flies. Thanks are due also to Dr. A. Earl Pritchard and to Mr. Kenneth E. Frick for their helpful suggestions.

SYSTEMATIC NOTES ON THE GENUS FORMICILLA IN THE UNITED STATES AND MEXICO

(Coleoptera: Anthicidae)

BY R. S. BEAL, JR.

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Present definitions of species of *Formicilla* seem to be drawn largely from characters of little taxonomic significance or from features which are generic in nature rather than specific. The genus itself has been defined on the basis of but a few of its real taxonomic characters and hence has been erroneously separated from that group of genera now classified as *Anthicus*, within whose phylogenetic limits it more properly lies. However, since Casey's genera seem for the most part to be valid on the basis of numerous, clear, morphological differences throughout the whole range of American Anthicids, it seems best to retain *Formicilla* for the present as a distinct genus. Unfortunately the South American species have not been available for this study, but it is hoped that this paper will simplify the task of assigning them to their correct systematic position.

The writer is especially indebted to E. G. Linsley for his helpful suggestions and criticisms in connection with this paper. For the loan of material from their own collections or from those in their care particular thanks are expressed to E. S. Ross and Hugh B. Leech of the California Academy of Sciences, E. A. Chapin of the United States National Museum, Frank H. Parker, K. S. Hagen, and A. T. McClay.

Genus FORMICILLA LeConte

Formicilla LeConte, 1851, Ann. Lyc. Nat. Hist. New York, 5:152; Casey, 1895, Ann. New York Acad. Sci., 8:644; Pic, 1911, Junk Coleopt. Cat., pars 36, p. 22.

Anthicus LeConte, 1852, Proc. Acad. Nat. Sci. Phila., 6:94 (not *Anthicus* Paykull, 1798).

Formicus LeConte, 1861, Class. of Coleopt. Part I, Smithson. Misc. Col., 3:266.

Formicomus LeConte and Horn, 1883, Class. of Coleopt., p. 412 (not *Formicomus* LaFerte, 1848); Champion, 1890, Biol. Centr.-Amer., 4(2):220; Fall, 1901, Occas. Papers Calif. Acad. Sci., 8:180-1.

Pubescence of dorsal surfaces variable, punctation setiferous, fine, and remote; ventral surfaces and legs covered with light recumbent to sub-recumbent pubescence, punctation minute and remote. *Head* convex, unimpressed at base; antennae gradually incrassate, eleventh segment entire and conoidal; ultimate palpal joint securiform. *Pronotum* elongate, strongly constricted at about basal third, constriction not extending across dorsal surface; collar narrow but deeply constricted; basal margin distinct. *Elytra* more or less convex with slight posthumeral depression or flattening; maculation consisting of median, apical, and sometimes humeral dark areas; intervening light areas transparent with variable, opaque reticulation; vannal veins of hind wings two, simple and unbranched. *Anterior coxal cavities* partially but not entirely closed by inward prolongation of lateral lobes behind coxae. Mesosternum extended laterad in broad, flat, laterally rounded, shining plate, wider than base of pronotum and visible from above in humeral angle, anterior margin subtransverse, lateral setae long, curving upward, inserted singly (not in pairs). Mesepisternum widely joined at midventral line, not visible from above and not visible between lateral margin of mesosternum and base of elytron. Medio-anterior margin of metasternum evenly concave and not produced between coxal cavities. *Legs* long and slender, profemora only moderately clavate, tibial spurs present, penultimate segment of metatarsus variable. Sixth abdominal sternite of male with narrow median cleft to base, inner margins of cleft slightly bilobed, tip of apical lobe bent slightly downward. Median lobe of aedeagus long and slender, evenly tapering to apex, without lateral parameres. Apical expansion of spicule triangular and bearing on either side a thin, sclerotized appendage. Last abdominal tergite apically rounded and not thickened, not reflexed internally, nor otherwise modified.

Genotype—*Formicilla munda* LeConte (monobasic).

Formicilla is readily separable from other neartic genera on the basis of pronotal, sternal, and genital characters as well as by its vestiture and general shining appearance. The narrow cleft of the sixth abdominal sternite is unlike that of any North American Anthicid I have seen, while the mesosternum with a dilation so broad that the mesepisternum is not visible between its lateral edges and the bases of the elytra separates it from all genera except *Dilandius*. However, the latter is distinct through differences in the median lobe and sixth abdominal sternite, in the shape of the pronotum in which the constriction extends across the dorsal surface, and in the peculiar shape of the head. In describing the procoxal cavities of *Formicilla* I have found it necessary to disagree with Casey, who stated that they were closed; in

Dilandius they are unmistakably closed, but only partially so in *Formicilla.*

The determination of species limits is made difficult by apparent gaps in the geographical record, gaps which are possibly not real but conceivably the result of a failure to collect these minute beetles. It is certainly true that there are two distinct complexes in the genus, that of *scitula* in the south-eastern United States and Texas, and that of *munda* with its allied forms extending from the San Joaquin Valley of California into Mexico and Central America. Specific characters are to be found in the vestiture, in the form of the elytra, in the shape of the penultimate metatarsal segment, in elytral coloration and maculation—though these are subject to considerable variation—and in a comparison of the width of the head with that of the anterior pronotal lobe. Careful comparative measurements of the lengths of the last three antennal segments show small mean differences, but the extremes overlap, at least in the species considered here, and hence the comparisons of these made by Casey do not have diagnostic value. The same thing has been found true of comparative measurements of the length and width of the pronotum, and of the length and width of the elytra.

Key to the Species of Formicilla in the United States and Mexico

1. Elytra with fine, sparse, subrecumbent hairs and usually long setae; penultimate metatarsal segment much longer than wide, barely emarginate apically, ultimate segment inserted near apex; anterior lobe of pronotum round; ratio of width of head to width of pronotum very nearly equal.....2

– Elytra with long setae but without subrecumbent hairs; penultimate metatarsal segment short and bilobed, ultimate segment inserted before the middle; anterior lobe of pronotum obovate; ratio of width of head to width of pronotum closely approximating 1:0.9 4

2. Ground color of elytra definitely lighter than color of pronotum and head; median band wide, faintly interrupted or confluent at suture; posterior band enveloping apex; Arizona and Sinaloa, Mexico .....*gilensis*

– Ground color of elytra same as color of pronotum and head; median band wide to narrow, interrupted widely to narrowly at suture; posterior band only occasionally enveloping apex....3

3. Humeri of elytra not or faintly marked with dark, apex of elytra never entirely enveloped by posterior fasciae; California and Arizona ..... *munda munda*

– Humeri of elytra occasionally strongly marked with dark, apex of elytra occasionally enveloped by posterior fasciae, fasciae occasionally extremely reduced; Southern Mexico to Guatemala ..... *munda gracilipes*

4. Median fasciae separated by space equal to half width of elytron; posterior band narrower than space between it and apex; islands off coast of So. Carolina and Georgia..... *scitula scitula*

– Median fasciae contiguous or separated by space equal to less than half width of elytron; posterior band wide, as wide or wider than space between it and apex or enveloping apex, sometimes confluent with median band; Georgia mainland to Texas ..... *scitula evanescens*

FORMICILLA GILENSIS Casey

Formicilla gilensis Casey, 1895, Ann. New York Acad. Sci., 8:647-8; Pic, 1911, Junk Coleopt. Cat., pars 36, p. 22.

Polished, head and body light to dark piceous, dorsal surface sparsely set with fine, short, subrecumbent hairs and usually with sparse, long, erect setae, but latter rarely limited to head. *Head* subquadrate behind eyes, temporal angles rounded; width behind eyes closely approximating width of anterior lobe of pronotum. *Pronotum* with obovate anterior lobe; ratio of pronotal width to length ranging from 1:1.37 to 1:1.57. *Elytra* ochreous; maculation of humeri dark brown to black, reduced to small spots or expanded into wide band contiguous at suture; median band brown to black, contiguous or faintly interrupted at suture; apical band wide, brown to black, enveloping apex; ochreous bar intervening between median and apical bands narrow, and V-shaped, transverse, or nearly obsolete; sides subparallel, widest near middle; profile not raised above level of pronotum, slightly convex, visibly impressed behind humeri; humeral angles prominent and evenly rounding; ratio of width to length ranging from 1:1.4 to 1:1.9. *Undersurface of thorax* piceous; posterior margin of anterior coxal floor not produced behind in acute cusp but rather slightly angulate and not projecting beyond middle of lateral lobes. Penultimate metatarsal segment narrow, not lobed, barely emarginate at apex, ultimate segment inserted near apex. *Abdomen* slightly to much darker than thorax, dark piceous to black. *Length* of male: 2.2 mm. to 2.5 mm.; width: 0.6 mm. to 0.8 mm.; length of female: 2.3 mm. to 2.8 mm.; width: 0.6 mm. to 0.8 mm.

Type locality—Tucson, Arizona. No other recorded distribution.

New records—Sedona, Arizona, May 19, 1947 (Edwin Potts); Phoenix, Arizona, May 8, 1947 (R. S. Beal); Willcox, Arizona, February 2, 1934 (Bryant); Nogales, Arizona, August 12, 1906 (specimen in Cal. Acad. Sci. collection); Robles Ranch, Pima Co., Arizona, August 17, 1947 (A. T. McClay); Los Mochis, Sinaloa, Mexico, July 20, 1922 (C. T. Dodds).

Though sympatric with *munda* and differing from it in few morphological characters, the large series I have examined never seem to intergrade with it. I have taken specimens running about on damp ground near streams and flying to lights. One adult specimen was collected under the bark of a decaying cottonwood at Tucson in the early part of March.

FORMICILLA MUNDA LeConte

Polished, ochraceous-buff to light piceous, dorsal surface sparsely set with fine, short, subrecumbent hairs and usually with long, erect setae. *Head* subquadrate behind eyes, temporal angles rounded; width behind eyes closely approximating width of anterior lobe of pronotum. *Pronotum* with obovate anterior lobe; ratio of pronotal width to length ranging from 1:1.25 to 1:1.51. *Elytra* with same ground color as head and pronotum; humeral maculae present or absent; fasciae at middle interrupted widely to narrowly at suture, occasionally much reduced; posterior fasciae wide, joined at suture, enveloping apex or not; sides subparallel, widest near middle; profile not raised above level of pronotum, slightly convex, visibly impressed behind humeri; humeral angles prominent and evenly rounding; ratio of width to length ranging from 1:1.3 to 1:1.7. *Undersurface of thorax* ochraceous-buff to light piceous; posterior margin of anterior coxal floor not produced behind in acute cusp but rather slightly angulate and not projecting beyond middle of lateral lobes. Penultimate metatarsal segment narrow, not lobed, barely emarginate at apex, ultimate segment inserted near apex. *Abdomen* identical in color to rest of undersurface. *Length* of male: 2.2 mm. to 2.5 mm.; width: 0.7 mm. to 0.8 mm.; length of female: 2.3 mm. to 2.7 mm.; width: 0.8 mm to 0.9 mm.

FORMICILLA MUNDA MUNDA LeConte

Formicilla munda LeConte, 1851, Ann. Lyc. Nat. Hist. New York, 5:152; Casey, 1895, Ann. New York Acad. Sci., 8:646; Pic, 1911, Junk Coleopt. Cat., pars 36, p. 22.

Anthicus munda LeConte, 1852, Proc. Acad. Nat. Sci. Phila., 6:94.
Formicus munda LeConte, 1861, Class. of Coleopt., Part I, Smithson. Misc. Col., 3:266.

Formicomus munda (LeConte), Champion, 1890, Biol. Centr.-Amer., 4(2):220; Fall, 1901, Occas. Papers Calif. Acad. Sci., 8:181.

Humeri of elytra not or faintly marked with black; fasciae at middle extending to or but narrowly interrupted at suture; posterior fasciae variable, but never entirely covering apex at suture.

Type locality—Yuma, California. No other recorded distribution.

New records—Visalia, California, September 10, 1944 (L. R. Gillogly); 4 miles south of Dos Palos, Merced Co., California, September 7, 1946 (K. S. Hagen); Ehrenberg, Arizona, July, 1938 (F. H. Parker); Blythe, California, July 8 to August 24, 1947 (J. W. MacSwain); Globe, Arizona, August 3, 1935 (F. H. Parker). I have examined one specimen now in the collection of Mr. K. S. Hagen labeled simply "Tex.", but its validity may well be questioned until verified by subsequent collections in that state.

The coloration and vestiture of this subspecies is somewhat variable, occasional forms lacking the long tactile setae on both the elytra and pronotum, although never the short recumbent hairs. In this respect it varies in a different direction than the following subspecies, which apparently always possesses the setae, but which varies to a greater degree in the extent of its elytral maculation, which may be quite reduced or much heavier.

FORMICILLA MUNDA GRACILIPES (Champion), *new status*

Formicomus gracilipes Champion, 1890, Biol. Centr.-Amer., 4(2): 220, and plate x, fig. 1.

Formicilla gracilipes (Champion), Pic, 1911, Junk Coleopt. Cat., pars 36, p. 22.

Humeri of elytra strongly marked with black or not, apex of elytra enveloped by posterior fasciae or not; fasciae occasionally extremely reduced or median fasciae expanded and confluent at suture.

Type locality—Not recorded.

Recorded distribution—Cordova, Mexico; Vera Cruz, Mexico; Champerico, Guatemala; Paso Antonio, Guatemala.

New record—5 miles south of Cuernevaca, Mexico, Nov. 19, 1946 (E. S. Ross).

The information concerning the extremes of variation in this subspecies has been drawn from Champion's description and records in the *Biologia Centrali-Americana*. The two specimens I have examined differ so far as I can tell in no significant detail

from *munda munda*, but the apparent geographic isolation of the two forms and the seemingly different ranges of genetic variability of each serve to justify the subspecific categories.

FORMICILLA SCITULA (LeConte)

Highly polished, pale rufo-testaceous, dorsal surface sparsely set with long, erect, tactile setae. *Head* just discernably less pale than body, oval, temporal angles broadly rounded and indefinitely defined; ratio of width of head measured just behind eyes to width of pronotum closely approximating 1:0.9. *Pronotum* with anterior lobe rounding and widest about middle; ratio of width to length ranging from 1:1.37 to 1:1.66. Elytra of same ground color as pronotum; setae always present, fine recumbent hairs lacking; humeri with or without dark marking; brown to black fasciae just before middle not at all or widely interrupted at suture, extending to or widely removed from apex; sides rounding, widest near middle; profile convex, slightly raised above level of pronotum, slightly flattened behind humeri; humeri obtuse and sharply rounding; ratio of width to length ranging from 1:1.4 to 1:1.7. *Undersurface of thorax* light piceous; posterior margin of anterior coxal floor produced behind in acute cusp projecting to edge or beyond edge of lateral lobes. Penultimate metatarsal segment short and bilobed with ultimate segment inserted before middle. *Abdomen* identical in color to rest of undersurface. *Length* of male: 2.1 mm. to 2.7 mm.; width: 0.7 mm. to 0.9 mm.; length of female: 2.1 mm. to 2.7 mm.; width: 0.8 mm. to 1.0 mm.

FORMICILLA SCITULA SCITULA (LeConte)

Anthicus scitula LeConte, 1852, Proc. Acad. Nat. Sci. Phila., 6:94.
Formicus scitula LeConte, 1861, Class. Coleopt., Part I, Smithson. Misc. Col., 3:266.
Formicilla scitula (LeConte), Pic, 1911, Junk Coleopt. Cat., pars 36, p. 22.

Humeri without maculation; median fasciae separated by space equal to half width of elytron; posterior band narrower than space between it and apex, barely interrupted at suture.

Type locality—South Carolina. No other recorded distribution.

New records—St. Simons Island, Georgia, July 12, 1931 (C. A. Frost); Tybee Island, Georgia, June 20 (H. W. Wenzel).

FORMICILLA SCITULA EVANESCENS Casey, *new status*

Formicilla evanescens Casey, 1895, Ann. New York Acad. Sci., 8:646; Pic, 1911, Junk Coleopt. Cat., pars 36, p. 22.
Formicilla scitula, Casey (nec LeConte), 1895, Ann. New York Acad. Sci., 8:644.

Humeri with or without dark markings; median fasciae contiguous at suture or separated by space equal to less than half

width of elytron; posterior band wide, as wide or wider than space between it and apex and often enveloping apex, interrupted at suture or not, sometimes confluent with median band.

Type locality—Austin, Texas.

Recorded distribution—Sebastian River, Florida.

New records—Brownsville, Texas, Sept., 1942 (E. S. Ross); Del Rio, Texas, July 23, 1924 (Wickham); Fedor, Texas (Birkman); Houston, Texas (Wickham); Corpus Christi, Texas, Oct. 20, 1905, April 13, 1906 (F. C. Pratt); Columbus, Texas, (Hubbard and Schwarz); Hidalgo, Texas, Sept. 2, 1940 (B. C. House); Roxie, Miss., Sept. 16, 1908 (W. D. Pierce); Maudeville, La., (H. Soltau); Shreveport, La., Sept. 14, 1908 (E. S. Tucker) and April 13, 1937 (Anderson); Peach Co., Ga., Nov. 19, 1937 (Turner); Jasper Co., Ga., July 25, 1936; Experiment, Ga., Nov. 10, 1935 (T. L. Bissell); Capron, Florida (Hubbard and Schwarz).

In his redescription of *scitula* Casey evidently had before him specimens from Florida only, which, although tending to be somewhat lighter in color than the Texas form, are closer to it than to the form originally described by LeConte from South Carolina. Perhaps other subspecies of *scitula* should be recognized than those here described, but present collections are not extensive enough to afford their determination.

SPECIES DESCRIBED BUT UNRECOGNIZED

Formicilla punctata Pic, 1904, Ann. Mus. Zool. St. Petersb., 9:491; Pic, 1911, Junk Coleopt. Cat., pars 36, p. 22.

I feel reasonably certain that *punctata*, said to be distinguished by large serial punctures of the elytra, especially on the disc, will prove, upon examination of the type, to be a synonym of one of our described species. The locality given by Pic is "Etats-Unis: Obisop (ex Motschulsky)." Since good diagnostic characters are not mentioned in the description, its systematic position must remain in doubt.

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A NEW NITELA FROM CALIFORNIA

(Hymenoptera, Sphecidae)

BY KARL V. KROMBEIN

Arlington, Virginia

The present species, the first known from the United States from west of the Mississippi River, is described at this time so that the name will be available for inclusion in the forthcoming synoptic catalog of North American Hymenoptera.

Nitela townesorum[1] Krombein, new species

Female. Body length 4.3 mm., forewing 3.1 mm. Mandible except base, tegula, trochanters and tarsi, ferruginous; palpi and tibial spurs testaceous. Pubescence inconspicuous, short, pale and sparse. Wings hyaline, stigma dark brown, venation lighter brown.

Head opaque, the front with numerous small punctures, the interspaces finely lineolate, temples finely lineolate; clypeal lobe obliquely angulate laterally; median carina of clypeus low, termi-

[1]I take pleasure in naming this species for its collectors, Henry, Marjorie, George, David and Jean Townes.

nating apically in a polished, impunctate triangular bevel and basally at the base of clypeus; front not at all gibbous in lateral view, the frontal carina evanescent, its location indicated by a short polished streak; interocular distance at upper level of antennal scrobes 1.86 the shortest interocular distance on vertex; distance between inner margins of antennal scrobes 1.5 the distance between outer margin of antennal scrobe and lower inner angle of compound eye; postocellar distance 2.5 the ocellocular distance; eyes with very fine hairs; length of malar space 0.5 the distance between outer margin of antennal scrobe and lower inner angle of compound eye.

Thorax subopaque dorsally, subopaque to shining laterally, the propodeum shining; pronotum with fine transverse rugulae, without a transverse carina, posteriorly with a shallow ill-defined sulcus which is not foveolate; mesonotum punctured similarly to front, the lateral and posterior margins weakly foveolate; anterior margin of scutellum foveolate; mesopleuron sculptured similarly to *cerasicola;* dorsum of propodeum regularly reticulate, the mesh finer than in *cerasicola.*

Forewing with recurrent and transverse cubital veins interstitial, submarginal cell rectangular.

Abdomen shining, with very sparse, fine scattered punctures.

Male. Unknown.

Type: ♀; near GLACIER POINT, YOSEMITE PARK, CALIFORNIA, July 17, 1948 (H., M., G., D. and J. Townes) [Townes Collection].

Paratypes: 2♀♀; same data but July 16, 1948 [Townes and Krombein Collections]. The paratypes agree in all essential details with the above description of the type.

N. townesorum is immediately distinguished from the other Nearctic species by having the recurrent and transverse cubital veins interstitial. It agrees with *cerasicola* Pate and *floridana* Pate, and differs from *virginiana* Rohwer, in having hairy eyes and a rectangular submarginal cell, and in the lack of a strong transverse carina on the pronotum and an antero-lateral foveolate area on the mesonotum. It differs further from *floridana* and *cerasicola* in that the front is not at all protuberant, from *cerasicola* in lacking the deep posterior sulcus on the pronotum and the well-developed frontal carina, and from *floridana* in the less strongly converging compound eyes (interocular distance at antennal scrobes 2.14 the shortest interocular distance on vertex in *floridana*), the foveolate anterior margin of the scutellum and the longer malar space (length of malar space in *floridana* one-third the distance between outer margin of antennal scrobe and lower inner angle of compound eye).

NOMENCLATORIAL NOTES ON THE GENUS PEPSIS

(Hymenoptera: Pompilidae)

BY PAUL D. HURD, JR.

University of California, Berkeley

During a recent study of the names applied to the genus *Pepsis* Fabricius, 1805 (1804):207, several instances of names requiring nomenclatorial changes were detected. In order to facilitate the citation of these names in a forthcoming paper this opportunity is taken to effect the necessary changes.

Included herein are three cases involving primary homonymy, one of secondary coexistent homonymy, and one of species misinterpretation.

Pepsis accipitrinus Hurd, *nom. nov.*

Pepsis accipitrinus Hurd, *nomen novum pro Pepsis fuscipennis* Smith, 1873:50, ♀, *nec Pepsis fuscipennis* Fabricius, 1805 (1804):210.

Pepsis atricoma Hurd, *nom. nov.*

Pepsis atricoma Hurd, *nomen novum pro Pepsis fusca* Lucas, 1895:788, ♀, plate 33, figure 181, *nec Pepsis fusca* (Christ), 1791:256.

On page 788 of his monograph Lucas described a "variety" of *nessus* Lucas, 1895:787, as *fusca* and indicated by reference to page 711 and also on page 811 its affinities with *Pepsis guatemalensis* Cameron, 1893:216. Brèthes, 1914:255, in his "Tableau Dichotomique des Pepsis" has accorded *fusca* of Lucas full specific rank which places it in homonymy with *Pepsis fusca* (Christ), 1791:256 which has been shown to be a member of the genus *Pepsis* by Kohl [*in litt.*] to Dalla Torre, 1897:254.

Pepsis linsleyi Hurd, *nom. nov.*

Pepsis linsleyi Hurd, *nomen novum pro Pepsis bonariensis* Lucas, 1895:754, 755, 760-762, ♂♀, plate 31, figure 81, plate 32, figure 112, plate 33, figures 205, 215, *nec Pepsis bonariensis* Lepeletier, 1845:476, ♀.

Lucas, under the impression that he had the Lepeletier species, treated a species from Costa Rica and Mexico (Orizaba) as

Pepsis bonariensis Lepeletier. However, Brèthes, 1914:322-333, 356, has shown that *Pepsis bonariensis* Lepeletier [from "Buenos-Ayres"] is not a member of the genus *Pepsis*, and is referred by him to the genus *Salius*. Therefore *Pepsis bonariensis* of Lucas is left without a name and is named *Pepsis linsleyi* in honor of Professor E. Gorton Linsley of the University of California who has been of invaluable assistance in the writer's studies on the genus *Pepsis*.

Pepsis palliata Hurd, *nom. nov*

Pepsis palliata Hurd, *nomen novum pro Pepsis obscura* Lepeletier, 1845:490, ♂ ♀, *nec Pepsis obscura Fabricius*, 1805 (1804):213.

Pepsis somatochlora Hurd, *nom. nov.*

Pepsis somatochlora Hurd, *nomen novum pro Pepsis apicalis* Lepeletier, 1845:472, ♀, *nec Pepsis apicalis* Gray, 1832:516. ♂.

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TWO NEW ORIENTAL PRIONIDS OF THE GENUS MEGOPIS

(Coleoptera: Cerambycidae)

BY J. LINSLEY GRESSITT

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The following descriptions are based on material from the Museum of Comparative Zoology at Harvard University and specimens sent to me by P. S. Nathan from South India. The type material is deposited in the above institution, as well as the California Academy of Sciences, the Lingnan Natural History Museum and the Forest Research Institute of Dehra Dun, U. P., India. I am indebted to Dr. P. J. Darlington for the loan of material.

Megopis (Aegosoma) mediocostata Gressitt, new species

Male: Dark reddish brown, darker on head and prothorax; pitchy black on costae, margins, sutures, parts of mandibles and apices of antennal segments; more reddish on abdomen and distinctly reddish on femora. Body very sparsely and briefly clothed with adpressed tawny hairs, somewhat longer on mesepimera and adjacent areas; first four antennal segments with fairly short curved oblique tawny hairs of subequal length on all sides; only a few scattered hairs on following segments.

Head more than one-half again as long as prothorax and broader than anterior margin of latter; irregularly granulose, more coarsely so on antennal tubercles, with a median darkened narrow smooth line; frontoclypeus impressed; eyes slightly closer above than antennal insertions, well separated from genal margins; genae finely punctured; mandibles each sharply notched beyond middle of external margin, nearly forming an accessory tooth. Antennae slightly longer than body; scape stout, densely rugose-punctate; third segment slightly arched, slender, densely granulose, a little longer than next three segments combined; fourth granulose, finely punctured at apex, as long as next two combined; fifth to last finely punctured, flattened and carinate externally. Prothorax nearly twice as broad as long (including tubercles), irregularly granulose, emarginate at middle of apex; each side with an acute tubercle at middle and with lateral margin distinct

posteriorly, though without a prominent basal angle, and obsolete anteriorly; disc concave in center and with three swellings at each side, arranged obliquely. Scutellum short and subrounded. Elytra distinctly narrowed posteriorly, finely granulose, minutely so posteriorly, subrounded apically; disc of each with two shiny raised costae; first extending only for a basal quarter, second extending from near end of basal fifth to a short distance from apex, ending suddenly, strongly raised except near its basal end. Thoracic sterna minutely granulose; abdomen micropunctulate; last abdominal sternite slightly emarginate apically. Legs long and slender; femora nearly parallel-sided, fully two-thirds as long as abdomen; last tarsal segment about as long as first three combined. Length 34 mm.; breadth 8.7 mm.

Female: Antennae flattened from apex of fourth segment, subglabrous, nine-tenths as long as body; elytra broad at humeri and strongly narrowed. Length 49.4 mm.; breadth 13.8 mm.

Holotype, male (in Calif. Acad. Sci.), ANAIMALAI HILLS, at 1300 meters, S. MADRAS, S. INDIA, June 28, 1946, P. S. Nathan; *allotopotype*, female (in Forest Research Institute), and *paratype* (in Lingnan N. H. Mus.), same data.

Differs from *M.* (*Aegosoma*) *cingalensis* (White) in being larger, less parallel-sided, darker, with the prothorax much less hairy, more tuberculate at middle of each side and less tuberculate at basal angles and more finely and densely granulose, and the elytra impunctate, densely granulose and with much abbreviated first costa and very strongly raised second costa.

Megopis (Aegolipton) piliventris Gressitt, new species

Male: Ochraceous; head and prothorax darker, pitchy; elytra testaceous except for ochraceous bases, costae and sutural margins and blackish outer margins; antennae pitchy basally, becoming reddish from apex of third segment; legs slightly reddish ochraceous. Body clothed with fine erect pale golden tawny hairs except for glabrous elytra.

Head one-half again as long as, and distinctly narrower than, prothorax, distinctly granulose, sparsely or irregularly punctured behind eyes and on genae, subrugose beneath, with a fine smooth median line on dorsum; frons and vertex each transversely rounded -concave; clypeus emarginate apically, making labrum subelliptical; eyes distinctly closer above than antennal insertions, widely separated from genal margins, distant beneath; mandibles each with an inner basal emargination, forming a posteriorly delimited tooth. Antennae eighth-ninths as long as body, not very stout, fringed beneath to about seventh segment; scape gradually but

sub-irregularly thickened, granulose; third segment as long as next three combined, granulose-punctate, more feebly so distally; fourth to sixth rather smooth with a few shallow punctures; seventh to last irregularly sculptured or rugose-punctate; last superficially divided and with a group of short erect hairs at apex. Prothorax more than one-half again as broad as long; each side with lateral margin well defined and bearing three teeth; median and posterior teeth more pronounced and acute; disc subeven, granulose to rugose at sides and shallowly punctured in center. Scutellum rounded behind, finely punctured. Elytra somewhat narrowed posteriorly, subrounded apically; disc of each covered with low granules and bearing four low costae, the outer two very indistinct, the inner two uniting at beginning of apical fifth, then separating again immediately with inner branch going towards suture obliquely, and outer branch apparently fusing with third. Ventral surfaces finely punctured, more sparsely so on abdomen. Legs flattened; hind femora about one-half as long as abdomen; last hind tarsal segment not quite as long as first three combined. Length 43 mm.; breadth 10.3 mm.

Female: Inner notch of mandible not evident; antennae three-fourths as long as body, basal segments with a few scattered hairs beneath; prothorax with lateral teeth longer and more slender; elytra with first two costae not united, but with a suggestion of a transverse connection; fifth abdominal sternite deeply and obtusely emarginate apically. Lenth 46.8 mm.; breadth 12.7 mm.

Holotype, male (in Museum of Comparative Zoölogy), Mt. Angka, at 2150 meters, Siam, March, 1933, Asiatic Primate Expedition; *allotopotype,* female (in Lingnan N. H. Mus.), same data.

Differs from *M.* (*Aegolipton*) *marginalis* (Fabr.) in being larger, more even and flattened above, paler, with shorter and smoother antennae, distinctly toothed prothorax and longer elytra.

INTERNATIONAL CONGRESS OF ENTOMOLOGY

The ninth International Congress of Entomology will be held at Amsterdam, The Netherlands from August 17 to 24, 1951. Those who are planning to attend should obtain from the Secretariat of the IXth International Congress of Entomology, 136 Rapenburgerstraat, Amsterdam, The Netherlands a preliminary application for membership in order to insure the receipt of all circulars concerning the Congress.—Paul D. Hurd, Jr.

NOTES ON OLIARCES CLARA BANKS[1]

(Neuroptera, Ithonidae)

BY PHILIP A. ADAMS

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This handsome insect, the only representative of its family known to occur in the Western Hemisphere, was described by Banks from a single male specimen collected at Walter's Station, California.[2] Since that time there have been no other recorded captures of the species. Mr. C. D. MacNeill has kindly presented me with a female which he took at light, three miles southwest of Parker Dam, San Bernardino County, California, on May 25, 1949. It agrees well with Banks' description, to which the following additions can be made:

Alara expanse, 44 mm.; length to tip of abdomen, 18 mm. Antennae fuscous, 9 mm. long. In the forewing the posterior branch of the media does not unite with the cubitus, but runs parallel to the anterior branch for a distance, and then forks; four branchlets running to hind margin of wing. Anterior branch of cubitus also with four branchlets to hind margin. Eighth, ninth, and tenth abdominal segments dark brown, more heavily sclerotized than others. Seventh sternite produced behind to an obtuse, heavily sclerotized point. Ninth segment with a deep longitudinal invagination, short dorsally, produced posteriad beneath to support the sand-plow, or "Psammorotrum." Psammorotrum small, slender, erect, fitting tightly against posteroventral surface of tenth segment, bearing a short tactile appendage on each side of apex. Tenth segment obtusely conical, flattened above.

Dr. Banks' specimen has the posterior branch of the media in the fore-wing fused to the anterior branch of the cubitus. Variation in the wing venation of the Neuroptera is often great, and could easily account for the difference between the two specimens. In all other respects the venation of the specimens before me checks with the description of the other. Neither specimen has the media and cubitus fused in the hind wings.

The insect undoubtedly oviposits under the surface of the sand, as do the Australian species,[3] although the hard points on the

[1]Ent. News 19, 1908, pp. 203, 204, fig.

[2]Location unknown.

[3]Tillyard, R. J., Proc. Linnaean Soc. of New South Wales, 44:427, 1919.

seventh and tenth abdominal segments, together with the small, appressed psammorotrum, indicate an ability to oviposit in somewhat harder ground. The flight is swift and moth-like.

BRISTLE DENSITY OF THE FIFTH ABDOMINAL STERNITE OF TWO HOUSE FLY STRAINS

(Diptera: Muscidae)

BY LAWRENCE L. LEWALLEN

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A comparison of the average number of bristles on the fifth abdominal sternite of a house fly strain from California and a strain from Illinois has disclosed that the Illinois strain has a higher number of bristles per sternite. The two strains under consideration are the laboratory strain from the University of California and the Hyman strain (chlordane-resistant) which was originally obtained from the University of Illinois.

The fifth abdominal sternite of one hundred female house flies of each strain and fifty male house flies of each strain was examined to obtain the averages. The California females averaged 42 bristles per sternite, whereas the Illinois females averaged 49 bristles per sternite. California males averaged 82 bristles per sternite and Illinois males averaged 89 bristles per sternite.

In computing the averages, some overlapping of figures occurred in the original data; therefore it would not be practicable to identify either strain merely by counting the bristles on the fifth abdominal sternite. However, it is interesting to note that when a series is examined, differences in the averages are evident.

TAXONOMIC NOTES ON SOME SMALLER BOMBYLIIDAE

(Diptera)

BY A. L. MELANDER[1]

The arid Southwest is especially favored with Bombyliidae. The larger and conspicuous species have found their way into museums and collections, but many of the smaller species have been overlooked. Not less fascinating, the small forms deserve attention, and would be better understood were dipterists as numerous as their colleagues, the collectors of beetles and butterflies.

In reviewing the smaller Bombyliidae of my collection I have brought together various notes and descriptions which deserve publication. The outcome of this study is presented herewith, and its importance is indicated by the announcement of the extension of two palaearctic genera, *Platypygus* and *Heterotropus*, to America, the suppression of the Old World genus *Alloxytropus* as a complete synonym of our *Prorates*, the inclusion of keys to several genera, and descriptions of thirteen new species and one new genus. The collection of Bombyliidae at the Citrus Experiment Station of the University of California, at Riverside, has been of service in furnishing data on many of these flies.

MYTHICOMYIINAE AND CYRTOSIINAE

There are a few Bombyliidae which have a single submarginal cell because the third vein is not forked. These genera are stymied in Curran's Manual at couplet 31, page 197, where provision is made only for the forms having two or three submarginal cells. The genera with reduced venation may be keyed thus:

31. One submarginal cell; anal cell open (only exceptionally closed and petiolate) .....a

a. Second vein short, ending in first vein, or imperfect, or wanting (Mythicomyiinae) .....b

— Second vein ending in costa well beyond first vein (Cyrtosiinae); discal cell complete .....*Platypygus* Loew

[1]Research Associate, University of California at Riverside. Paper No. 632, University of California, Citrus Experiment Station, Riverside, California.

b. Discal cell imperfect c
— Discal cell complete .....*Mythicomyia* Coquillett

c. Discal cell confluent with the large second basal cell.....
.....*Glabellula* Bezzi

— Discal cell confluent with the third posterior cell.....
.....*Empidideicus* Becker

Platypygus americanus Melander, new species

Length 3.5 mm.—A greatly hunchbacked, plump, quite bare, yellow species, with unforked third vein, complete discal and open anal cells. Head in profile longer than high, occiput convex with the lower angles rectangular to enclose the deep mouth opening, lower side of head nearly straight but evenly rounding opposite the proboscis into the prominent anterior mouth cavity which in profile is at a right angle to the face; antennae midway between front ocellus and oral margin, face and front in same plane, face convex from side to side, front quadrate, slightly depressed along middle; eyes obliquely oval, widely separated, minutely indented above antennae, ocelli at vertex; proboscis uniformly thick, straight, porrect, shorter than head; basal antennal joints very small, equal, third joint longer than basal two together, pyriform, with a thick cylindrical style almost as long as the joint and tipped with a microscopic seta. Abdomen about equal to the thorax, stout, last sternite globular and enveloping the genitalia. Legs without bristles. Costa thinning at wing tip beyond third vein, ambient vein thin, second vein ending midway between first and third veins, anterior crossvein just before middle of discal cell.

Wholly yellow except the black third joint of the antennae, the blackish occiput and small supra-antennal spot, and the dark brown strong wing veins. The lower occipital angles are yellow. Face, front, base of antennae, mouth cavity, scutellum, legs and halteres flavous; mesonotum opaque, marked with three incomplete broad vittae of reddish-yellow tone, the middle one abbreviated in front of scutellum, the lateral ones not reaching the humeri; remainder of body largely luteous; pleurae and abdomen shining; pubescence yellow.

Holotype: MOUNTAIN HOME CANYON, on west slope of SAN BERNARDINO MOUNTAIN, CALIFORNIA, June 3, 1946. The specimen is probably a female.

This is the first report of the occurrence of this palaerctic genus in America. While the sides of the mouth cavity are prominent they do not project so strongly as to come in the subgenus *Cyrtisiopsis* Seguy.

Empididеicus flavifrons Melander, new species

Second vein vestigial, no marginal cell, basal cells coextensive, veins largely thin and pale; legs yellow except the broad last tarsal joint; front, face, base of antennae, sides of notum broadly, much of pleurae and hind margins of abdomen yellow, more extensively so in the female; occiput, disk of thorax, scutellum and base of abdominal segments black, vestiture pale.

Front one-half wider at ocelli than at antennae, face half as long as front, anterior ocellus in advance of the others; facets uniform; third antennal joint pyriform, the thickened style half as long as the third joint; proboscis projecting half the head-height. Yellow of sides of notum broadened beside the humeri, a short dark line immediately above root of wing; pleurae centrally darkened, a yellow spot above front coxae and another in front of halteres. Yellow of abdominal segments increasing posteriorly; genitalia brown. Last joint of front tarsi forming a circular flat disk, claws black. Posterior cells 1–3 of equal extent along margin, petiole of fourth vein three-fourths length of intercalary vein, anal lobe wider than anal cell; halteres wholly ivory.

Two males, one female: Palmdale, California, March 27, 1947. The species is readily recognizable by its completely yellow front.

In the Annals of the Entomological Society of America, vol. 39, p. 455 (1946) I announced the occurrence of this palaearctic genus in California and Arizona and described three species.

GLABELLULA Bezzi

Glabellula arctica Zetterstedt has had a complicated generic history, successively appearing as *Platygaster* Zetterstedt (preoccupied, Hymenoptera and Hemiptera), *Sphaerogaster* Zetterstedt (preoccupied, Coleoptera), *Glabella* Loew (preoccupied, Mollusca) and *Glabellula* Bezzi. This little black hunchbacked fly is rare in collections and is found through Northern Europe and Siberia. What seems almost certain to be the same was described by C. T. Greene as *Pachyneres crassicornis*, from specimens from the District of Columbia, Pennsylvania and Manitoba. The American specimens have the legs black, the true arcticas have the knees and tarsi brown. The palaearctic fauna has two partly yellow species of *Glabellula* (*femorata* Loew, Turkestan, and *nobilis* Kertesz, Asia Minor) and a wholly black species (*unicolor* Strobl, Alps, which may be *arctica* with black halteres); and Malloch has described *australis* from the Philippines.

Glabellula is related to *Mythicomyia*, differing mainly in that the discal cell is confluent with the large second basal cell and

the fifth vein arises directly from the anal cell without the angulation normally to be found at the base of the discal cell. While I have collected thousands of specimens and many diverse species of *Mythicomyia,* in fifty years of collecting I have found only 19 individuals of *Glabellula.* These specimens are closely alike yet probably represent six not easily differentiated species. The flies measure one to two millimeters in length, are chunky, with flattened abdomen, black in color, the thorax more or less yellowish at the sides, with only microscopic pubescence, the legs short and antennae stubby. Like *Mythicomyia* they frequent flowers. The distinctions for the American species are given in the following table.

Key to the Species of Glabellula

1. Notum polished, pleurae, coxae and femora shining, sides of notum narrowly yellow along notopleural suture, legs black, front and face black or brownish, abdomen wholly black, antennal style thick, its diameter one-fourth the third joint; length 2 mm. (D. C., Penn., Mont., Ida., Manitoba) ..... *crassicornis* Greene

– Notum, upper pleurae, coxae and femora subshining, knees and tarsi more or less brown, front and face bright to dull yellow, sides of thorax usually more broadly yellow along notopleural suture, expanding upward along transverse suture 2

2. Third antennal joint rotund, the style less than half as long as the joint, second vein meeting first to form a small but distinct triangular marginal cell 3

– Third antennal joint pyriform, about twice as long as deep, the style about half as long and one-third as thick as the third joint, second vein arising proximally so that the marginal cell is virtually crowded out, metatarsi yellow, abdomen wholly black; length 1 mm. (Cal.) ..... *metatarsalis* Melander

3. Wings shortened, with semicircular apex, anal and posterior veins almost as strong as anterior veins, head black, abdomen wholly black, length 1.5 mm. (Cal.) ..... *rotundipennis* Melander

– Wings with parabolic apex, posterior veins weak and translucent 4

4. Antennal style one-fourth as thick and nearly one-half as long as third joint, abdomen subopaque black; length 1.24 mm. (Cal.) ..... *pumila* Melander

– Antennal style thin, one-sixth as thick and much less than one-half as long as third joint; abdominal segments with more or less evident yellowish hind margins 5

5. Yellow of hind margins of abdominal segments somewhat triangularly widened laterally, abdomen dull. (Mont., Ida., Wash.) .....*fasciata* Melander

– Hind margins uniformly and narrowly yellow, abdomen shining (Cal.) .....*nanella* Melander

Glabellula fasciata Melander, new species

Male. Length 1.2 mm. Depressed yellow part of front reaching almost to anterior ocellus, with central black spot; face yellow almost to oral margin; proboscis slightly projecting; third antennal joint rounded oblong, one-fifth longer than deep, style about one-fourth as long as third joint. Humeri, spot at transverse suture and posterior calli light yellow; upper pleurae mostly yellow. Sixth and seventh tergites tipped with uniform yellow margin, segments two to five marked only with yellow lateral triangles progressively increasing in size. Legs blackish, knees narrowly brownish. Wings hyaline, anterior veins dark brown, other veins translucent; knob of halteres yellowish.

Female. Sides of mesonotum widely yellow, mesopleura with large diamond-shaped yellow mark, humeral mark extending down to front coxae and back along upper pleurae to below wing. Yellow lateral marks of abdomen larger than in male, those of fifth segment meeting.

Holotype and allotype: BLEWETT PASS, CASCADE MOUNTAINS, WASHINGTON, July 17, 1920. Seven *paratypes:* with the types; Kamiac Butte near Pullman, Washington, July 25, 1914; Moscow Mountain, Idaho, July 13, 1907 and Saltese, Montana, August 22, 1916.

Glabellula metatarsalis Melander, new species

Female. Length 1 mm. Front yellow almost to anterior ocellus but with a round black supra-antennal spot, face yellow to the black cheeks, carinate, half as wide as the front; antennae longer than in the other species, style one-third as thick as last joint; proboscis scarcely protruding. The short pubescence of notum, scutellum and abdomen white, notum shining black, humeri and posterior calli light yellow, notopleural suture dull yellowish, encroaching on transverse suture and on pleurae; pleurae mostly black, an oval yellow spot over front coxae and an irregular line over the others. Abdomen wholly black. Legs black, apex of femora fuscous, metatarsi yellow. Wings hyaline, apically semicircular, anterior veins brown, others translucent; halteres white, the stalk dull yellowish.

Holotype: BOREGO, CALIFORNIA, April 3, 1946. *Paratype:* Palm Springs, California, April 3, 1925, on mesquite, P. H. Timberlake, collector, in Citrus Experiment Station.

Glabellula nanella Melander, new species

Male. Length 1.25 mm. Depressed area of front three times as wide as high, not attaining front ocellus, yellow, with a round black supra-antennal spot, face yellow on upper two-thirds; proboscis scarcely projecting; third antennal joint rotund, style one-fifth as long and one-sixth as wide as third joint. Humeri, lateral spot at transverse suture and postalar calli pale yellow; humeral spot extending down on pleurae to base of front coxae and horizontally to root of wing, a horizontal yellow line across top of ster nopleura. Hairs of abdomen brownish, venter black. Legs black, knees yellowish extending on both femora and tibiae, hind metatarsi brown. Wings hyaline, anterior veins blackish, posterior veins thin and translucent, marginal cell very small, twice as long as its greatest width, apex of wing almost semicircular.

Holotype: CAMP ANGELUS, on the west side of SAN BERNARDINO MOUNTAIN, CALIFORNIA, elevation 5800 feet, May 26, 1947. A crushed specimen from the South Forks of the Santa Ana River, about eleven miles east of Camp Angelus, elevation 6250 feet, June 19, 1945, is probably the same, but the incisures of the shining abdomen do not show yellow.

Glabellula pumila Melander, new species

Male. Length 1.25 mm. Depressed area of front twice as wide as long, dull yellow, with a round median black spot, upper half of face dull yellow; proboscis scarcely projecting; third antennal joint circular, style relatively stout. Humeri, postalar calli and connecting line yellowish, notal pubescence short and grayish, pleurae finely coated except center of sternopleura, the yellowish marks of pleurae vague. Abdomen almost completely black, only a linear indication of pale hind margins at the sides. Knees and hind metatarsi brown, rest of legs black. Wings hyaline, anterior veins blackish, posterior veins thin, pedicel of third vein (i. e. underside of marginal cell) half as long as following section, posterior crossvein of same length as anterior crossvein, apex of wing paraboloid.

Holotype: MILL CREEK in the SAN BERNARDINO MOUNTAINS, CALIFORNIA, at elevation 6000 feet, July 18, 1947, on *Rhamnus californica*, collected by P. H. Timberlake, in collection of Citrus Experiment Station. Without knowledge of the extent of variability in *Glabellula* this specimen is given species rank. The dimensions of the antennal style and third joint seem to be fairly constant in the genus and in this instance set *pumila* apart from its nearest relatives, *nanella* and *fasciata*.

(Continued)

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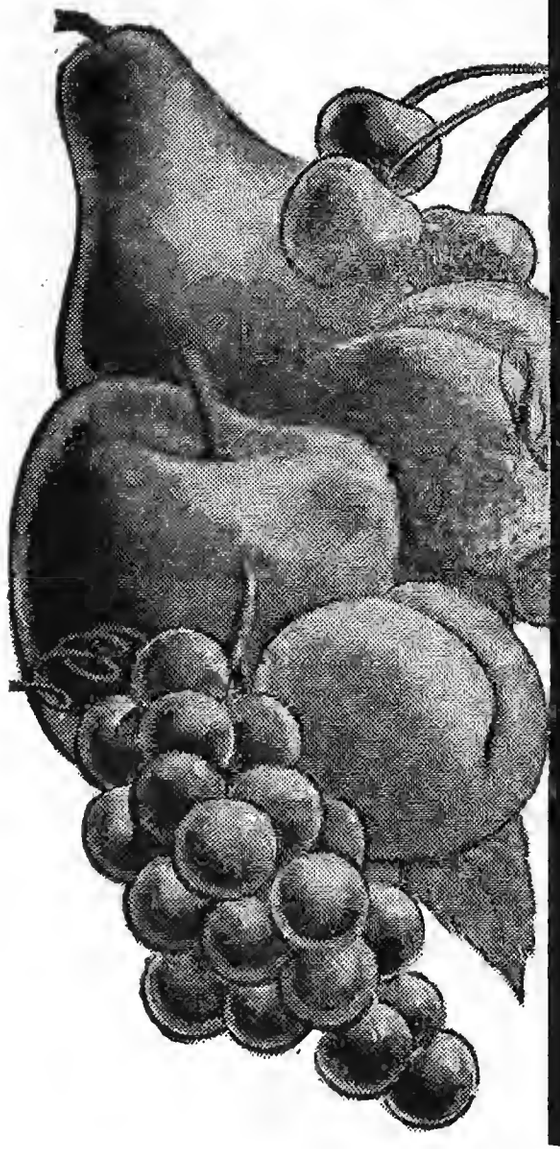

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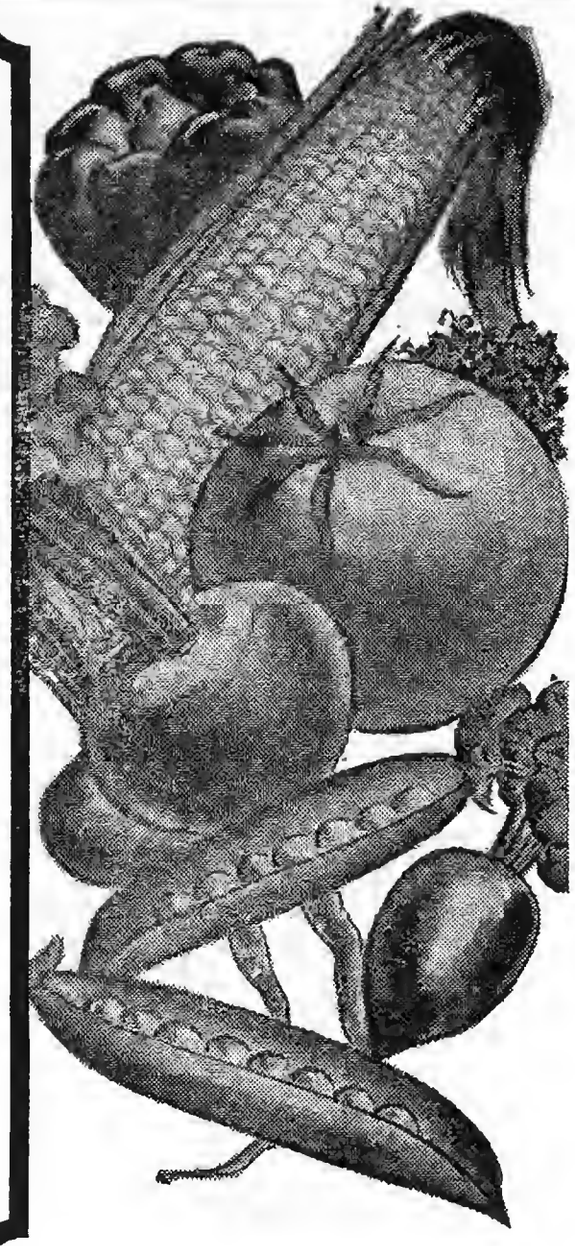

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TAXONOMIC NOTES ON SOME SMALLER BOMBYLIIDAE

(Diptera)

BY A. L. MELANDER[1]

(Continued from last issue, p. 144)

Glabellula rotundipennis Melander, new species

Male. Length 1.3 mm. Depressed part of front dull brownish, face black; third antennal joint oval, one-fourth longer than deep, style short and thick, one-half longer than wide and one-fourth as long as third joint; proboscis slightly projecting. Humeri, narrow notopleural suture and posterior calli yellow; pleurae with an irregular inconspicuous yellow median line. Abdomen altogether black, opaque, its hairs black. Legs black, apex of femora slightly brownish. Wings lightly infuscated, veins blackish; halteres dull yellowish, the stalk brown.

Holotype: South Forks of Santa Ana River, San Bernardino Mountains, California, at elevation 6250 feet, June 18, 1945. A female from Camp Baldy, San Gabriel Mountains, California, July 1, 1945, has the hind margin of the seventh abdominal segment narrowly yellow.

Prorates Melander

Syn.: *Alloxytropus* Bezzi, Bull. Soc. Roy. Entom. Egypte, 1924: 186 (1925).

In Entomological News, 1906, p. 372, I erected the genus *Prorates* for a small species, *claripennis*, from New Mexico, placing it in the subfamily Hybotinae of the Empididae. Reviewing the genus in Genera Insectorum, fasc. 185: 376 (1927) I transferred it to the Bombyliidae within the subfamily Heterotropinae.

The Bombyliid genus *Alloxytropus* Bezzi, known from two Egyptian species, is the same as *Prorates*. Efflatoun has published lengthy and well illustrated descriptions of the palaearctic species (Bull. Soc. Fouad 1er Entom. 1945). His specimens were taken in the heat of early afternoon as they hovered slowly.

On May 3 and 4, 1945, I took a dozen specimens of *P. claripennis* inside my automobile while in camp at Palm Canyon in the Borrego Desert in Southern California. The flies were taken early in the morning on the windshield and windows as they endeavored to escape from the car, which they had entered for the night.

Apystomyia Melander, new genus

Eyes of male contiguous from ocelli almost to antennae, not notched, the facets of upper two-thirds coarse, lower facets abruptly minute; front of female very broad above; occiput quite flat; ocelli of male large, on the elevated vertical triangle; mouth opening broad and large, obliterating the face, the cheeks wide, eyes distantly separated below; antennae inserted low on head, basal joints minute, third joint rotund and compressed, microscopically pubescent, the apical style cylindrical, blunt, about one-third as long as the third joint; mouth parts vestigial, fleshy, not projecting. Thorax glistening jet black, with long coarse hairs, scutellar margin setose; pleurae bare. Abdomen slender, tapering, pilose in male, not tomentose, pygidium minute, globular, with two small erect spatulate dorsal palps enclosed by a pair of almost triangular lateral valves tipped with a few setulae, ventral piece small. Legs with coarse hairs, almost setose on femora and tibiae, without tomentum, pulvilli present. Wings very delicate, costa continuing to fourth vein, first vein chitinized, other veins of male thin and translucent, anal lobe very large, alulae moderate, third vein forked near tip of wing, fourth vein forked, the petiole of second posterior cell about as long as posterior crossvein, discal cell narrow, elongate, anterior crossvein at basal third, petiole of anal cell about as long as the arched anal crossvein; calypteres with nearly straight edge, heavily fringed.

Genotype: *A. elinguis* Melander, new species, following.

This enigmatical little fly does not seem to be related to any other genus, and its assignment to the Heterotropinae is made because it does not conform with any other subfamily or family. Superficially the neuration is of the same pattern as *Prorates*, that is, the same veins and cells are present, but the proportions and dimensions of vein sections are so wholly dissimilar that the resemblance can at best be only coincidental.

Because of the almost complete absence of the ambient vein the genus will key to the Scenopinidae in Curran's Manual, etc., but it will be recalled that also in *Prorates* as well as in *Caenotus canus* the costa stops near the tip of the wing. *Apystomyia* has

very delicate neuration, with the fourth vein forked and the anterior crossvein toward the base of the discal cell, an abundance of rather stiff pile, and a strong antennal style, all of which characters preclude inclusion in the Scenopinidae.

Apystomyia elinguis Melander, new species

Male. Length 3 mm. Black, head and thorax polished, abdomen and legs subopaque; hairs of head and thorax abundant, rather stiff and black, of abdomen finer and white. Sides of occiput with dense coarse pile directed laterally; ocellar triangle with four erect stiff hairs; the very small front with two projecting long hairs; hairs of the wide cheeks numerous and less stiff. Hairs of thorax well separated, but long, erect and rather stiff, denser above notopleural suture, scutellum with twelve long marginal hairs. Abdominal hairs long on basal half, becoming shorter caudally. Inferior hairs of front femora black, about three times diameter of the joint, hairs of posterior femora finer and white; front tibiae with an extensor row of eight hairs; middle tibiae gradually enlarging distally, with a subapical stout broad spur underneath, at base of which the tibia is strongly excised, with ten extensor hairs and underneath with a closer row of hairs which are small along the middle, the last one a stout seta; hind tibiae with a double row of extensor hairs, the anterior ones black, the posterior row white, no hairs beneath; last third of middle metatarsi strongly capitate; basal half of hind metatarsi and all of third and fourth joints white. Wings milky translucent, root black, costa and first, second and third veins mostly brownish though thin, other veins translucent whitish, third vein forked just before end of second vein, the branch only slightly arched and two-thirds as long as last section; alula with long white fringe, calypteres black anteriorly, white behind, the fringe long and white; halteres wholly full black.

Female. Occiput without the lateral bunches of hairs; hairs of thorax less abundant, six scutellar bristles; abdomen quite bare; hairs of legs inconspicuous, all black, middle legs normal, hind tarsi wholly black. Wings subhyaline, not milky, posterior veins more or less like anterior.

Holotype and allotype: WRIGHTWOOD, on the north slope of SAN GABRIEL MOUNTAINS, CALIFORNIA, May 24, 1945. The specimens were discovered in sweepings from vegetation along the small stream which later disappears in Sheep Creek Canyon. *Paratypes:* Five males, six females: with the types, and Sheep Creek Canyon, same day; Camp Angelus and Sugarloaf Mountain in the San Bernardino Mountains, May to July; and near Keene Camp on Mount San Jacinto, June 7, 1942. The specimens from Sugarloaf

Mountain were found along the overflow from a small spring at elevation about 7000 feet. The species seems to be subalpine and attracted to moisture.

Apystomyia, Greek, literally, a fly of which nothing is known; *elinguis,* Latin, without a tongue.

CAENOTUS Cole

The genus *Caenotus* was originally placed in the Therevidae, from which family it differs in the lack of bristles, the short antennae, and in having the second basal cell pointed distally, without being blunted by the characteristic "small crossvein." Cole described two closely related species, *inornatus* with four posterior veins and *minutus* with three veins from the discal cell. Both species were taken at Alamogordo, New Mexico, with *Prorates claripennis* at Highrolls, near by.

In the Genera Insectorum, fasc. 185: 376 (1927) I transferred *Caenotus* to the Bombyliidae, where it can be placed in the subfamily Heterotropinae. *Caenotus minutus* and the following new species key to the Bombyliidae in Curran's Manual, but *inornatus,* because of its five posterior cells, leads to the Therevidae.

KEY TO THE SPECIES OF CAENOTUS

1. Discal cell emitting four posterior veins; hind tibiae yellowish; male genitalia wholly luteous. (N. Mex.) ....*inornatus* Cole
– Discal cell emitting three posterior veins; legs blackish; male genitalia more or less blackened 2

2. Thorax of male openly pilose, notal hairs erect; pygidium posteriorly open below and with a pair of projecting caudal styles; facets of male eyes nearly uniform above antennae 3
– Thorax nearly bare, the sparse notal hairs short, reclining and white; pygidium closed, spherical, without projecting caudal processes; uppermost facets of male much smaller than those toward antennae. (Cal.) .....*canus* Melander

3. Pile of head and mesonotum white; wings slightly milky because of the white microtrichia, second submarginal cell evenly enclosing wing-tip; body opaque, lightly cinerous; eighth tergite of male not developed. (N. Mex.) .....*minutus* Cole
– Pile of head and mesonotum mostly black; wings clear hyaline, branch of third vein ending just before wing-tip; body black, the abdomen shining; eighth tergite of male subequal to seventh. (Ariz.) .....*hospes* Melander

Caenotus canus Melander, new species

Male. Length 3 mm. Black, head and upper side of body lightly coated with cinereous pollen, more densely on mesonotum. Upper occiput concave, the hind margin of the eyes forming a broad V, ocellar triangle not protuberant, facets near ocelli as small as those of the sunken lower area of the eye; chin with a few white hairs; mouth parts retracted; third joint of antennae conical, two and one-half times as long as wide, the apex scarcely constricted. Hairs of rear of notum and of scutellum sparse, short and erect; mesopleura with a few fine white hairs; sternopleura polished below. Hairs of abdomen scattered and inconspicuous; pygidium polished black, its hairs sparse and pale, eighth tergite not developed; venter glabrous, first four segments polished, remainder lightly cinereous. Legs black, hairs inconspicuous. Wings hyaline, broader than in the other species, veins brownish becoming paler towards base, sides of second submarginal cell nearly parallel, third vein (R_5) ending at wing-tip, costa continuing to third vein, no ambient vein, the three posterior veins not reaching margin, anal cell three times as long as wide, last section of anal vein two-thirds length of anal crossvein, anterior crossvein at middle of discal cell; halteres with large white knob, the stalk dusky.

Holotype: About five miles south of ADELANTO, CALIFORNIA, May 23, 1945.

Caenotus hospes Melander, new species

Male. Length 4-5.5 mm. Black, the pollen of head and thorax dark gray, scutellum and whole abdomen shining. Upper occiput not encroaching on eyes, ocellar triangle elevated, its black hairs proclinate, upper facets virtually uniform, the ventral area of small facets not sunken; chin and palpi black-pilose; basal joints of antennae with rosette of hairs; third joint with nearly round base and subequal thick styliform end. Notal pile rather dense, erect and black, but the hairs of humeri, mesopleura and sternopleura white, sternopleura not shining; front edge of mesonotum marked with a white pruinose spot on each side next to the humeri. Hairs of abdomen long and fine but shorter on ventral segments; pygidium distinctly longer than wide, the upper cover deflexed apically at the sides. Legs black, the femora with fine whitish hairs. Wings hyaline, veins light brown becoming yellowish at base, costa thinning at tip of wing but continuing as the ambient vein around hind margin, second submarginal cell widening apically, all veins reaching margin, anterior crossvein at middle of discal cell, anal cell four and one-half times as long as wide, last section of anal vein not half the length of the anal crossvein; halteres white, the stalk dusky at base.

Female. Pubescence much shorter, hairs of chin, palpi and sides of notum whitish, notal pubescence mostly reclinate; head and notum mostly brownish-pollinose; front two-thirds as wide at ocelli as at antennae, uniformly opaque. Wings lightly infumated, veins dark to base. The head is relatively smaller and the abdomen longer than in the male.

Types: ORGANPIPE CACTUS NATIONAL MONUMENT, southern ARIZONA, at Headquarters camp, 62 males and 6 females, taken during the latter part of April, 1947 and 1948. Nearly all the specimens were found on the outside of the windows of our house trailer during the day. A very few were attracted to light. One specimen has the second posterior cell separated from the pointed discal cell by a short petiole.

Heterotropus senex Melander, new species

Male. Length 4 mm. A short, stocky, black, opaque, heavily glaucous, white-pilose fly with massive pygidium, separated eyes and rather long antennae. Most of the insect is black, but the front except upper third, face and cheeks are yellow, three-fourths of the tibiae and apical parts of pygidium are reddish yellow, abdominal incisures are obscurely yellowish and the halteres are mostly whitish. Eyes separated more than the width of an ocellus, lower facets smaller than upper, front and face bare, cheeks and chin with long loose hairs, pile of upper occiput and ocellar triangle curved, face one-fifth as long as front; antennae as long as head, first antennal joint twice the size of the globular second joint and furnished with loose long hairs, third joint subulate, twice as long as basal pair, the thick apical style one-third as long as the third joint and appearing as a continuation of it, under high magnification the apex shorn off below and bearing a minute sensilla in the middle of the depression; proboscis strong, about head-height, obliquely porrect; palpi slender, apparently two-jointed. Hairs of mesonotum and scutellum erect and uniformly distributed, mesopleura with scattered hairs, pleurae otherwise bare. Abdomen clothed with similar hairs, shorter on venter; pygidium comprising a large dorsal hood beneath which are two strong claspers having their apex spoon-shaped, curved outward and chitinized, ventral piece heavily convex, its apex deeply emarginate. Legs with normal pubescence, becoming pilose under femora; middle tibiae with two small apical spurs. Wings hyaline, veins yellowish at base, becoming brown, first vein ending opposite posterior crossvein, third vein forked nearly midway between anterior crossvein and wing tip, the branches greatly diverging to include tip of wing, anterior crossvein slightly before middle of discal cell, anal cell closed at margin, ambient vein strong.

Holotype: ORGANPIPE CACTUS NATIONAL MONUMENT, ARIZONA,

at Headquarters, April 16, 1948, taken on flowers of desert marigold, *Baileya multiradiata.*

This is the first record of the occurrence of this palaearctic genus in America. Engel, 1937, listed twenty-six named species and varieties, and these show a sufficient range in color and structure to admit the American species to the genus without question.

HETEROTROPINAE

Heterotropus, Caenotus, Prorates and *Apystomyia* may be grouped together in the subfamily Heterotropinae. As such they are differentiated from the other Bombyliidae by having the occiput flattened, eyes of male bisected into two sizes of facets but not indented behind, tibiae without seriate spines, third vein forked, first posterior cell open and anal cell petiolate. To provide for these genera the following modifications may be made in Curran's key in his Manual, pp. 195, 197. *Oncodocera* and *Phthiria* are not related, but key into this group.

19. With four or five posterior cells 24
24. First posterior cell open 31
31. Two submarginal cells 36
36. Anal cell closed 37
37. Proboscis projecting beyond the anterior oral margin 39
— Proboscis short, not projecting beyond the anterior oral margin .....b
39. The intercalary vein between the fourth and fifth veins arising from the discal cell .....a
— The intercalary vein arises from the fourth vein, the second posterior cell petiolate; no ambient vein; third antennal joint conical, style microscopic .....*Prorates* Melander
a. Third antennal joint subulate; costa continued around hind margin as the ambient vein .....*Heterotropus* Loew
— Third antennal joint scarcely tapering, the apex excised or more or less truncate, with a microscopic sensory hair; proboscis long, labellae narrow; ambient vein stopping at anal vein .....*Phthiria* Meigen
b. Abdomen much broader than the thorax and densely pilose; hind margin of eyes concave and indented, facets uniform in male .....*Oncodocera* Macquart
— Abdomen elongate and not furry; eyes not indented behind, facets of two distinct sizes in male c
c. Third vein forked near discal cell, second posterior cell sessile, discal cell shorter than basal cells; thorax opaque pollinose— .....*Caenotus* Cole
— Third vein forked near apex of wing, second posterior cell long-petiolate, discal cell longe rthan basal cells, thorax glistening jet black .....*Apystomyia* Melander

CYLLENIINAE

Exepacmus nasalis Melander, new species

Female. Length 5 mm. Face strongly protuberant, conical, the head transversely impressed at antennae, face shining black, almost bare but with some white pruinosity in back, cheeks yellowish, receding, front black, mostly shining, orbits narrowly and anterior part continuing on facial orbits, white-pruinose, pile scattered, erect, wholly black, front three-fourths as wide at ocelli as at antennae, slightly convex; occiput deeply grooved behind ocelli, the sides swollen, pile short and whitish above, absent below; first antennal joint almost cubical, second joint very short, third joint about twice length of basal joints together, with short pyriform base smaller than first joint, and with thickened styliform process nearly twice as long and half as deep as base, the apical two-thirds of the end process slightly expanded and terminated by a weakly sutured square style bearing a minute seta. Thorax opaque black, with whitish tomentum and hairs, scutellum with eight yellow marginal bristles; pleurae whitish-pilose above, centrally with white tomentum. Abdomen opaque blackish, tomentum yellow above, white on venter, hairs sparse and yellow, a few black hairs dorsally at rear of segments, most abundant on seventh segment, eighth segment large, deflexed, rufous, distally with appressed golden fringe, genitalia tipped with rosette of yellow spines. Coxae and femora black, bearing white scales, knees briefly and tibiae yellowish, hind femora and all tibiae with strong seriate black spines, tarsi black, base of middle metatarsi yellowish, pulvilli as long as claws. Wings hyaline, veins firm, second vein arising from third at basal fourth of discal cell, forming an angle of about 70 degrees and then rounding off, anterior crossvein at middle of discal cell, third and fourth veins apically nearly parallel, apex of anal cell slightly narrower than that of first posterior cell; halteres yellow.

Holotype: SHEEP CREEK CANYON, four miles south of PHELAN, CALIFORNIA, April 25, 1946.

The species agrees well with Coquillett's description of the genus and *E. johnsoni*, the only other species, except that the genotype has the face, base of antennae and femora yellow. Apparently the face of the new species is more protuberant and the antennal depression is not mentioned by Coquillett.

Exepacmus has the knee-like origin of the second vein similar to that in *Exoprosopa*, but the second vein arises much before the anterior crossvein.

DESMATONEURA ARGENTIFRONS Williston

This genus and its single species was described in 1895 from a single male from Albuquerque, New Mexico. It measures 8

millimeters, has black legs with the knees alone yellowish, the wings broadly brownish across the middle with the distal part of the wing cinerous. I have received through Dr. H. Hagan two females collected August 1 and 2, 1918 at Lynndyl, Utah, by George E. King, that may be the dimorphic other sex of *argentifrons*. They differ in size, being 4 and 5 millimeters long, in having yellowish tibiae and nearly hyaline wings, uniformly but slightly infuscated, the costal cell fuscous almost to end. One specimen has the origin of the second vein about twice the length of the anterior crossvein from the latter, as in Curran's figure 80 in his North American Diptera, page 199, but the anal cell is two-thirds as wide as the first posterior cell on the margin. The other specimen is abnormal in having the anterior crossvein duplicated in the right wing, but in the left wing the knee of the second vein arises at a distance the length of the anterior crossvein from the latter, and the anal cell is almost closed, as in Curran's figure.

Female. Postocellar groove deep, front broad, widening below to slightly more than twice the distance between the eyes at the vertex, moderately white-pollinose, with short white proclinous pubescence, the front edge yellowish; antennae widely separated, the third joint with bulbous base and styliform process as in most species of *Aphoebantus;* face retreating. Tomentum and hairs of body whitish. Tip of abdomen and last ventral segments yellowish.

PARACOSMUS Osten Sacken

Loew described (Centuries X, 48) *Allocotus* n. gen. *edwardsii* from a female from California. Osten Sacken (Western Diptera, 262) noted that *Allocotus* was twice preoccupied and established the name *Paracosmus*. Later (Biol. Centr.-Am., Dipt. I, 155) Osten Sacken described a second species, *P. morrisoni,* from Sonora. From the descriptions it should be possible to separate the two. *P. edwardsii* has a distinct row of median triangles along the abdomen, black halteres, and the front of the female white-pollinose except above and below. In *morrisoni* the margins of the abdominal segments are uniformly whitish, the halteres more or less yellow, and the frontal orbits alone are pollinose. When trying to allocate the 44 specimens before me I would assign those from California to *edwardsii* and those from Arizona and New Mexico to *morrisoni.* This is in agreement with material determined by Coquillett and C. W. Johnson, but Cole identifies the Californian specimens as *morrisoni.*

There is much intergrading between *edwardsii* and *morrisoni*, so it is doubtful if two species exist. The size of the white triangles on the abdomen varies and especially in the females has a tendency to flatten out; the color of the halteres is not reliable; and the extent of the pollen on the front of the female is subject to much variation. Venation, pollinosity and color of the face are of no help. The characters selected for the following table show some correlation, but identification will depend on which side of the couplet holds most agreement with the specimen. *Paracosmus insolens* Coquillett is a distinctive species, and the new species, *rubicundus*, is quite unrelated to the others.

KEY TO THE SPECIES OF PARACOSMUS

1. Head and body almost wholly black; lower occiput polished; front of female largely polished, of male argenteous; antennae black; veins black; pygidial parts large, projecting caudally....2
– Head, body and legs almost wholly or largely yellow; first antennal joint yellow; veins mostly yellow; pygidial parts very small; front and occiput silky .....*rubicundus* Melander

2. Femora and tibiae reddish or brown; hairs in front of halteres loose; anterior crossvein distinctly beyond middle of discal cell; first antennal joint about twice as long as second; lateral valves of pygidium not lobate; size 5 - 10 mm. 3
– Legs black, only extreme base of tibiae yellowish; a dense cluster of silver-white pile in front of halteres, similar dense pile along notopleural suture and at sides of first abdominal segment; anterior crossvein near middle of discal cell; basal antennal joints subequal; lateral valves of pygidium ending in large incurved lobes; size 3.5 - 4.5 mm .....*insolens* Coquillett

3. Whitish abdominal fasciae expanding in the middle into a series of triangles decreasing in size posteriorly; front of female pruinose except anterior third and at vertex, twice as wide at antennae as at ocelli; halteres usually blackish; lateral valves of pygidium nearly as wide near apex as near base, all black, ventral piece rotund and not tapering; veins black to brown.....*edwardsii* Loew
– Whitish abdominal fasciae without definite triangular expansions in middle; front of female pruinose narrowly along orbits, scarcely twice as wide at antennae as at ocelli; halteres usually paler; lateral valves distinctly narrower apically, usually with yellowish border, ventral piece shaped somewhat like a scorpion's stinger; veins yellowish to brown .....*morrisoni* Osten Sacken

Paracosmus rubicundus Melander, new species

Male. Length 5.5 - 7.5 mm. Vertex blackish, about one-third as wide as lower front, center of occiput black in ground color, roof of oral cavity narrowly blackish, remainder of head flavous, mostly sericeous, cheeks shining; second joint of antennae blackish, third joint wholly black, elongate elliptical, four times as long as wide, widest at middle, the apex obliquely truncate, longer below, with a microscopic sensilla at upper angle; proboscis one-half longer than head, black except basal sheath, palpi very slender, U-shaped, the enlarged tip black. Disk of thorax black, with close appressed pubescence, sides largely flavous, hairy in front of wings; scutellum with small blackish median spot at base; pleurae marked with blackish on lower mesopleura and near legs, mesopleura and hypopleura hairy, anterior pteropleura shining; all vestiture whitish. Abdomen robust, first segment and hind margins of others flavous, remainder reddish, the sides of segments three and four each with an oval black spot; genitalia not projecting, the sides of the ninth segment infolded as short flaps, ventral piece rotund but small. Tarsi apically brown, anterior pairs with minute pulvilli, no pulvilli on hind tarsi. Wings hyaline, anterior crossvein at two-thirds discal cell, third vein without spur, first posterior cell at margin three times as wide as end of anal cell; halteres ivory white.

Female. Vertex half as wide as lower front; genitalia forming a round truncated end to the abdomen, the sides with long golden fimbria.

Types: SONORA, MEXICO, 83 kilometers south of the Border, on the road to Rocky Point, April 21, 1947. The flies were found in considerable numbers on the sand dunes from which they were reluctant to fly. Finally, they were caught by laying the net flat on them and removing them with the fingers, often a painful operation for the dunes were filled with long-spined barbed sandburs, usually just hidden under the sand. Professor Timberlake and I found the species also near Palm Springs, California, on May 6, 1946. There are 22 paratypes.

This species differs strikingly from the black species in color, sericeous not shining coating, reduced pulvilli, small pygidial parts, and elongate third joint of the antennae. The black females have the end of the abdomen compressed.

KEY TO THE SPECIES OF METACOSMUS

1. Face, cheeks and chin mostly pale yellow; legs largely yellowish; anal cell narrowed apically though wide open; abdomen bare 2

– Face, cheeks and chin mostly black; legs black, anal cell not tapering apically; abdomen pubescent. (Cal.) .....*nitidus* Cole

2. Legs yellowish brown; anterior crossvein at last third of discal cell; stem of halteres brown. (Cal., Ariz.) .....*exilis* Coquillett

– Legs partly black, the extreme base of hind femora, apical part of anterior tibiae and base of tarsi yellow; anterior crossvein at three-fifths the discal cell; stems of halteres white. (Penn.) .....*mancipennis* Coquillett

Curran has figured the wing and head of *mancipennis* in his Manual of the Genera of American Diptera. F. X. Williams has collected *exilis* in the Huachuca Mountains, Arizona (Citrus Experiment Station collection). Timberlake has *nitidus* from Santa Rosa Mountains, California, at 7500 ft. altitude, and I have taken the same species at the South Forks of the Santa Ana River, in the San Bernardino Mountains, at 6300 feet.

NOTES ON CERTAIN MEXICAN COCCINELLIDAE

(Coleoptera)

BY BORYS MALKIN

University of Washington, Seattle

During the summer of 1947 the writer spent three months collecting insects in various parts of Mexico, mainly in the states of Nayarit and Oaxaca. In the coleopterous family *Coccinellidae* about forty species were accumulated. Of these, five seem to be new records for Mexico and were not listed in the Blackwelder catalogue[1] of the Latin American beetles. The following species of *Scymnus* the writer regards as new.

[1]Blackwelder, R. E. 1945. *Checklist of the coleopterous insects of Mexico, Central America, the West Indies, and South America.* Part 3. U. S. Nat. Mus., Bul. 185.

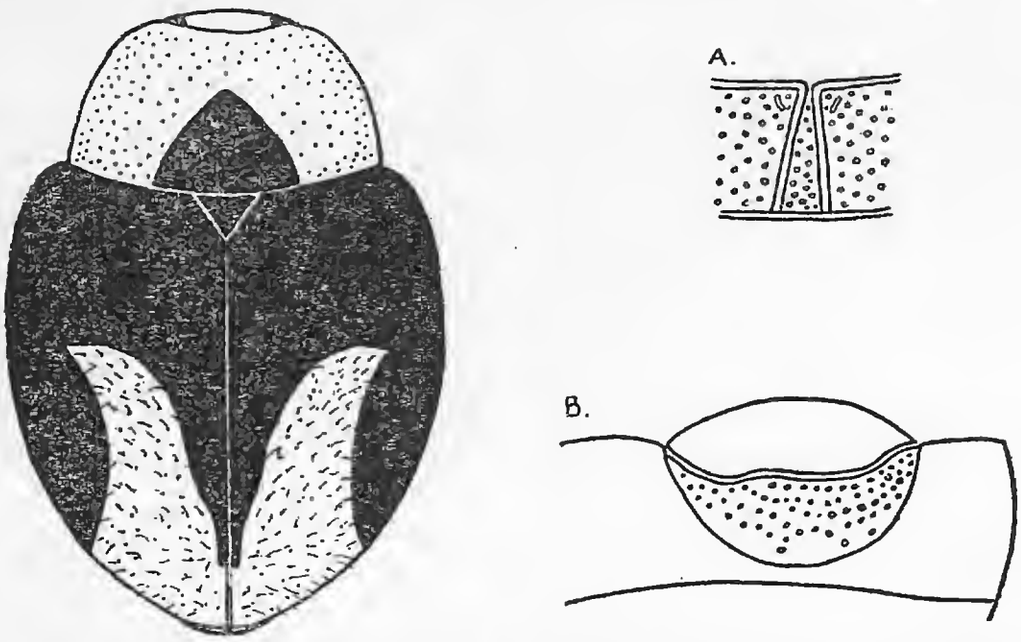

Fig. 1. *Scymnus mexicanus* Malkin, new species. A. Prosternal carinae. B. Abdominal plate.

Scymnus mexicanus Malkin, new species

Head: Dark, yellow-brownish, strongly punctured. Clypeus yellow. Palpi conical, yellow. *Pronotum:* very regularly curved, slightly more than twice as wide as long. Distinctly but not very strongly punctured and with dense golden pubescence. Color of thorax yellow with the usual black spot in the center reaching the base of the elytra. *Elytra:* very slightly longer than wide. Shining black except for the posterior portion where there is a brown-red spot on each elytron. These spots are prolonged into a spur and reach the middle of the disc, and coalesce only at the apex of elytra. Punctures on the elytra distinct and denser toward the sides. Yellow pubescence pressent throughout. Epipleura black except at the extreme apex where they are brown. *Prosternum:* yellow, darkened in the middle. Coarsely and closely punctured. Prosternal carinae converging in front, very distinct and uninterrupted. *Metasternum:* smooth, shining glabrous in the middle and sparsely pubescent toward the sides, with a feeble median impression. Punctures present on the sides, sparse. *Abdomen:* black, indistinctly punctured. Abdominal plates regularly curved not reaching the basal line of the first segment. *Legs:* dark yellow, femora darker in the middle. Length 2.1 mm., width 1.5 mm.

Type, of undetermined sex, in the American Museum of Natural History, New York. The specimen was collected by the writer at SALINA CRUZ, OAXACA, MEXICO, July 9-17, 1947, while sweeping miscellaneous vegetation. Salina Cruz is a port on the Pacific coast in the Isthmus of Tehuantepec region. It is an arid area approaching the conditions of the Sonoran Desert.

This species does not seem to be related very closely to any of the known Mexican forms of *Scymus* but comes quite close to *S. postpinctus* Csy., described from Wyoming[2]. From this it differs in somewhat smaller size, rounder form, sparser punctulation of the dorsal surface, entirely dark sides of the elytra, a well defined prosternal carinae, and larger and better defined elytral spots.

The additions to Blackwelder's catalogue are as follows:

Hyperaspis rotunda Csy.—Tequixistlan, Oaxaca, July 18 (1 specimen). Described from Texas and Louisiana.

Brachyacantha bolli Cr.—Monte Alban, Oaxaca, Sept. 14 (1 specimen). Former distribution as above.

Brachyacantha bistripustulata decora Csy.—Oaxaca, Oaxaca, July 20-24 (1 specimen). Described from Texas.

Brachyacantha bistripustulata guttata Weise—Oaxaca, Oaxaca, July 20-24 (6 specimens). This variety was taken with a very large number of *B. bistripustulata* (Fab.). The latter was also collected at Tepic, Nayarit, and Tolosa, Oaxaca (Atlantic slope of the Isthmus of Tehuantepec, in tropical rain forest), while I have seen specimens taken by Mr. B. E. White at Brownsville and Uvalde, Texas. Mr. White has also taken the variety *guttata* at Omos Park, Texas (all of his records in July, 1941) which incidentally would represent a new record for *guttata* in the United States. Blackwelder lists this variety only from Colombia, S. A. As all these records cover a very wide and diverse topographical province the exact status of the variety *guttata* is uncertain.

Brachyacantha tau Lec.—Oaxaca, Oaxaca, July 20-24 (several specimens), September 13-20 (3 specimens). Previous records are from Nebraska and Montana.

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[2]Casey, T. L. 1899. *A revision of the American Coccinellidae.* Jour. New York Ent. Soc. 7(2): 71-169.

A NEW NAME FOR A CALIFORNIA MOSQUITO

(Diptera, Culcidae)

BY B. BROOKMAN[1] AND W. C. REEVES

The George Williams Hooper Foundation for Medical Research, University of California, Medical Center, San Francisco

P. Galindo, in an unpublished thesis (Contribution to our knowledge of the genus *Culex* in California, Master of Science Thesis, Division of Entomology and Parasitology, University of California, Berkeley, 1943, pp. 49-55) proposed the name *Culex* (*Neoculex*) *reevesi* for a hitherto unknown species of mosquito from the coastal region of California. Wirth included *C. reevesi* Galindo in keys to the Culicidae of California (*in* Usinger, R. L., La Rivers, I., Chandler, H. P., and Wirth, W. W., Biology of Aquatic and Littoral Insects, University of California Syllabus Series, Syllabus SS. University of California Press, Berkeley, March, 1948, p. 230 and 231) in the mistaken assumption that the name had been published. Apparently Wirth based his diagnosis of the species on Galindo's unpublished description. However, since these keys were validly published in a form which complies with recent opinions of the International Commission of Zoological Nomenclature, meeting in Paris in 1948 (Usinger, personal communication), the name *C. reevesi* Wirth must hold under the rules of priority as being the first published for that particular species.

R. M. Bohart (The subgenus Neoculex in America north of Mexico, Ann. Entomol. Soc. Am., 41(3): 342, Sept., 1948) described what he believed to be the same species as that of Galindo, and, in deference to Mr. Galindo, retained the name, *C. reevesi.* However, we have found this species to differ from *C. reevesi* Wirth both in adult and in larval characters and consider it another species. Therefore, *C. reevesi* Bohart becomes a primary homonym of *C. reevesi* Wirth.

In order to clarify this situation, the present authors wish to designate *Culex boharti* Brookman and Reeves, n.n. for *C. reevesi* Bohart, September, 1948 (not *C. reevesi* Wirth, March, 1948).

[1]Sanitarian (R), Communicable Disease Center, Public Health Service, Federal Security Agency, Atlanta, Ga.

A complete description of *C. reevesi* Wirth will be published by us in a forthcoming paper, "New records of mosquitoes from Lower California, Mexico, with descriptions of *Culex* (*Neoculex*) *reevesi* Wirth and the immature stages of *Culex* (*Melanoconion*) *anips* Dyar."

BOOK NOTICE

The Nature of Natural History. By Marston Bates. Charles Scribner's Sons, New York. [10+] 309 p. 1950. Price $3.50.

This is a book written to popularize science, to reveal its methods and motives, its techniques and philosophy, as applied to natural history. It succeeds admirably, helped by Dr. Bates' clarity and humor, and by being written in the first person. Yet it is equally a book for scientists, and especially for entomologists. The thought-provoking ideas and broad viewpoint, the simplification and summarization necessary for his purpose, are helpful to the student who has read voluminously but become lost in the details and failed to emerge with basic principles.

The first half of the book is expository, and moves a little slowly for the naturalist, but is essential for a wide audience. The rest is more philosophical. The author has spent years in the neotropics—indeed most of the manuscript was written at Villavicencio, Colombia—and has been impressed less by the idea of nature red in tooth and claw, than by the cooperation between organisms and within populations. This thought is being expressed widely these days, as in Ashley Montagu's "On Being Human." Whole paragraphs from Bates' book would not sound at all out of place in Overstreet's "The Mature Mind."

In his own words, the first three-quarters of the book discusses "the naming and cataloguing of organisms; their reproduction and development; their relations with the environment and their organization into populations and communities; and finally, their evolution, the explanation of the diversity of organic form and of its fitness or adaptation." For the last he apologizes as follows: "The project is, furthermore, dangerous, because all of my colleagues will read this book (not for information, but to find what mistakes I have made—I do the same thing with their books) and none will agree with the emphasis or the point of view, and they will be volubly dismayed at the topics I have neglected. I am caught, though, because it would be unthinkable to write a book on natural history without a chapter on evolution."

The last three chapters treat on the application of science, its relation to human economy; scientists themselves, personal quirks and all; and the nature of the scientific method. There are 7 pages of annotated selected references, and a full index in 11 pages.

—HUGH B. LEECH.

TWENTY-FIVE YEARS OF MIGRATION OF THE PAINTED LADY BUTTERFLY, VANESSA CARDUI, IN SOUTHERN CALIFORNIA[1]

CHARLES H. ABBOTT

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The British naturalist, C. B. Williams, has for some years been collecting information from correspondents all over the world relating to migratory species of butterflies. In addition, he has made numerous observations of his own in various parts of the world (Williams, 1930; Williams et al, 1942). Yet little seems to have been done to concentrate on a single migratory species in a single region. The studies of Woodbury, Sugden, and Gillette in Utah (Woodbury et al, 1942; Sugden, et al, 1947) and of Beall in Ontario, Canada (1941) are important exceptions.

The author, who is not an entomologist, but who is interested in migration problems from the standpoint of animal ecology, first came in contact with the migration of the painted lady butterfly, *Vanessa* (*Pyrameis*) *cardui,* in the spring of 1924, in what appears to have been the greatest migration of the species since 1901. As a newcomer in southern California, he did not realize that such a migration was an exceptional phenomenon, in spite of the numerous questions which were asked him about it. It was not until the spring of 1925, when during the entire spring he saw only two painted ladies, and when he found that the literature was almost entirely lacking in reports of the 1924 migration, that he realized that here was an ecological problem of a spectacular nature which was being almost entirely neglected. As Redlands is popularly supposed to be strategically located on the migratory routes of birds, it promised to be a favorable location for analyzing butterfly migration.

Since that time there have been three migration years, 1926, 1941, and 1945, none of them involving as large numbers as 1924, but all conspicuous and lasting for several weeks. The plan of analysis has been to organize observers in all parts of southern California for making simultaneous observations and reports. The fact of one interval of fifteen years between migrations shows the difficulty of much organizing in advance (Abbott, 1941, 1946).

[1]A paper presented at a Symposium of the Zoology Division of the Seventh Pacific Science Congress of the Pacific Science Association, New Zealand, February, 1949.

This plan of study has involved in general two parts: detailed records at the University of Redlands with the assistance of students in zoology classes; and reports from other regions in southern California. In 1926 and 1941, I wrote to individuals whom I knew, mostly former students, in locations from which I desired information. In 1945, through lack of time to make contacts by correspondence, I advertised the matter in the press, and this proved to be the most fruitful in results. Of the many volunteer contributors, I wish to mention in particular Mr. Roy Cain of San Bernardino, who, with an occupation making him travel to all parts of San Bernardino County, kept detailed daily records for the entire period of the migration, approaching two months.

The study is a long way from solving any fundamental problems of insect migration. But it has established a few facts which are at least the basis for further work.

In the following summary, migration is used for any mass movement of animals from one locality to another, without assuming any theory as to its cause. Butterflies refers to the species *Vanessa cardui* unless otherwise specified.

DURATION IN TIME

A migration extends over a considerable period of time, approaching two months. The 1924 and 1926 migrations were from early February to late March; the 1941 and 1945 migrations were from early March to late April. Most of the printed accounts, such as those of California observers summarized by Williams, deal only with a few days at the height of the migration.

The beginning of a migration can be noted by observing that the butterflies are all flying in the same direction, each one in a straight line. When ten butterflies are seen crossing a city street at the same angle in a distance of half a mile, it is time to open a notebook.

Each year's migration consists of a series of waves, the numbers increasing more or less daily to a maximum, then diminishing and increasing again. In 1926 and 1941 there were thus three peaks of maximum abundance at scattered intervals. In 1945 there were apparently three peaks within two weeks, so close together as to make separation somewhat uncertain. The relation of the waves to weather conditions is discussed later in this paper.

GEOGRAPHICAL EXTENT

The geographical extent should be considered in relation to the map of southern California (figure 1). It appeared to vary slightly in the different years, yet this variation may have been due to incompleteness of reports from certain regions. The 1941 records show best the complete path of migration from Campo on

Figure 1. Map of Southern California, showing the principal localities referred to. Migrants were reported from all these points in 1945, except those marked 1941. Cajon Pass is the principal pass through the mountain ranges to the Mohave Desert on the north. South of it is the interior valley and coast region of Southern California. Between Borego and the Colorado River is the Colorado Desert. (Drawn by D. L. Soltau.)

the Mexican border north to the southern slope of the San Bernardino Mountains in the vicinity of Cajon Pass. There they appeared to be crossing the east-west range without taking advantage of the pass. Intermittent observations north of the mountains followed them to Calico in the Mohave Desert, a distance of 170 miles from Campo.

The country covered south of the mountains was the type of California semi-desert known as brush or chaparral. North of the mountains it was true desert of the high altitude Mohave Desert type.

The eastern border of the migration extended well into the Colorado Desert, which is lower in altitude and hotter than the Mohave and in general a barrier to distribution as the Colorado River is approached. Incomplete records on the western border indicated that the butterflies did not quite reach the ocean beaches that year.

The 1945 records are valuable as showing a cross section of simultaneous migration from Hermosa Beach to Needles on the Colorado River, a distance of 225 miles. Over most of this front the butterflies crossed the mountains from the southern valleys and spread north over the Mohave Desert, reaching a point 225 miles north northwest of Campo. Reports indicated approximately the same peak days over the entire cross section.

As there was no opportunity for records from south of the Mexican border, the point of origin of the flights could not be determined. But in California they covered an area at least 225 by 225 miles. No reports were received of their crossing the mountains further west to Bakersfield in the San Joaquin Valley or to Santa Barbara on the coast.

The figures just given for the extent of the migration do not indicate that butterflies were evenly distributed over the territory at any one time. Counts showed axes of migrating paths, the numbers diminishing toward the boundaries. For example a wave of migration from March 14 to 21, 1941, had its axis in Redlands, with its boundaries approximately eight miles west and eight miles east of Redlands. By March 22 and 23 the axis had shifted a few miles west. W. S. Wright wrote of passing through three migrating paths in 1926 during a sixty mile ride inland from San Diego in an easterly direction, the butterflies being absent in the intervening regions.

DIRECTION OF MIGRATION

The direction of migration throughout the territory was usually north-northwest, varying to northwest or north. This in general was directly against the prevailing wind. Yet there were enough exceptions to suggest that butterflies can fly as efficiently at right angles to the wind as directly against it. It may be noted that Woodbury, Sugden, and Gillette (1942), in studying the 1941 migration in Utah and adjacent states, found the direction of flight varying from north to northeast. The territory studied by them is separated from that included in the present paper by a hot dry desert which is an effective barrier to many moisture-requiring species.

The possibility that flights against the wind may be flight toward more favorable moisture conditions is taken up later.

TOPOGRAPHY AND DIRECTION OF FLIGHT

The course and direction of the flight were not determined by natural topographic features. Cajon Pass, San Gorgonio Pass, and the branch of the latter known as San Timoteo Canyon are popularly thought of as migration routes. Yet the butterflies flew in straight lines, crossing these canyons and their branch canyons at any angle, or sometimes missing them entirely.

To maintain their straight path of migration, butterflies regularly rose over obstacles such as hedges and trees, even tall eucalyptus trees and three story buildings, yet they consistently kept within a few feet of the ground otherwise. Each individual butterfly appeared to be maintaining an even distance above the ground. A striking illustration could be seen from the roof of the Hall of Science at the University of Redlands where one looked down on the migrants and observed that when they flew over trees they flew no higher than necessary. When they reached the vertical south wall of the Hall of Science, most of them stopped to feed on a lantana bush, and on leaving flew around the west end of the building before resuming the north-northwest direction. A few, however, ascended in a spiral and passed over the roof.

It was also interesting to watch them cross a narrow canyon with steep walls. They consistently flew down one wall and flew up the opposite wall rather than crossing from rim to rim, which to the observer would have seemed the simpler method of following a straight line.

RATE OF FLIGHT

Each butterfly appeared to be flying at a steady even rate, although there were obvious individual differences. Measurements were made of the rate of flight by recording with a stopwatch the time required to pass over a measured distance of ground, the measurements being taken on days when the wind was very slight. The 1941 measurements showed times of between 5 and 10 seconds in flying 100 feet. The average, 7.5+ seconds, gives approximately 6.6 minutes for one mile and 9.1 miles per hour. A similar set of figures, made on the same field in 1945, averaged 7 seconds for 100 feet, 6.16 minutes for one mile, and 9.7 miles per hour.

TIME OF DAY AND WEATHER CONDITIONS

During a migration the largest flights occurred in warm, sunny weather, with a flight ceasing almost entirely if several cold, rainy days came together. This subject needs further investigation as a factor in the varying curve of abundance during the entire migration period.

The best statistical record of the hours of daily flight was kept at Redlands by M. Salmond, March 20 to 27, 1941. On all of these days the flight began between 8:15 and 9:00 a.m., and ended between 3:20 and 5:15 p.m. This was during a period when there was fog from late afternoon to early morning.

The actual beginning of a daily flight was described by Miss Salmond on April 25, 1941, when, at 6:50 a.m. six butterflies, which apparently had been "sleeping" on the lawn, flew up, circled around more or less, and flew off to the northwest.

FEEDING

Butterflies stopped freely to feed. Favored food plants were lantana, apricot, greasewood (*Adenostoma fasciculatum*), pussy-willow, various flowers of park and campus.

OTHER SPECIES

Were other species associated with *Vanessa cardui* in the migration? It is difficult to give an absolute answer, because the common species *Vanessa caryae*, usually considered non-migratory, remembles *cardui* so closely that they look alike when flying. However, it is easy to identify the two species when they are feeding on a lantana bush. The author did this many times, and,

while both species fed together, only individuals of *V. cardui* were seen to arrive from the southeast and leave in a northwest direction. The *V. caryae* left in any direction, usually flying to other plants.

Occasionally single individuals of *Vanessa atalanta*, easily distinguished, were seen in a migratory swarm of *V. cardui*, and these also fed commonly on the same food plants. It was noted, however, that the individuals of *V. atalanta* stayed longer on a food plant, and not once was one seen to fly away from it in a definite direction. Therefore the present conclusion limits the migration to the one species.

DISCUSSION

The migration of *V. cardui* is spectacular, always in the same direction with minor variations, at very irregular intervals, and through country where the climatic and vegetation types change very slightly. There is no present evidence that any of the migrants return, and they do not increase the permanent population of the territory over which they pass.

The two questions which most commonly occur are:

(1) Why do they migrate?

(2) What determines the direction of migration?

The most commonly proposed theory for the cause of this type of migration is the "pressure of population theory." This has been applied to migrations of insects, mammals, and even the rhythmic migration of birds.

Chapman, in his paper "Insect population problems in relation to insect outbreak" (1939), shows in detail how this theory holds true for insects under the most complex combinations of conditions. He includes migration as one of the manifestations of an insect outbreak.

To quote the part directly applicable to *V. cardui:*

"In cases represented by insects having a high biotic potential, the relaxation of environmental resistance during a single generation, or even for a very short time during a critical part of the reproductive period, may result in a population increase of outbreak proportions. On the other hand, in case of a low biotic potential or a slight relaxation of environmental resistance, it may be necessary to have several successive periods of reduced resistance occur to make it possible for a population to build itself to outbreak proportions."

Without knowing how Chapman would characterize the biotic potential of *V. cardui,* the paragraph just quoted gives enough variables to account for the irregular intervals between migrations and for the variation in numbers in the different years. Chapman further states:

"In the case of migrating insects, it is necessary to study the area from which they migrate to determine whether conditions are such that populations will be built up and that the breeding conditions will encourage the populations to migrate."

Because it is not known how far south of the Mexican border the flights originate, it is uncertain whether it is chiefly in desert or semi-desert conditions. But it is known that on the edge of the Colorado Desert in California, during the wildflower season, the corresponding period of maximum insect abundance is in March and April. The variable is the amount of winter rainfall and to some extent its monthly distribution, which has a direct effect on the abundance of wildflowers. A favorable year might greatly increase the butterfly population in the succeeding year. This is a point on which the data are not available.

A report of a concentration of a butterfly population in this region was given to the author by W. S. Wright of the Natural History Museum, San Diego, under the date of April 16, 1926. To quote:

"Early this spring one of our collectors visited the desert near Yuma, Arizona, and on his return reported millions of painted ladies on the desert, feeding on the Desert Encelia. Later a visitor to the museum corroborated this report, adding that the numbers were equally great in the region about Salton Sea and as far west as the entrance to Carriso Gorge on the S. D. and A. R. R. Just prior to the first flight observed in the city, there occurred a strong wind blowing off the desert. Now my theory is that the insects breed on the desert or in contiguous territory and that the strong drying winds cause them to seek other fields. Some instinct, or the force of the wind, drives them westward until they reach the cool ocean breeze, having the effect of turning them from the westward course towards the northeast in this locality."

Is there a possible truth in these sentences that this butterfly is precisely adjusted to an optimum condition of humidity, or of humidity and temperature combined? Does the prevailing north-northwest direction of flight, which exists everywhere except per-

haps in the extreme south region described by Wright, represent a direction which maintains this optimum?

If this theory should be correct, it does not explain why they continue on into the Mohave Desert, where the air becomes dry again. It may be that the flight gradually slows down in the Mohave Desert on that account. But it does show the need for experiments on the reaction of this species to moisture and temperature gradients.

Temperature is suggested, because the interior valleys of California and the coastal regions have fewer extremes than the desert. Also the experiments of Kendeigh (1934) on birds indicate that temperature is more important than length of day in determining the fact and direction of bird migration. This is important in the west-east bird migrations in California in which temperature differences are conspicuous and the length of day factor is eliminated.

ADDITIONAL POINTS IN NEED OF STUDY

(1) Do these butterflies lay eggs along the migratory route and do they continue migration after egg-laying? References to egg-laying on migration are made by Woodbury et al (1942) and brief references by Campbell (1924) and Dow (1924); but little evidence is available on this point.

(2) Does a second generation move northward in late summer? Woodbury et al (1924) report one instance in 1935; and W. Hovanitz wrote me on September 18, 1944, that he remembered a single instance in Pasadena, California, in the fall of 1940, but that he had no notes on it. It may be noted that the California tortoise-shell, *Nymphalis californica* Bdv., aggregates and migrates irregularly in the late summer in northern California, but the direction of migration varies from north, through west and south, to southeast (Comstock, 1927; Williams, 1930).

(3) There are no reports of a fall migration of *V. cardui* in California. In 1941, I wrote to all observers who had reported on the spring migration asking them to report on any possible instance of a fall migration. All replies received were in the negative.

(4) A study of the distribution and abundance of *V. cardui* in southern California in a non-migratory year is very desirable, as well as of its behavior reactions.

SUMMARY

(1) The painted lady butterfly, *Vanessa cardui,* has had four migrations in southern California in twenty-five years, in the springs of 1924, 1926, 1941, and 1945.

(2) Against the background of the great migration of 1924, the lesser succeeding migrations have been analyzed qualitatively and to some extent quantitatively.

(3) Time relations. Each migration period lasted nearly two months, showing a succession of increases and decreases with three maxima. The maxima, which were irregularly distributed, appeared to be related to weather conditions. Flying occurred during the sunny hours of the day, and almost ceased during cold, rainy periods.

(4) Geographical extent. This was partially determined by compiling the reports of cooperating observers scattered over southern California. The territory covered in 1941 and 1945, carefully mapped, showed a northward flight from the Mexican border to the leading towns and highways of the Mohave Desert, a distance of 225 miles. This actually is too small a figure, because the flight, or part of it, originated south of the Mexican border, and it may have gone farther north into the less accessible parts of the desert.

(5) Geographical extent, continued. A west-east cross section in 1945 showed butterflies migrating simultaneously in all of the territory from the coast to Needles on the Colorado River, a distance of 225 miles. Farther south, the cross section is narrower, being limited on the east by the driest section of the Colorado Desert. Farther east, in Arizona and Utah, another set of butterflies was in migration, but averaging a month later, in both 1941, and to a lesser degree in 1945 (Woodbury et al, 1942; Sugden et al, 1947).

(6) Most of the territory in which the migration was studied is the California type of semi-desert known as brush or chaparral, although the flights actually extended many miles into the Mohave Desert.

(7) The butterflies fly in a straight line, usually north-northwest, regardless of topography, keeping a few feet above the ground, and rising over obstacles. The flight is usually against the wind, but is just as controlled when the wind comes from a different direction.

(8) The type of migration, large numbers at irregular intervals, is typical of the migrations of those insects and mammals which make a non-returning migration in a predictable direction at irregular intervals. Chapman's application of the "pressure of population" theory is shown to apply to this migration, and is given as the only current hypothesis.

(9) It is suggested, as a hypothesis for further analysis, that, while the direction of wind may not be the factor determining the direction of flight, the effect of the wind on either temperature or humidity may be a controlling factor. If so, the butterflies must be capable of very precise adjustment to these factors.

ACKNOWLEDGMENTS

Thanks are due to the many observers, here unnamed, who contributed much of the data on which this study is based; also to D. L. Soltau for the map in Figure 1.

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BOOK REVIEW

The Insect World of J. Henri Fabre. By Edwin Way Teale. Dodd, Mead & Company, N. Y., xvi + 333. 1949. Price $3.50.

Fabre's careful observations and masterful reporting of natural phenomena are too well known to require examination here. The studies which this great French naturalist gave to the world have already been translated into many other languages from the original French. Teale has concerned himself with the English translations of A. T. de Mattos which have long been a source of enjoyment to both naturalists and laymen. By a process of careful editing he has presented 40 interesting excerpts from 13 of the de Mattos books.

These selections are in the identical phraseology of the de Mattos translations but are seldom complete. In order to give a maximum coverage, Teale has done a skillful piece of editing which is worthy of some explanation. For example, Teale will give one paragraph from de Mattos, skip several pages, then present several complete pages without any apparent lack of continuity. In this manner many of Fabre's statements expressing his anti-selectionist views or comments concerning the wonders of divine creation have been deleted. For the younger naturalist these omissions will serve to emphasize the natural wonders of Fabre's world. However, as Teale has indicated in his introduction, an understanding of Fabre's belief in the immutability of creation is necessary for a full appreciation of his abilities and limitations. For the benefit of the reader, Teale has given a brief foreword to each chapter along with the source of each selection. However, chapter ten is credited to the Mason Bees while it should have been referred to chapter six of Bramble-Bees and Others.

Unfortunately Teale did not see fit to illustrate this book, other than with a series of end plate photographs. One of these illustrations is misnamed as a Meloe oil-beetle while it appears to be a member of the genus *Epicauta*.

Minor criticisms as these are no indictment of the excellence of Teale's work in bringing together so many carefully selected and well edited passages from Fabre's life work. This is particularly so since so many of Fabre's observations were the first of their kind and in many cases have not yet been duplicated.—J. W. MACSWAIN.

NOTES ON THE CLASSIFICATION OF TORYMUS WITH THE BIOLOGY AND DESCRIPTION OF A NEW SPECIES

(Hymenoptera: Torymidae)

BY KENNETH R. HOBBS

Oregon State College, Corvallis[2]

Torymus festivus Hobbs, new species

Female: Length 2.5 mm.; ovipositor 2.2 mm. Body blue-green with purple reflections on propodeum and dorsal surface of abdomen. *Head* transverse, wider than thorax, slightly wider than long as viewed from the front; front green with lateral area beyond clypeal region blue with yellow reflections near eye margins; face below antennae with long, delicate hairs becoming short above; two fine carinae extending upward from margin of mouth curving slightly mesad and about as long as the basal distance between them; a prominent median carina; antennal depressions deep, bright shiny blue; scape somewhat compressed, not reaching median ocellus, yellow beneath and fuscous above, pedicel and ring segment infuscate; funicle and club brown with light brown longitudinal sense organs extending almost the entire length of each segment and beyond apical margin of each funicular segment; all segments of funicle sub-quadrate increasing in width toward the tip; ocelli brownish-red; eyes red.

Thoracic dorsum blue-green, minutely punctured, moderately clothed with short whitish hairs anteriorly to very long whitish hairs posteriorly on scutellum; parapsidal furrows distinct; scutellar crossfurrow absent; propodeum weakly reticulate, shining bluish-purple anteriorly to purple posteriorly, green laterally; fore coxa blue-green with apex yellow, middle and hind coxa green; basal and apical portions of femur and tibia honey yellow, median portion brown with metallic green reflections from hind femur; front tibial spur bifid as seen under high power; first three segments of tarsi approaching white, the last two dark brown; wings moderately ciliate; veins testaceous, a small crescent-shaped vein remnant one-fourth the distance from the base of wing in middle; stigmal vein petioled.

Abdomen longer than thorax; dorsal surfaces blue-green, finely reticulate, sparsely clothed with silky white hairs, fourth segment blue, moderately reticulate with long white hairs laterad; segments

[1]This publication is a portion of the thesis submitted in partial fulfillment of the requirements for the degree of Master of Arts from the graduate school of Oregon State College.

[2]Instructor, California State Polytechnic College, Voorhis Unit, San Dimas, California.

five and six bluish-green with yellow reflections, reticulations and hairs same as for segment four; the sterna infuscate; pygostyle with one heavy and three fine setae of approximately equal length.

Male: Length 1.95 mm. Scape short, light brown basally, the remainder being dark blue-green with purple reflections; abdomen dark brown with bluish reflections dorso-basally, the remainder, dorsally, yellow-green; in other respects the male is like the female.

Type locality: Campus of Oregon State College, CORVALLIS, OREGON. Host: *Dasyneura* sp. infesting seeds of *Thuja plicata* Don. and *Chamaecyparis lawsoniana* Parl.

Location of the Types: The female type, the male allotype, 50 female and 50 male paratypes are in the California Academy of Sciences. 12 female and 12 male paratypes have been deposited in each of the following institutions: U. S. National Museum; Southern California Academy of Sciences, Los Angeles; American Museum of Natural History, New York; Museum of Comparative Zoology, Cambridge, Mass.; State Natural History Survey Division, Urbana, Ill.; British Museum (Nat. Hist.), London; Cornell University; State College of Washington, and the Oregon State College collection. The following private persons have received 6 female and 6 male paratypes: Dr. Osmond P. Breland and Dr. W. W. Jones. 43 female and 7 male paratypes are in the author's collection. There is a total of 193 female and 158 male paratypes.

Described from 165 females and 136 males collected by sweeping *T. plicata* and *C. lawsoniana,* August 23 and 24 and September 27, 1947; 5 females and 10 males by sweeping, Corvallis, Oregon, June 2 and 11, 1948; 2 females and 4 males reared in laboratory during April, 1948, and emerged in laboratory May 7, 1948; 1 female from Estacada, Oregon, collected in cones March 26, 1948, and emerged in laboratory on May 11, 1948; 2 females and 1 male collected in cones at Port Orford, Oregon, on May 30, 1948, and emerged in laboratory on June 3, 1948; 19 females and 8 males collected in Ashland, Oregon, in cones on May 18, 1948, and emerged in laboratory from May 23 until June 15, 1948. Specimens not included in the type series were also found in cones from 10 miles west of Philomath, Oregon and 12 miles east of Cave Junction, Oregon. In the material inspected, specimens were not found in cones from the following localities: Campus of Chico State College, Chico, California; and Hillsboro, Oregon.

Variation—The general color of the male and especially the female varies from green with a few slight yellow reflections to rather dark purple. In one particular specimen, also included in the type series, the lateral and ventral body regions and coxa were a brilliant ruby red. In other respects, there can be no doubt that this specimen belongs to *T. festivus*. The femur and tibia of both sexes varied from honey yellow to brown to bright blue-green. In the female, the length of the body varies from 1.65 mm. to 2.90 mm. and the ovipositor from 1.40 mm. to 2.40 mm. In only one instance was the ovipositor found to be the same length as the body. The average body length is 2.14 mm.; the average ovipositor length, 1.85 mm. The body of the male varies in length from 1.30 mm. to 2.30 mm., the average being 1.90 mm.

Torymus festivus is most closely related to *Torymus coloradensis* Huber whose host is *Cecidomyia* species gall on *Artemisia*. *T. coloradensis* Huber, however, differs in the following respects: body generally green, all segments of the funicle longer than wide, mesepimeron very deeply incised, coppery, and wings strongly ciliated. It is interesting to note that the hosts of both parasites belong to the same family of Diptera.

BIOLOGY

While studying the development of the torymid life cycle, I had the unusual opportunity of watching the continuous change from the last larval instar to the pupal stage. Three days before pupation, the development of the hind intestine and anus is evidenced by the clearing of the ventriculus of all waste products. At first the body becomes slightly constricted marking off the thorax from the abdomen. Shortly the appendages begin to form ventrally and the abdomen lengthens. The legs appear first and are followed by the antennae and wings. By the time the wings and head take their shape, a large mass of tissue forms on the posterior end of the body, dorsally. The abdomen swells and by writing movements the skin is split over the head and worked off in about 10 minutes. From the mass of tissue just mentioned, the ovipositor commences to grow up over the abdomen to a position overlapping the scutellum. The growth of the ovipositor is assisted by great arching movements on the part of the body. The complete growth of this organ takes slightly more than 30 minutes. Complete pupation takes less than 18 hours under laboratory conditions.

Since neither description nor illustration of the egg or larva of this genus could be found in the literature, a description of the egg and last larval instar is included herein. Females of several species of *Torymus* were dissected and the eggs were found to be constant in general shape and in surface texture. The egg of *T. festivus* is 0.58 mm. in length and 0.17 mm. wide. It is largest toward the anterior end and tapers gradually to a point posteriorly. The anterior end becomes restricted rapidly and ends in a prominent projection. The surface is smooth, without evidence of minute nodules or projections as found on the eggs of many members of the same family.

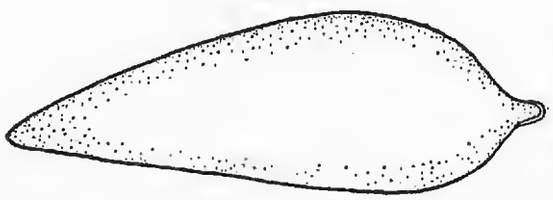

FIG. 1

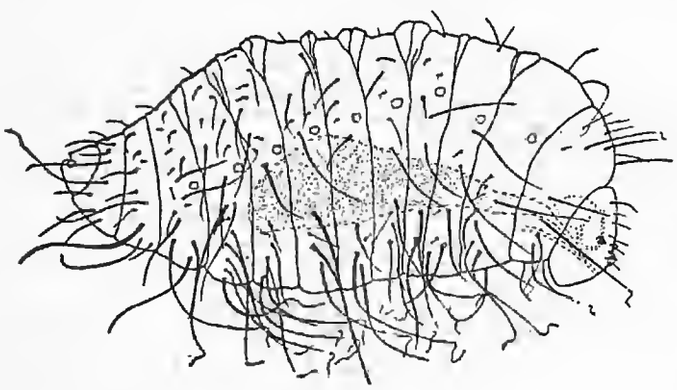

FIG. 2

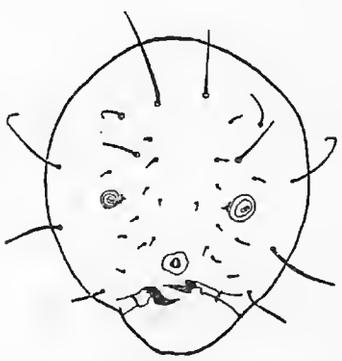

FIG. 3

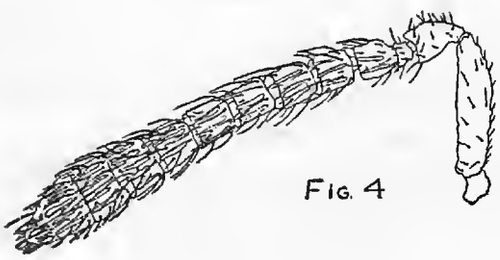

FIG. 4

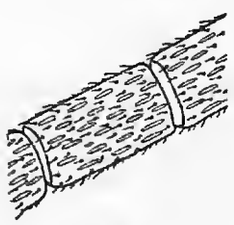

FIG. 5

EXPLANATION OF FIGURES

Fig. 1, lateral view of egg of *Torymus festivus;* Fig. 2, lateral view of mature larva of *T. festivus;* Fig. 3, front view of head of larva showing setal patterns; Fig. 4, antenna of female; Fig. 5, semidiagramatic drawing of portion of antenna of *T. gigantum* to show contrast with Fig. 4; Fig. 6, lateral view of thorax of adult female; Fig. 7, lateral view of abdomen of adult female; Fig. 8, front view of the head of adult female; Figs. 9, 10, 11 are photomicrographs of ovipositor saw, antenna and wing of *T. festivus female.*

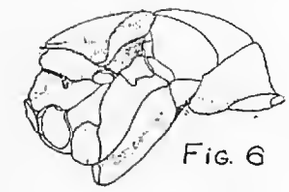

Fig. 6

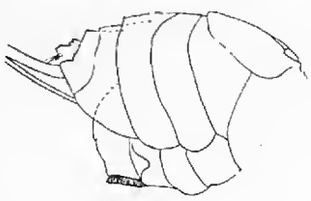

Fig. 7

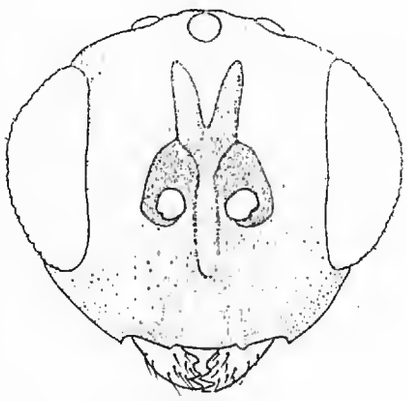

Fig 8

Fig. 9. Ovipositor saw

Fig. 10. Antenna

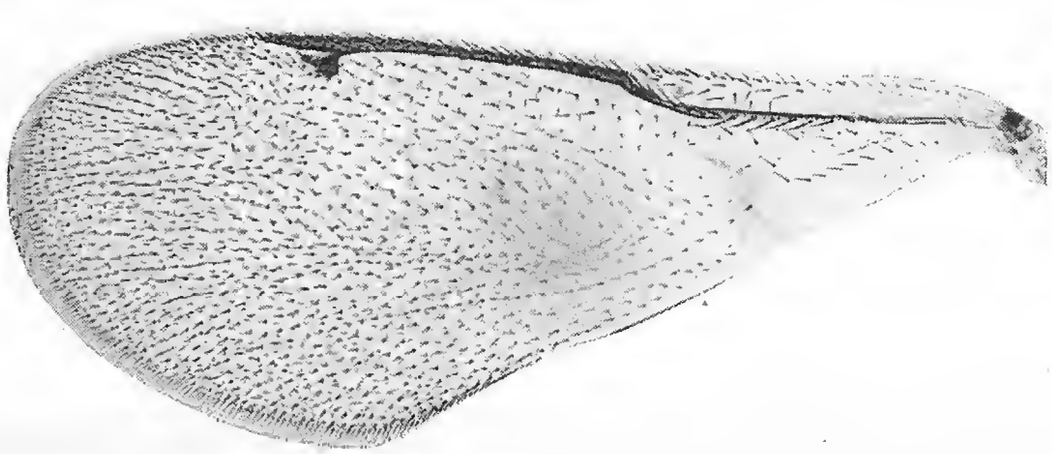

Fig. 11. Wing.

The last instar larva is cylindrical in cross-section, 1.6 mm. to 2.2 mm. in length and 0.83 mm. to 0.91 mm. in width. The head capsule measures between 0.31 mm. to 0.40 mm. across. The head viewed from the front bears three tubercles, one of which is quite prominent just above the fine uni-dentiate mandibles and two fine tubercles slightly below an imaginary line drawn halfway between the vertex and the ventral edge of the head and halfway toward the center from the lateral edges. There are five pairs of long setae on the face: three pairs along the lateral edge, one pair near the dorsal margin, and one pair about halfway between the latter and the paired tubercles. The remainder of the facial setae are minute paired sensoria hardly distinguishable under compound magnification. Abdominal segments 2 to 10 bear prominent, circular spiracles. The dorsal surface of all segments except the first bears very short setae. The dorsal surface of the first segment has several long, thick setae. The setae become progressively heavier and longer toward the venter of all segments. Each seta extending from the ventral surface has a fine barb at the end.

CLASSIFICATION

During research on the new species, *Torymus festivus*[3], several new characters and biological developments were recorded which may prove to be of importance in the determination of Chalcidoidea and of Torymidae in particular.

The following are three new taxonomic characters derived from the study made on this species of *Torymus*. The first characters noted are the setal pattern and a vein remnant of the wing. Many slides showing wings of different species of *Torymus* were prepared. These wings were photomicrographed and enlarged for quick comparison and specific determinations. Setal patterns, particularly in the areas of the stigmal vein and the wing base, varied sufficiently between species for separation. Within the stigmal knob itself are varying numbers and sizes of circular sensoria. These organs vary slightly within a species and also between wings of the same specimen. However, in a series containing at least 4 individuals of the same species there is a general arrangement of the stigmal sensoria found to be constant. A small crescent-shaped vein remnant one-fourth of the distance from base of the wing was found in *Torymus festivus*. This vein remnant varies among different species in the intensity of pigmentation from obscurity to relative prominence.

[3]I wish to express my appreciation to Mr. A. B. Gahan for determining *Torymus festivus* as a new species.

Illustrations and discussions have been published to express the value of antennal sense organs in generic and specific determination for certain other members of this super-family. To my knowledge, no previous mention has been made in the use of this character in the determination of Torymidae. In the process of clearing antennal material for slides, cellosolve was employed. This agent caused the sense organs to become well-defined. The organs appear to be of three types: sensilla trichodea; sensilla chaetica; sensilla placodea (Snodgrass, 1935). The sensilla placodea are the largest and most readily seen without special preparation from the pinned specimen. This particular organ does not vary perceptibly within the same species and shows great differences in size, number, and distribution between species. Observations indicate that the smaller the species, the larger and fewer in number the sense organs may be. This fact, in addition to others, indicates that there is a possibility of dividing the many species now included in the genus *Torymus* into two genera. Figs. 4 and 5 show marked differences between the sense organs of *T. festivus* and T. *giganticum.*

In various species of *Torymus,* the face, as seen from the front, differs in shape, robustness, setal arrangements and length, punctations and reticulations, color patterns and facial carinae. All of these are structural differences of significant use to the taxonomist. It is felt, however, that too little importance has been attached to facial carinae, two of which have never been mentioned in previous literature on this group of insects. I refer to those extending upward from the margin of the mouth, outlining the approximate position of the labrum found in orthopteroid insects.

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THE TAXONOMIC CHARACTERS OF THE LARVAE OF THE GENUS CULISETA FELT, 1904 IN CALIFORNIA[1]

(Diptera, Culicidae)

BY ERNESTINE B. THURMAN AND PHYLLIS T. JOHNSON

In order to facilitate the tremendous amount of identification required for operational field projects, a study was undertaken to discover characters in the fourth stage larvae of the four Californian species of *Culiseta* which could be used for identifying unmounted material with the aid of a dissecting microscope (x 72). The use of the taxonomic characters employed by previous workers are only in part suitable for this purpose.

The four species involved in this study are: *Culiseta* (*Culiseta*) *impatiens* (Walker, 1848), considered to be rare in the State, adults having been reported from Butte, El Dorado, Mariposa, Sacramento, and Shasta Counties; *C.* (*C.*) *inornata* (Williston, 1893), reported from 44 of the 58 counties in California; *C.* (*C.*) *incidens* (Thomson, 1868), the most widely distributed in the State, having been reported from 53 counties; and *C.* (*C.*) *maccrackenae* Dyar & Knab, 1906, with a distribution of 28 counties.

To separate *impatiens* from the other three species of *Culiseta* found in California, the character of similar upper and lower head hairs (see Plate 1, Fig. A) as listed by earlier authors (Freeborn, 1926; Dyar, 1928; Reeves, 1941; Freeborn and Brookman, 1943; Matheson, 1944; and Usinger, La Rivers, Chandler, and Wirth, 1948) appears to be adequate.

In the separation of *inornata* from *incidens,* previous workers have used characters to be found on the basal pecten teeth; in *incidens* these teeth have 1—3 minute or depressed denticles, while in *inornata,* 3—4 outstanding denticles are present. This character has proved to be reliable (see Plates 2 and 3), but somewhat impractical for rapid identification in that it necessitates the time-consuming task of mounting individual specimens. Differences in the size of the comb scales are figured (Plates 2 and 3) but also considered impractical as key characters.

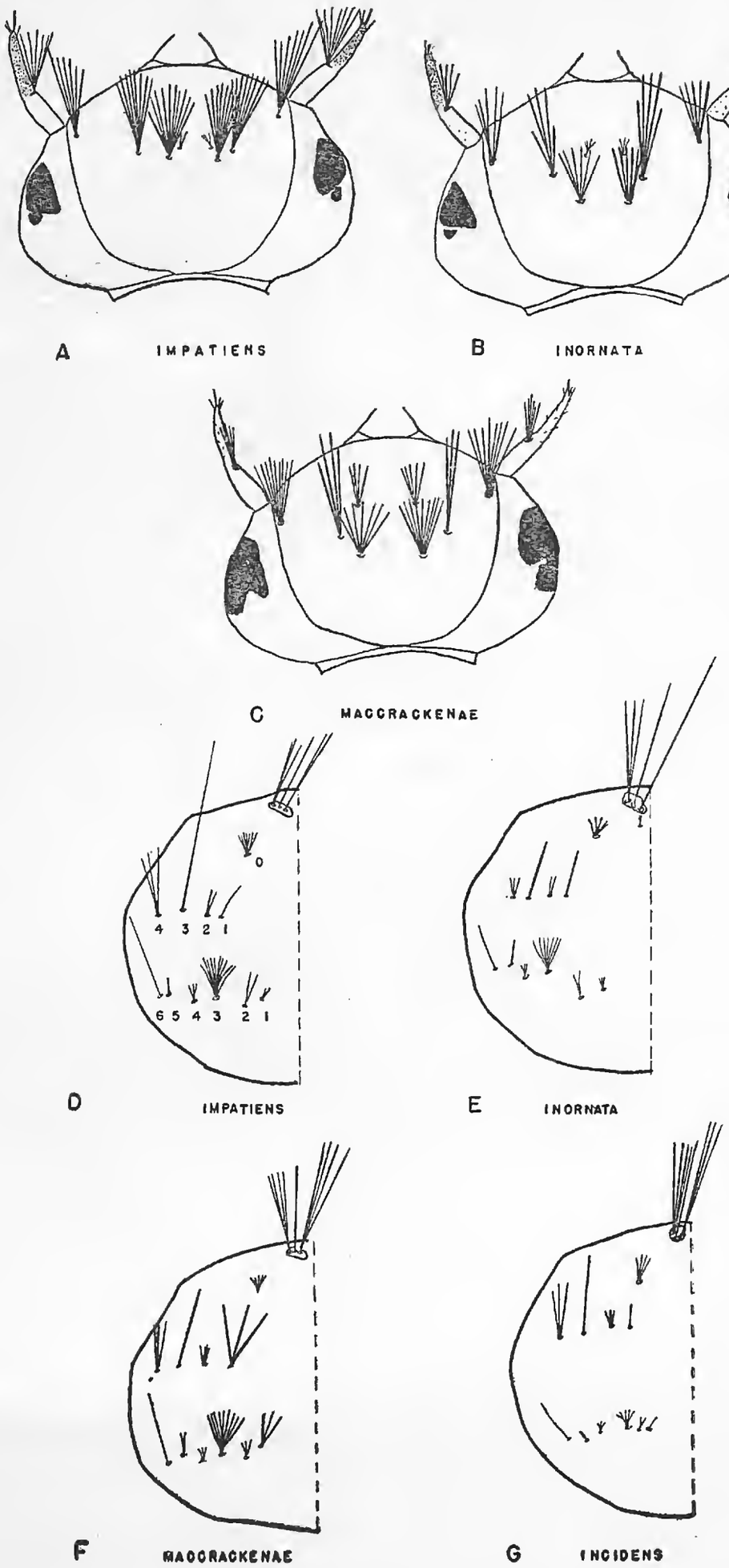
[1]From the Bureau of Vector Control, California State Department of Public Health, and the Communicable Disease Center, Public Health Service, Federal Security Agency, Atlanta, Ga.

C. maccrackenae was distinguished from *incidens, impatiens,* and *inornata* by the authors cited above, by characters of the anal segment. In *maccrackenae* the anal plate was said to have a cleft within which the anterior tufts of the ventral brush were inserted. In the other species, the cleft has been listed as lacking, the tufts puncturing the sclerotization of the anal plate. In a study of 480 larvae of the four species, including reared correlated series of all but *impatiens* (only one larval skin of a reared *impatiens* was available), variations were so evident in the size of the cleft and in the number and position of the tufts inserted within the cleft, that we have concluded that this character is much too variable for reliable diagnostic purposes. The percentages of variations found in this study are as follows: Of the *incidens* larvae, 33% had no cleft (considered by previous authors to be typical); 33% had one tuft within a small cleft; 18% with 2—3 tufts within the cleft; and 16% had all the tufts within a total cleft. Variations in *maccrackenae* also were pronounced, with 10% without a cleft; 20% with one tuft inserted within a small cleft; 50% with 2—3 tufts within the cleft; and 20% with all tufts within a total cleft (previously considered to be typical). Similar variations were found to exist in *inornata.*

To supplement these previously used characters for distinguishing the larvae of the four species, the following group of new characters are presented:

1. Variations in the branching and the length of the lateral hair of the anal segment.—These variations were found to be reliable in separating *inornata* from the other species (Plate 2). Boddy (1948) found this hair in *inornata* to be double and quite heavy, whereas in *incidens* it was occasionally triple, shorter, and was noticeably less robust. It is described by Carpenter, Middlekauff, and Chamberlain (1946, p. 111) for *inornata* as ". . . long, double or triple," but it may be 1—5 branched, is usually double, minutely barbed, and as long as or longer than the anal plate (Table I). In the other 3 Californian species the hair may be 1—5 branched, is usually triple, fine, not barbed, and ¼—¾ as long as the anal plate (Plates 2 and 3).

Plate 1.—Diagrammatic sketches of the head and thorax showing the dorsal hairs of diagnostic value of: Fig. A—*Culiseta impatiens;* Fig. B— *C. inornata;* Fig. C—*C. maccrackenae;* Fig. D—*C. impatiens;* Fig. E—*C. inornata;* Fig. F— *C. maccrackenae;* Fig. G—*C. incidens.*


A IMPATIENS
B INORNATA
C MACCRACKENAE
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4 3 2 1
6 5 4 3 2 1
D IMPATIENS
E INORNATA
F MACCRACKENAE
G INCIDENS

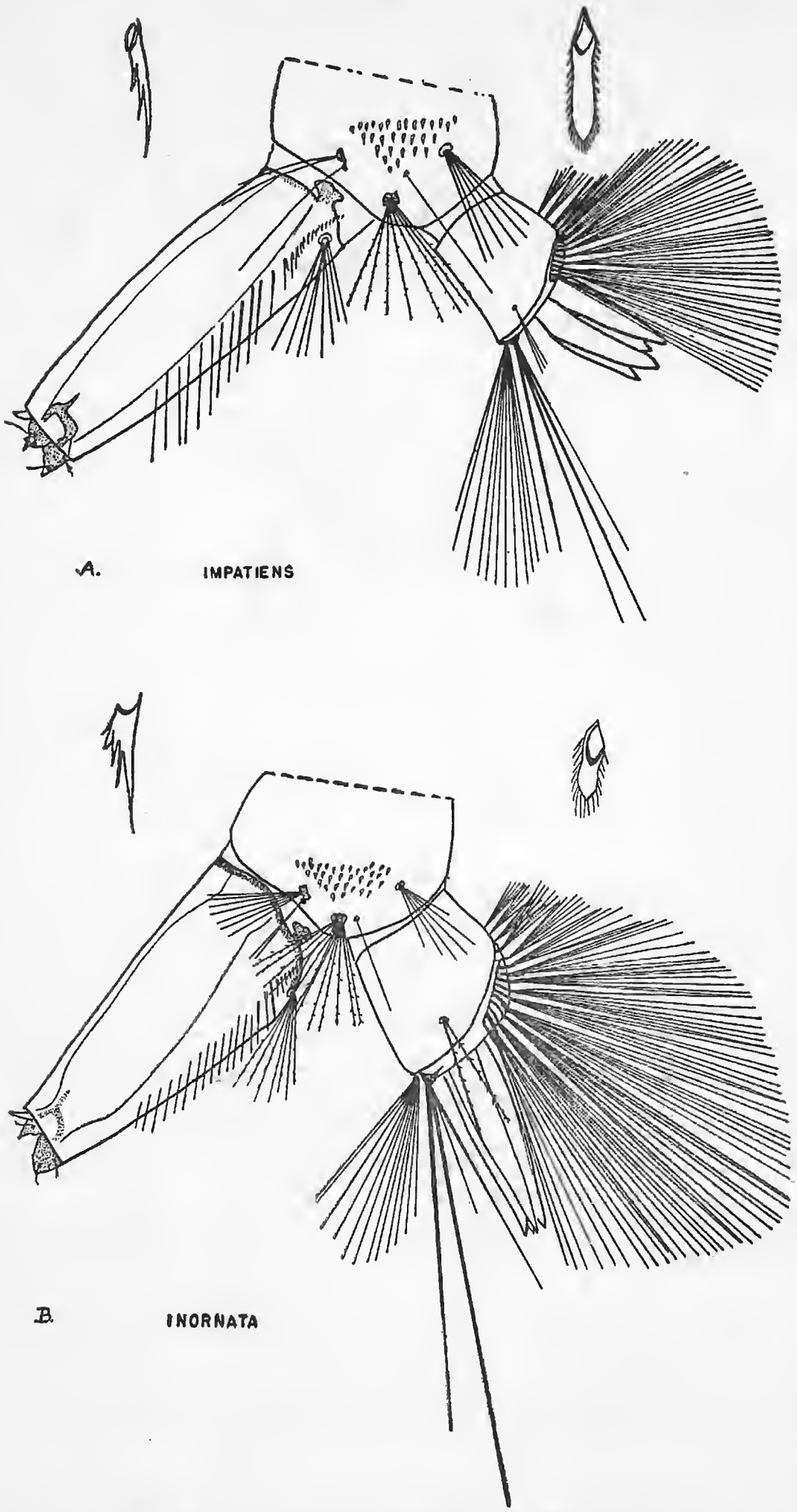

Plate 2.—Lateral view of eighth abdominal segment, siphon, and anal segment (comb scale and pecten tooth enlarged) of: Fig. A—*Culiseta impatiens;* Fig. B—*C. inornata.*

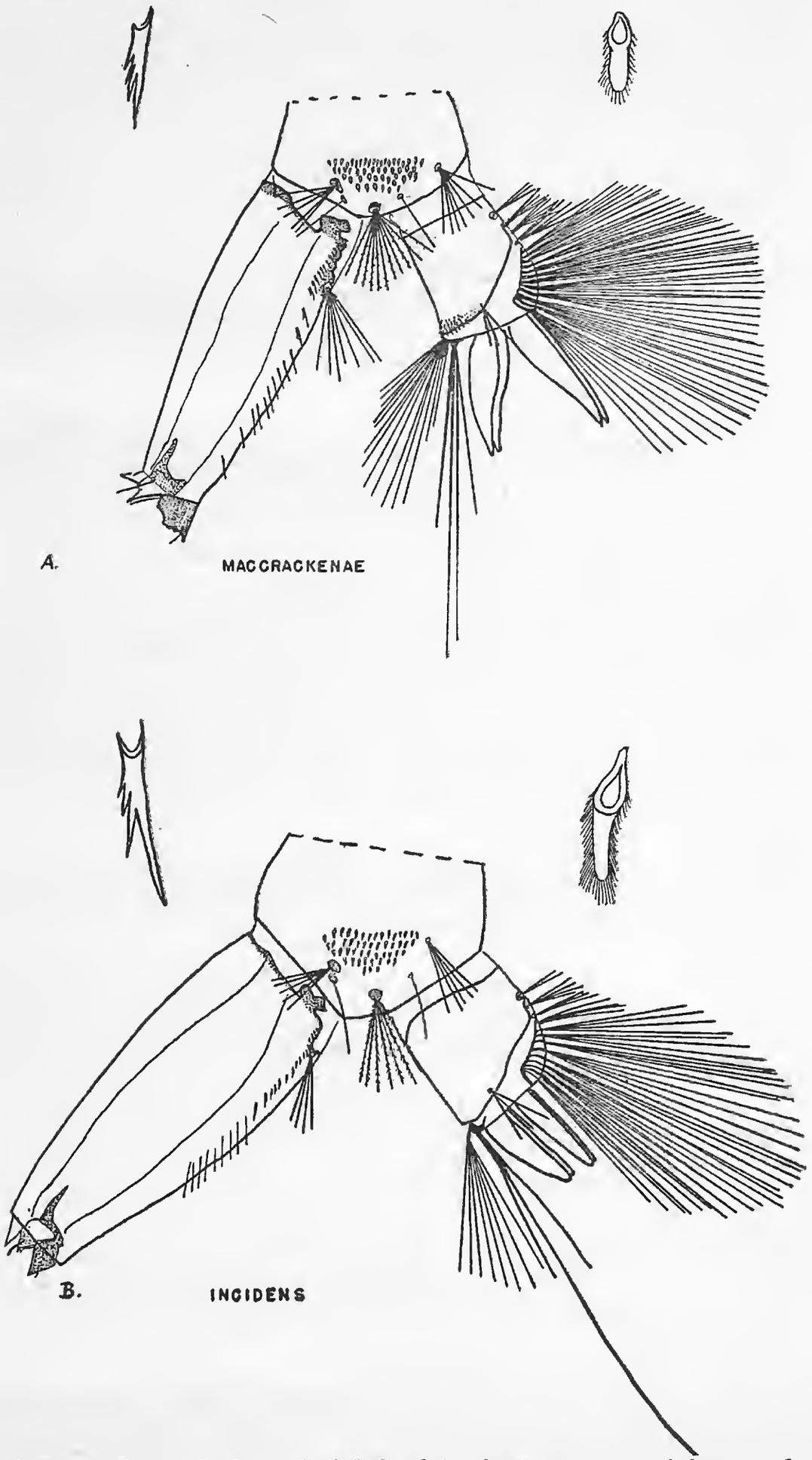

Plate 3.—Lateral view of eighth abdominal segment, siphon, and anal segment (comb scale and pecten tooth enlarged) of: Fig. A—*Culiseta maccrackenae;* Fig. B—*C. incidens.*
Plates 2 and 3 were drawn with the aid of a micro-projector.

2. An area of heavy short spines on the apex of the anal plate near the dorsal brush.—This spiny area is present in both third and fourth instars of *maccrackenae* while the anal plates of *incidens, impatiens,* and *inornata* are smooth.

3. The position of the basal siphonal tuft (as suggested by Dr. R. M. Bohart, through personal communication) and the texture, length, number, and position of the normal and hairlike pecten teeth.—The basal hair tuft in all four species is stellate, the branches being arranged much as the ribs in a partially opened umbrella, rather than spread fanlike in the same plane (Marshall, 1938, p. 207). In *maccrackenae,* the tuft is situated in a darkened area in the sclerotization, near the apical normal pecten teeth, which occurs at the apex of a scalloped cleft in the siphon. Following one or two widely-spaced, modified, normal teeth, the hairlike pecten teeth are short, less than ½ as long as the basal tuft, with one or two teeth apically detached; the row of teeth extends from the base along 4/5 the length of the siphon. In the other 3 species the tuft of the siphon is placed near the base of the pecten. The hairlike pecten teeth in *incidens* are fine, about ½ as long as the tuft, and extend beyond the middle of the siphon. In *impatiens,* the normal

Table 1. Percentages of Variations of the Lateral Hair on the Anal Plate of *Culiseta inornata* (Will.), *Culiseta incidens* (Thom.), and *Culiseta maccrackenae* D. & K.

Species	No. Tufts Studied	Distribution of Percentages of Branch Variations				
		Single	Double	Triple	Four-Branched	Five-Branched
C. inornata	112	6	59	29	3	3
C. incidens	522	4	27	42	21	6
C. maccrackenae	56	4	37	46	11	1

Table 1 (continued):

Species	Distribution of Percentages of Physical Characters					
	Texture			Length		
	Fine and Smooth	Slightly Barbed	Heavy and Barbed	¼-½ as long as Plate	⅔-¾ as long as Plate	As long as or longer than Plate
C. inornata	3	14	83	0	18	82
C. incidens	98	2	0	65	35	0
C. maccrackenae	98	2	0	46	54	0

pecten teeth extend from the base ¼ the length of the siphon. The hairlike pecten teeth are heavy, ⅔ as long as the basal tuft. The entire pecten extends ⅔ the length of the siphon. In *inornata,* these teeth are fine, ½ as long as the tuft, and the row reaches ¾ the length of the siphon.

4. The dorsal thoracic hairs.—These are illustrated in Plate 1, Figures D, E, F, and G, where the chaetotaxy followed is that employed by Marshall (1938, p. 47). Only those hairs used in differentiation have been figured. Prothoracic hair No. 1 (Plate 1, Figures E and G) in *inornata* (as pointed out by Dr. H. D. Pratt, personal communication) is single, and 1½ times as long as prothoracic hair No. 2; in *incidens,* this hair is either double or multiple, and slightly longer than hair No. 2; in *maccrackenae* and *impatiens,* this hair is similar in size and number of branches to that of *incidens,* with *maccrackenae* having from 2—8 branches and *impatiens* 1—3. The mesothoracic group of setae is diagnostic in *maccrackenae* and *impatiens* in that hairs Nos. 1 and 3 in *maccrackenae* are respectively, double to quadruple, and single; both prominent and heavy; in *impatiens,* No. 1 is single and inconspicuous, while No. 3 is single, and 6—8 times as long as the prothoracic hair No. 0 (Plate 1, Figures D and F). In both *inornata* and *incidens,* mesothoracic hair No. 1 is single and inconspicuous (Plate 1, Figures E and G).

5. The size of the postclypeal hairs (Plate 1, Figure C).—In *maccrackenae* these are prominent with 4—5 branches, and are almost as long as, and as heavy as, the upper head hairs. This is in contrast to the normal, small postclypeal hairs possessed by the other three species.

The following key to the *Culiseta* larvae of California has been prepared using the foregoing characters.

KEY TO FOURTH INSTAR LARVAE OF CALIFORNIAN SPECIES OF CULISETA

1. Mesothoracic hair No. 1 large, double to quadruple, and very conspicuous (Plate 1, F); postclypeal hairs 4—5 branched, prominent, about as heavy as those of the upper and lower head hairs (Plate 1, C); posterior margin of anal plate with heavy short spines at apex near dorsal brush (Plate 3, A) ..... *maccrackenae* Dyar & Knab, 1906

– Mesothoracic hair No. 1 small, less conspicuous, usually single; postclypeal hairs normal with branches noticeably more delicate than branches of the upper and lower head hairs; anal plate smooth 2

2. Both upper and lower head hairs multiple, fan-shaped, with branches equal or subequal in number and length (Plate 1, A); mesothoracic hair No. 3 single, conspicuous, 6—8 times the length of prothoracic hair No. 0 (Plate 1, D) ..... *impatiens* (Walker, 1848)

– Lower head hairs multiple, with two or three prominent middle branches; upper head hairs multiple, fan-shaped, with shorter and more branches than lower head hairs; mesothoracic hair No. 3, if single, inconspicuous, less than 6 times the length of prothoracic hair No. 0 3

3. Lateral hair on the anal segment as long as or longer than anal segment, rather stout and usually double (Plate 2, B); prothoracic hair No. 1 usually single (Plate 1, E) ..... *inornata* (Williston, 1893)

– Lateral hair on the anal segment shorter than the segment, rather fine, and usually triple (Plate 3, B); prothoracic hair No. 1 double or multiple (Plate 1, G) ..... *incidens* (Thomson, 1868)

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In addition to those mentioned in the text, the authors extend grateful acknowledgments for the collection or loan of specimens, suggestions in preparation of the plates, and for reviewing the manuscript to: Dr. William C. Reeves, George Williams Hooper Foundation; Dr. Stanley B. Freeborn, University of Cailfornia; Dr. Alan Stone and Dr. Willis W. Wirth, U. S. National Museum; Mr. C. M. Gjullin and Mr. W. W. Yates, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture; Mr. Theodore Aarons, Alameda County Mosquito Abatement District; and to D. C. Thurman, Jr., S. A. San., Bernard Brookman, S. A. Scientist, and Roy F. Fritz, Scientist, Communicable Disease Center, Public Health Service; Mr. Richard F. Peters, Mr. S. J. Kirkwood, Mr. Earl Mortenson, and Mr. Edmond C. Loomis, all of the Bureau of Vector Control.

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A SECONDARY HOMONYM IN THYSANOPTERA

(Thysanoptera: Phlaeothripidae)

Jones (1912)[1] described *Anthothrips flavipes* from a unique female collected at San Jose, California. Since that time the species has had a somewhat stormy taxonomic career, having been relegated in the literature to at least four additional genera. Hood (1949)[2] transferred this species to the genus *Watsoniella*, apparently overlooking the fact that Moulton (1928)[3] employed the name *Watsoniella flavipes* for a new species taken in Abyssinia.

It is unfortunate that Jones' name, which has appeared frequently in the literature, must be changed because of the coëxisting Moulton name preceding it in the genus *Watsoniella* by twenty-one years. I therefore propose the name *Watsoniella jonesiana nom. nov. pro Watsoniella flavipes* (Jones), *nec* Moulton.

—H. EDWIN COTT, *Davis, Calif.*

[1]U. S. Dept. Agr., Bur. Ent., Tech. Ser., No. 23, Pt. I, pp. 18-19, Pl. V, figs.5-7.
[2]Rev. de Ent., 20 (1-3):23-26.
[3]Ann. Mag. Nat. Hist., Ser. 10, 22:241-242.

OBSERVATIONS ON FLIGHTS OF PLEOCOMA CONJUNGENS

(Coleoptera: Scarabaeidae)

BY WILLIAM HAZELTINE

Richmond, California

The 1948 flights of *Pleocoma conjungens* Horn[1] in the area of Mount Hermon, Santa Cruz Co., California, began on the morning of October 27, between 7:50 and 8:00 A.M., and the last definite general flight was on December 13, at 8:30 A.M. (All times given are Pacific Daylight Saving Time. Standard Time is one hour earlier.) On two later occasions, December 31, 1948, and January 2, 1949, beetles with Pleocoma flight habits were seen in the Scotts Valley area. These could have been *P. conjungens*, but the sight record is not positive. The time and weather conditions were right for a flight, and a male from an earlier flight retained in an observation cage was still alive, indicating that this species probably was still capable of activities in the area.

The largest flights were from approximately half an hour before dawn to half an hour after dawn, and from sunset to approximately 45 minutes thereafter. They occurred only on rainy days or when the humidity was near the saturation point. Actual precipitation was not necessary to cause flight activity, as was evidenced by the behavior of a captive male. An observation cage was kept in a non-heated room, the air in which reflected outdoor conditions, and the beetle was active when there was heavy fog or rain outside.

The largest recorded 1948 flights occurred in the mornings, when about 85% of my males were taken. The remainder were captured during the evening flights. In all, 165 males of *P. conjungens* were collected at three stations in the Mount Hermon area.

During the first flight of the 1949 season (November 6), 107 males were taken almost continually from 10 P.M. to 6 A.M. There was a steady light rain all night, and a nearly full moon shone through the fog-like clouds enough to light the area somewhat.

The times of flight in the three collecting stations agreed very closely in beginning and ending. As the weather conditions were not the same at each place, the possibility of flight dependency upon some factor in addition to humidity was considered. Since the flights occurred during the crepuscular hours or when the moon was full, light may be a controlling factor. To test this hypothesis, the following experiment was tried: Males were allowed to become accustomed to earth in an indoor container. At 9 A.M., the soil was wet down and the curtains drawn. An hour later, males were ob-

[1]I am indebted to Dr. E. G. Linsley for identifying males.

served actively walking on the earth's surface, while the room was in semi-darkness. Within a few minutes after the lights were turned on, however, the beetles had all disappeared by digging into the soil.

Males in flight early in the season were strongly attracted to lights, but those in later flights did not show this phototropism, and had to be collected with a net.

Both males and females were watched as they dug. They used the flattened clypeus with a motion suggesting a scoop shovel, getting the head as low as possible and then lifting it and the dirt in front of or above the clypeus. The anterior tarsi were drawn up behind the strongly toothed and dilated fore tibiae, which were used to loosen dirt and move backward. The middle and hind legs pushed the body forward and also continued the backward movement of the loosened soil. The strokes of all the legs were lengthwise of the body. It was surprising that very few males had the fore tarsi missing, and that the heavier female could dig at a much faster rate that the male.

Males found in the ground were in unlined earthen cells within four inches of the surface. Captive males in the observation cage remained near the surface until the earth was wetted, whereupon they immediately started to dig to the surface.

Males enter the ground between flights, and this accounts for the numerous small holes that make it difficult for the collector to find the burrows of females. The burrow of a male is typically about half an inch in diameter and generally is free of loose dirt around the opening; that of the female is noticeably larger, about three quarters of an inch in diameter, and usually has loose dirt around the mouth. The burrow of the female also generally has a plug of loose earth an inch or two below the opening. This plug suggests that the female first comes to the surface, then turns around and goes down the open hole, pushing up dirt as she digs. A male and female were taken in the same burrow, the male above the female, and both were about 8 inches below the surface and headed down. This pair of beetles was in comparatively dry sandy soil.

The larvae of *P. conjungens*[2] were taken early in the spring in an area of grass and yellow pine roots. The three females found in the soil were in close proximity to the following plants:

1. *Pinus ponderosa* Dougl. Yellow pine.[3]
2. *Gnaphalium* sp. Cudweed.[3]
3. *Quercus agrifolia* Nee. Coast live oak.[3]

[2]Determined by Dr. E. G. Linsley.
[3]Determined by Dr. C. D. Duncan.

RECORD OF THE GENUS PROCATHAROSIA IN NORTH AMERICA

(Diptera: Tachinidae or Larvaevoridae)

BY PAUL H. ARNAUD

Natural History Museum, Stanford University, California

A male tachinid recently collected by the writer in Santa Clara Co., California, was kindly identified as *Petia calva* Coquillett by Prof. H. J. Reinhard of the Agricultural and Mechanical College of Texas. Dr. L. P. Mesnil of the Commonwealth Bureau of Biological Control, Zurich, Switzerland, also examined the specimen and found it to be congeneric with the genus *Procatharosia* Vill. Coquillett (1910) originally described the genus *Petia* with the new species *calva* as generic type, on the basis of two male specimens from San Pedro, California, and Moscow, Idaho. Villeneuve (1924) proposed the new generic name *Procatharosia* with *Catharosia flavicornis* Zetterstedt as type. Townsend (1915, 1936 and 1938) considered *Petia* Coquillett to be a synonym of *Catharosia* Rondani, 1868. This synonymy is incorrect because of the probable misidentification of the European species by Townsend. *Petia* was first used by Gray in 1839 for a genus of reptiles. Therefore, *Procatharosia* Villeneuve 1924 is the first available generic name and the American species should now be called *Procatharosia calva* (Coquillett).

The distribution of the two known species of *Procatharosia* is western Europe for *P. flavicornis* and western North America for *P. calva*. The specimens of *P. calva* studied are: ♂, Stanford University, California, July 1, 1949; 2 ♀♀, Stanford University, California, July 28, 1949; ♀, Redwood City, San Mateo Co., California, July 30, 1949; all collected by the writer.

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A WESTERN RACE OF LANGURIA MOZARDI

(Coleoptera: Languriidae)

BY PATRICIA VAURIE

American Museum of Natural History, New York

Examination of 114 specimens of *Languria mozardi* (Latreille), the Clover Stem-Borer, from various parts of Texas, Arizona, Utah, and northern Mexico, shows that in this area there is a race with the legs consistently darker than the *mozardi* of northeastern and southeastern United States. It is proposed to name it

Languria mozardi occidentalis Vaurie, new subspecies

Similar to *m. mozardi* in size and in coloration above, but differing from it in coloration below, *occidentalis* having more piceous on the femora and less piceous on the abdomen.

Type Locality: UVALDE, TEXAS, June 14, 1932, J. O. Martin, collector; type deposited in the California Academy of Sciences. 36 *paratopotypes*, 33 in the California Academy of Sciences, 3 in the American Museum of Natural History. 81 *paratypes* from: UTAH: St. George (Chas. Palm). ARIZONA: Phoenix, February 28, 1929 (J. H. O'Dell), August (D. K. Duncan), (Chas. Palm), June 24, July 4, 1942 (P. C. Grossman); Tempe, August 1 and 3, 1917, Corn. Univ. Exped. Lot 542; Globe, June (D. K. Duncan), February 23, 1936 (Parker), May 19 (Duncan and Parker); Tucson, Univ. Farm, June 4, 1926 (A. A. Nichol); Pima Co., September 1, 1925 (C. L. Marsh); Yuma, May 14, 1939 (Van Dyke Coll.); Maricopa Co., August 27, 1928 (O. L. B.); "Ariz." (Chas. Palm). TEXAS: Clifton, June 16, 1929 (J. O. Martin); Waco (Schff. Coll); Austin, April 7, 1924 (J. O. Martin), May 30, 1897 (G. W. Beck); New Braunfels, June 26, 1917 (Schff. Coll.); San Antonio, May (A. Fenyes Coll.), June, 1942 (E. S. Ross); Carrizo Spgs., June 12, 1932 (J. O. Martin); Ben Bolt, June 23, 1930 (J. O. Martin); Kingsville, Corn. Univ. Lot 912 Sub (C. T. Reed); Fedor, (Van Dyke Coll.); "Tex." (Schff. Coll.), (Chas. Palm). MEXICO: Chihuahua: Delicias, July 11, 1947, D. Rockefeller Exp. (Cazier); Sinaloa: Los Mochis, June 18, 1922 (Van Dyke Coll.). 29 paratypes in the California Academy of Sciences, 21 in the American Museum of Natural History, 13 at Cornell University and 18 in the collection of Frank H. Parker.

Discussion: In *occidentalis* the middle and hind femora are usually entirely piceous and always more than half piceous, in contrast to *mozardi* where they are usually less than half piceous or half piceous and half reddish yellow. This is a small but constant difference and is shown below.

Table 1. Color of the middle and hind femora of *Languria m. occidentalis* and *L. m. mozardi:*

	114 *L. m occidentalis*		196 *L. m. mozardi*	
More than half piceous	109	(96%)	21	(11%)
Half piceous	5	(4%)	110	(56%)
Less than half piceous	—		65	(33%)

The front femora in both races are at least half piceous, but they are usually entirely so in *occidentalis* and from half to three-quarters in *mozardi.*

On the abdomen, the three apical segments are entirely piceous in 280 of 299 *mozardi* specimens, or 93 per cent, and in another series, 152 of 170, or 89 per cent, have them piceous. In *occidentalis,* on the other hand, of 114 specimens, only 43, or 37 per cent, have these segments fully piceous; the same number (37 per cent) have but two apical segments piceous, leaving 29 individuals, or 26 per cent, more or less in between, with only part of the third apical segment piceous.

It seemed that, in general, the elytral punctuation was deeper and larger in *occidentalis* and the head and thorax more strongly punctate, but these characters were found to vary quite a bit in both populations and to be very difficult to assess objectively.

There are physiological and ecological differences between these races. Southwestern *mozardi* (*occidentalis*) has three distinct generations a year, the first passed almost exclusively on yellow sweet clover (*Melilotus officinalis*), the second and third usually on alfalfa (*Medicago sativa*), while in the east there is but one generation, usually passed on red clover (*Trifolium pratense*), but also on other host plants, mainly Compositae.

No specimens have been examined from New Mexico, Colorado, Nevada, California, or Lower California, but it is probable that individuals from these states would be *occidentalis* rather than *mozardi.*

*New names in bold face, synonyms and homonyms in italics.

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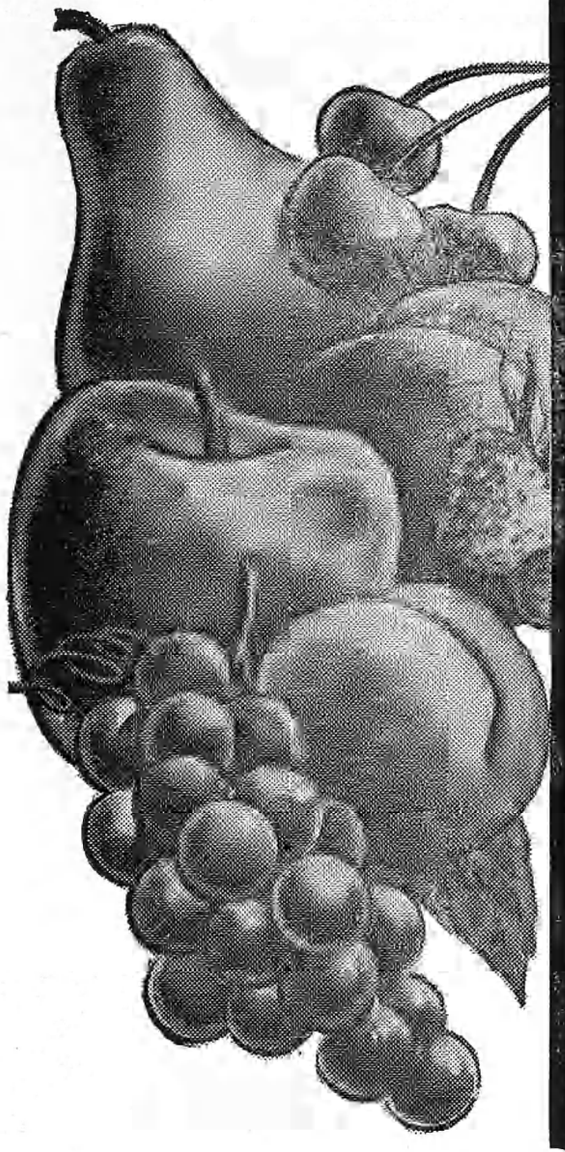

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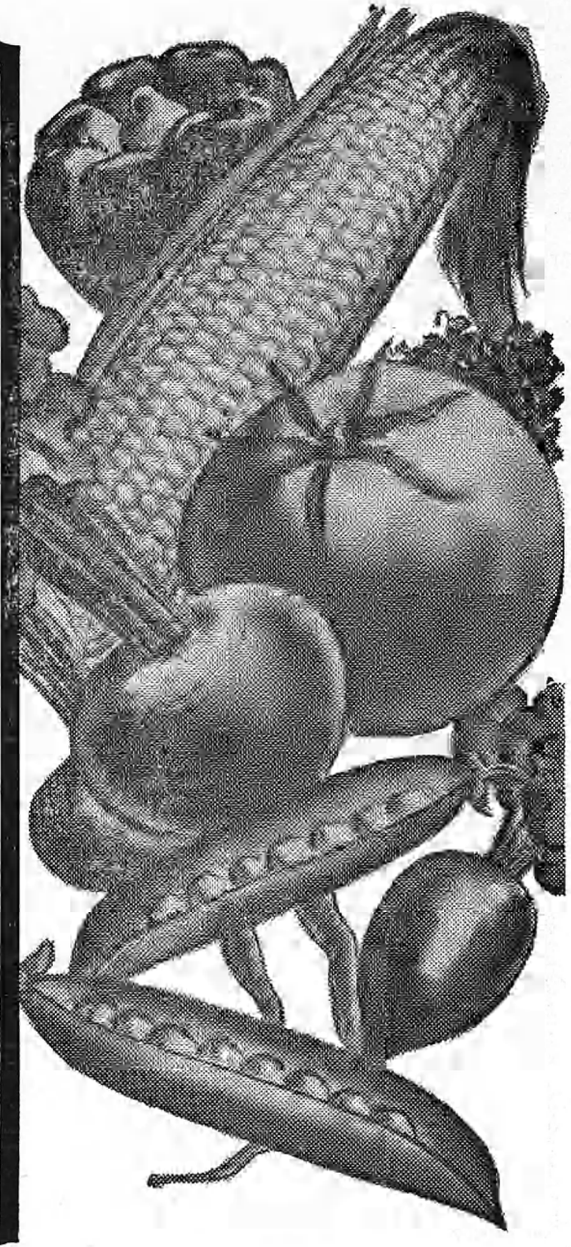

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