

THE PAN-PACIFIC ENTOMOLOGIST

Published by the
Pacific Coast Entomological Society
in co-operation with
The California Academy of Sciences

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San Francisco, California

1929

THE PAN-PACIFIC ENTOMOLOGIST

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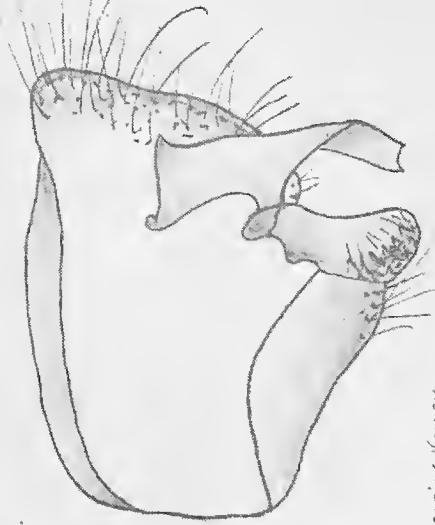
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phaeton



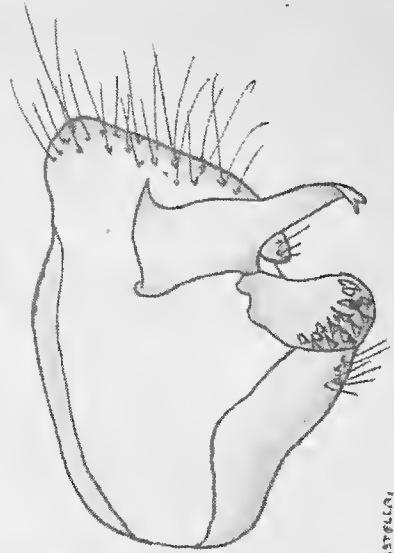
BRONX, N.Y.
MAY 13, 1904

chaleedona

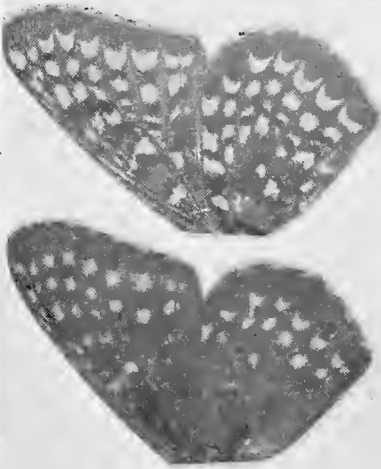


VISITATION VALLEY,
SAN FRANCISCO, CALIF.
JUNE 8 1914

dwinellei



CASTLETON,
SANTA COUNTY, CALIF.
JUNE 15, 1905



type phaethusa



♂

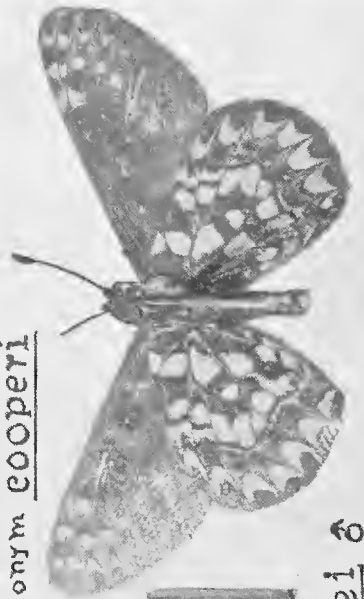
Cooperi
Bred by Behr
♂ sent me as type
1863



♀

Cooperi
Bred by Behr
♂ sent me as type
1863

synonym cooperi



Heliconia
var.
Dwinellei
M. G. S.

type dwinellei ♂



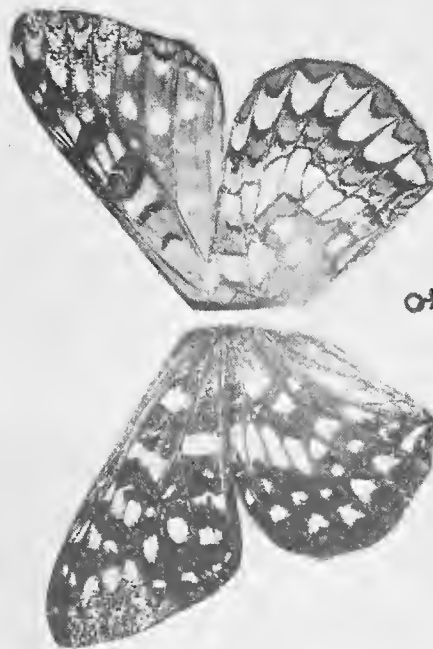
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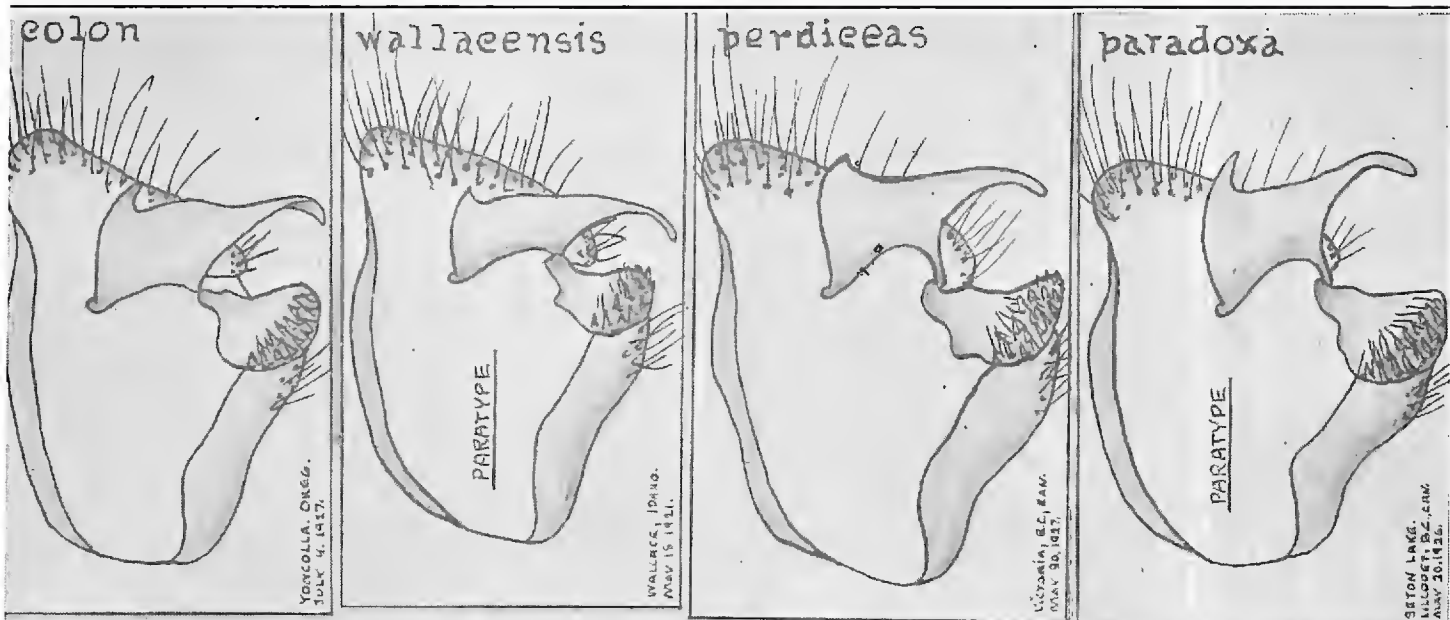
type phaeton



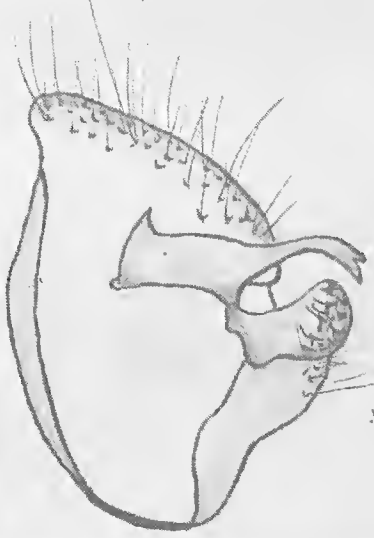
♀

type chaleedona



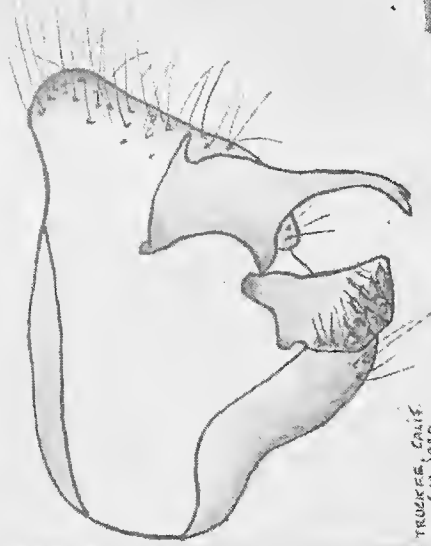


meglashanii



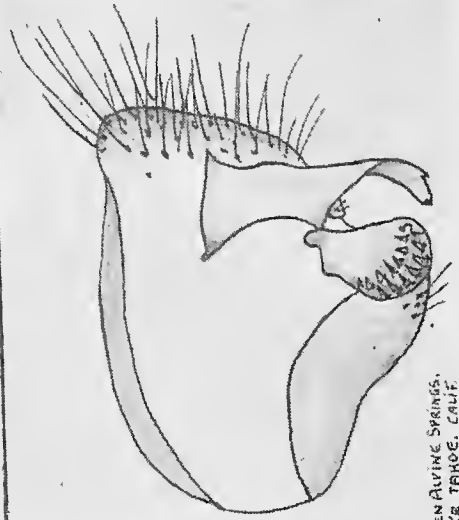
TRUCKEE, CALIF.
MAY, 1920.

truekeensis

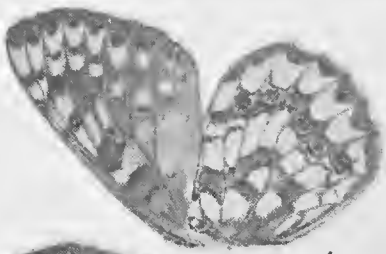


TRUCKEE, CALIF.
MAY 19, 1920.

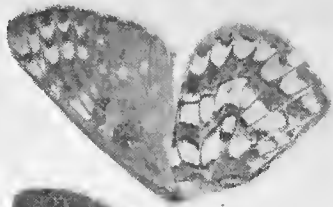
sierra



GLEN ALPINE SPRINGS,
LESEE TRAOE, CALIF.
JULY 10, 1925.



♀



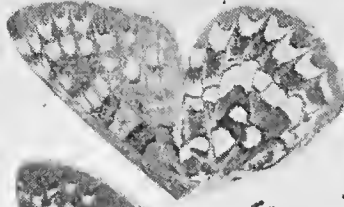
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meglashanii



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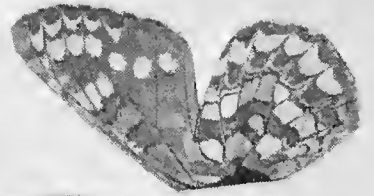
♂



type truekeensis



♀

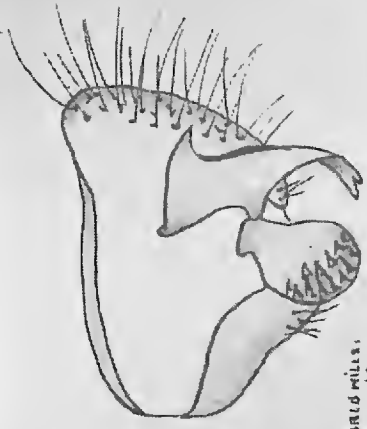


♂



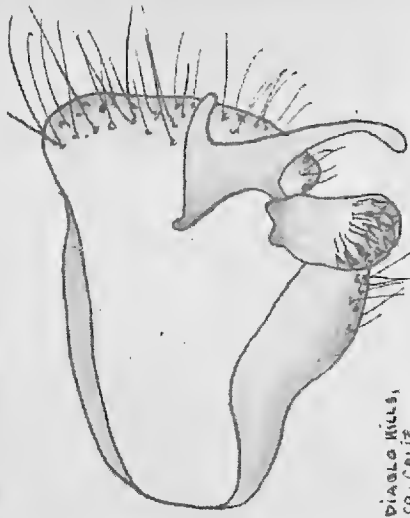
type sierra

olaneha



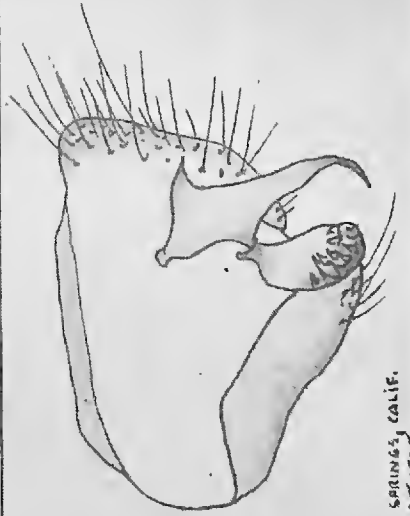
CASA DIABLO HILLS,
MONO CO., CALIF.
JUNE 22, 1925

georsei

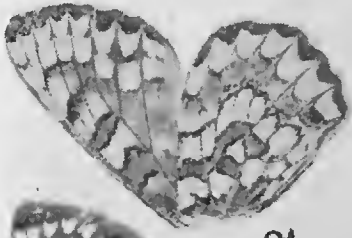


CASA DIABLO HILLS,
MONO CO., CALIF.
JUNE 23, 1925

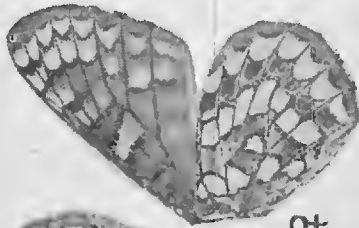
quino



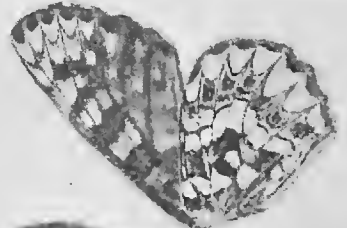
PALM SPRINGS, CALIF.
MAR. 28, 1928



♀



♀



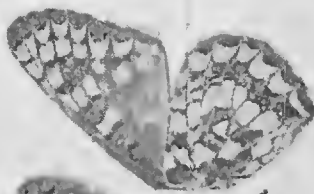
♀



♂



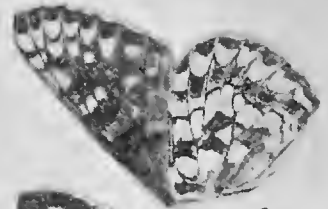
type ♂ olaneha



♂



type ♂ georsei

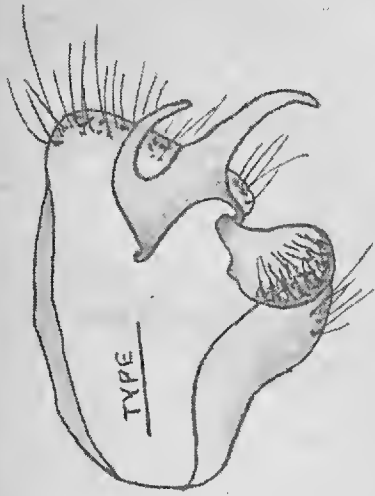


♂



quino

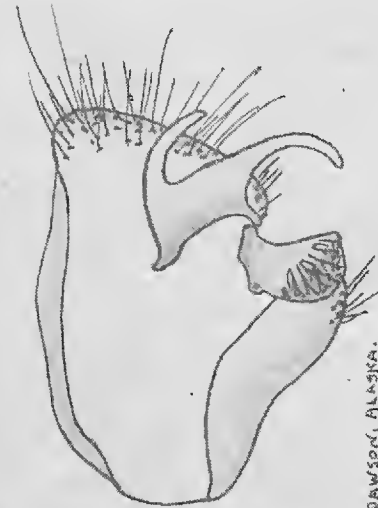
anicia



(RE-DRAWN)

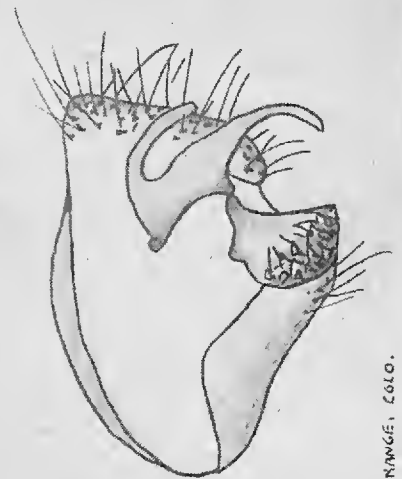
ROCKY MTS. N.A.

helvia



NEER DAWSON, ALASKA.
JULY, 1908

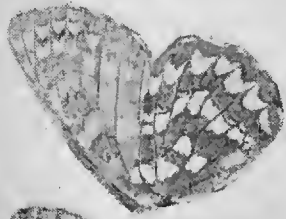
euryton



SNOWY MANGE, COLO.
JULY.

Anicia ♂

Anicia ♀
Colo. 10000 ft
Brucei Trow



♀



Rocky mts.
Peak of Derby
40500 ft



♂ helvia



♂



♀

synonym brucei



type ♂ anicia



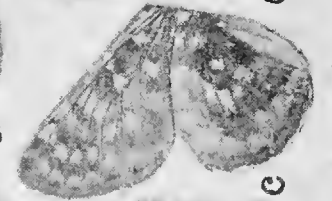
Yukon Territory
Crested Auk
Anchorage, Alaska
July 1908
The Stearns



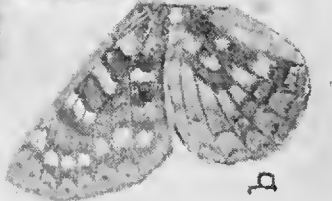
a



d



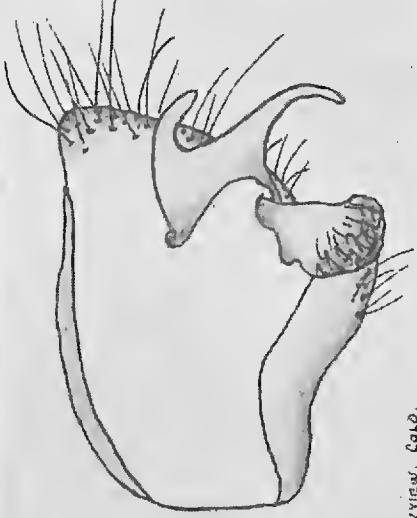
c



b

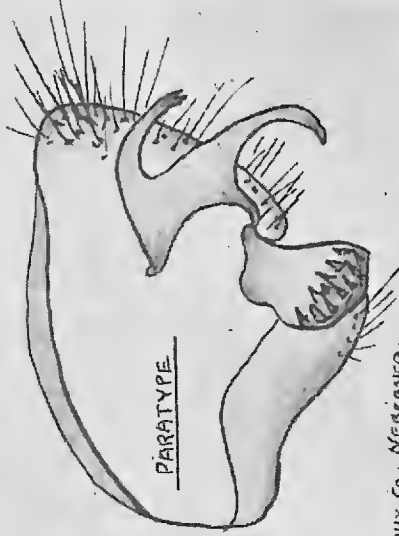
euryton

capella



PLAINVIEW, COLO.
JUNE.

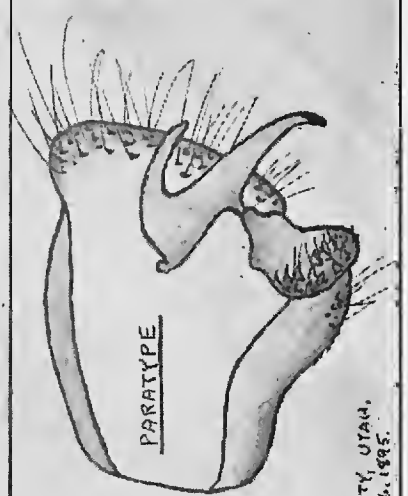
bernadetta



PARATYPE

SIOUX CO., NEBRASKA.
JULY 4, 1919.

maria



PARATYPE

PARK CITY, UTAH.
JUNE 26, 1895.



♀



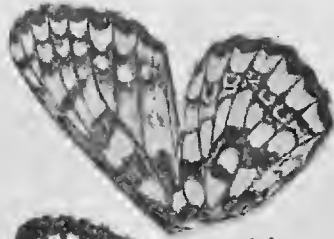
type capella

*Melitara
rubiginea
v. capella
Type Barnes*

Platte Canon,
Col. 28 1873
W. Barnes



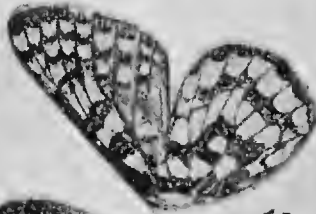
♂



♀



type bernadetta



♂



♀



type maria



♂



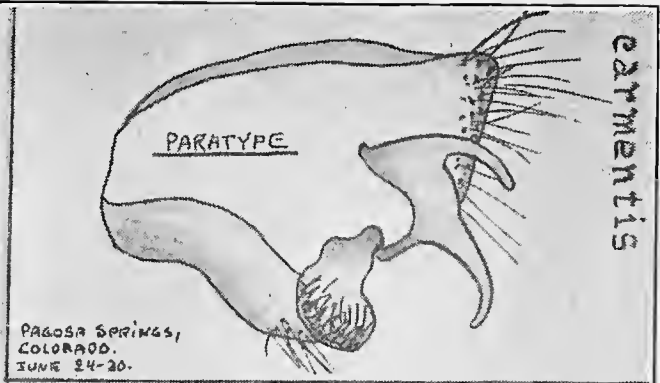


Euphydryas
carmentis
Holotype ♂ B. B. B. B.

1900
Pagosa Spgs
Colo.



type carmentis



carmentis

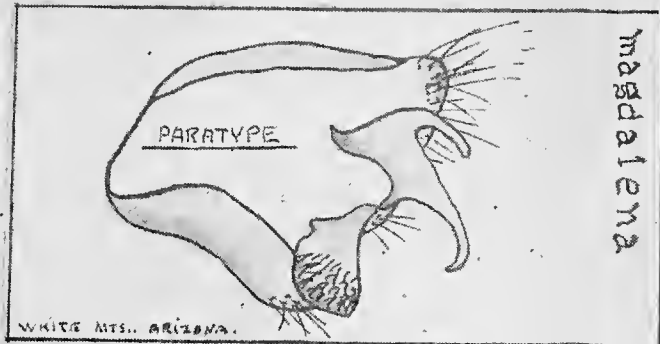


Euphydryas
magdalena
Type ♂ B. B. B. B.

White Mts.,
ARIZ.



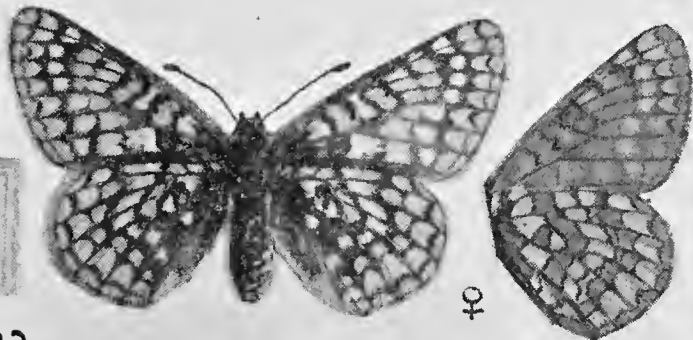
type magdalena



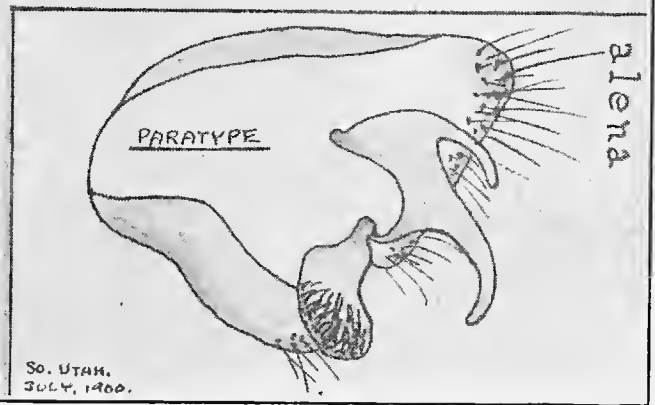
magdalena



Barnes,
So. Utah,
July 1890
Euphydryas
alena
Holotype ♂ B. B. B. B.



type alena



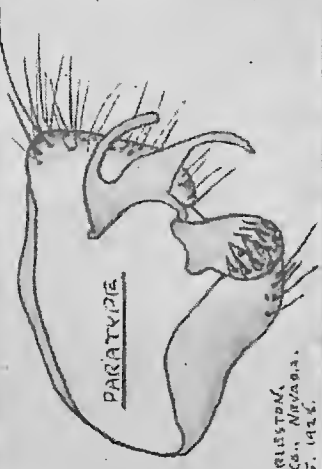
alena

wheeleri



MONO LAKE,
INYO CO., CALIF.
JUNE 13, 1916.

morandi



PARATYPE

MT. GARIBOLDI,
CALIF. CO., NEVADA.
JULY 15, 1916.

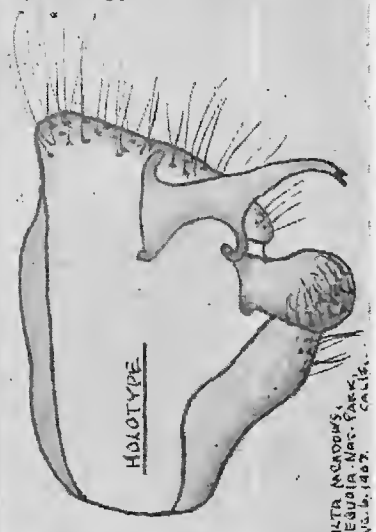
hermosa



TYPE

SOUTHEAST ARIZONA,
JULY, 1891.

irelandi

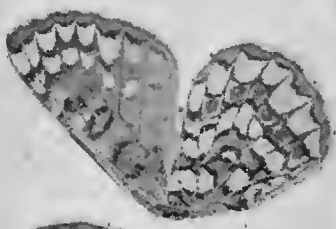


HOLOTYPE

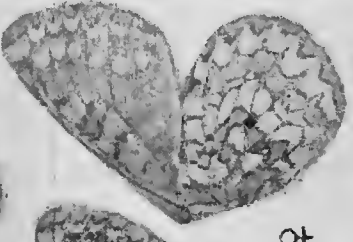
ALTA MONTAÑA,
SEQUOIA NAT. PARK,
CALIF.,
AUG. 6, 1907.



♀



♀



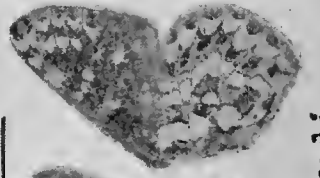
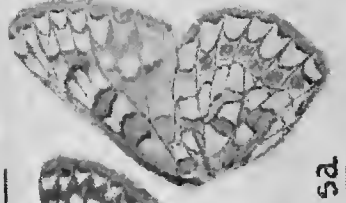
♀



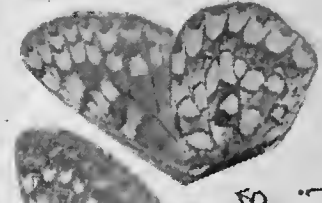
♀



♂



coll. lit.
Wheeleri, M. S. W.

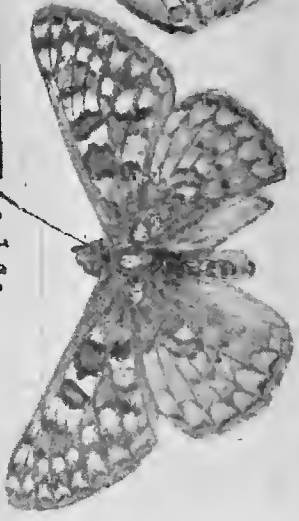


♂

type wheeleri



type morandi

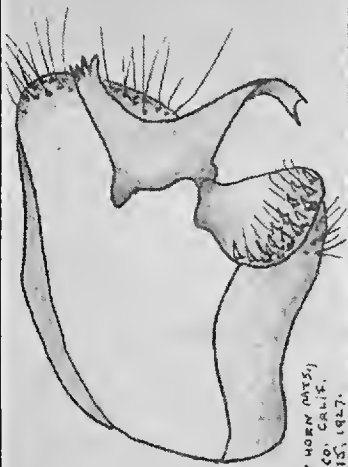


type hermosa



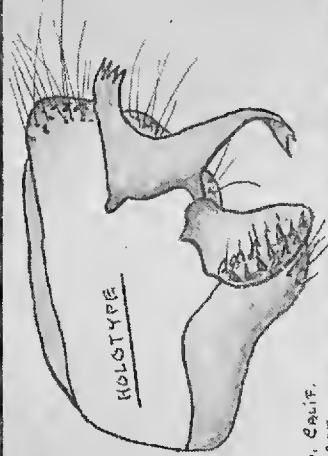
type irelandi

editha



GREEN HORN MTS.,
KERN CO., CALIF.,
MAY 13, 1927.

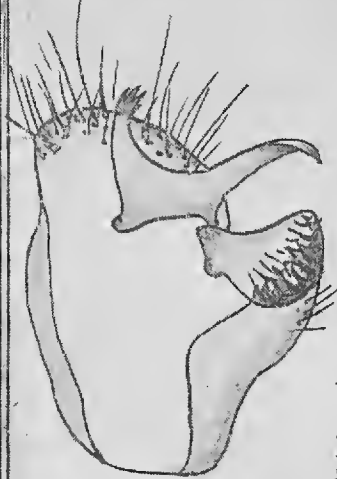
wrighti



HOLATYPE

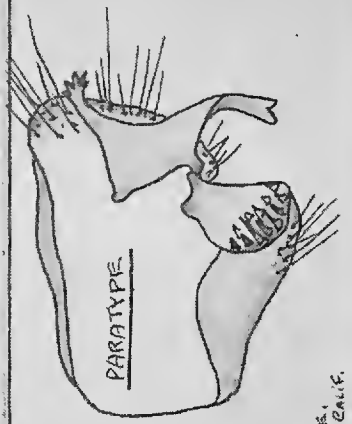
SAN DIEGO, CALIF.,
MAR. 8, 1907.

augusta



SHIP BUCKLE MTS.,
CALIFORNIA,
JUNE 11, 1922.

monoensis



PARATYPE

MORO LAKE,
MORO CO., CALIF.,
JUNE 14, 1926.



♀



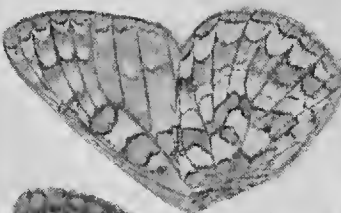
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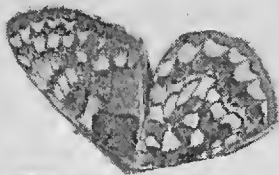
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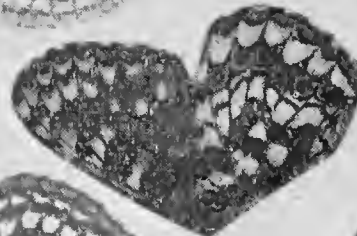
♀



♂



♂



♂



♂



type editha



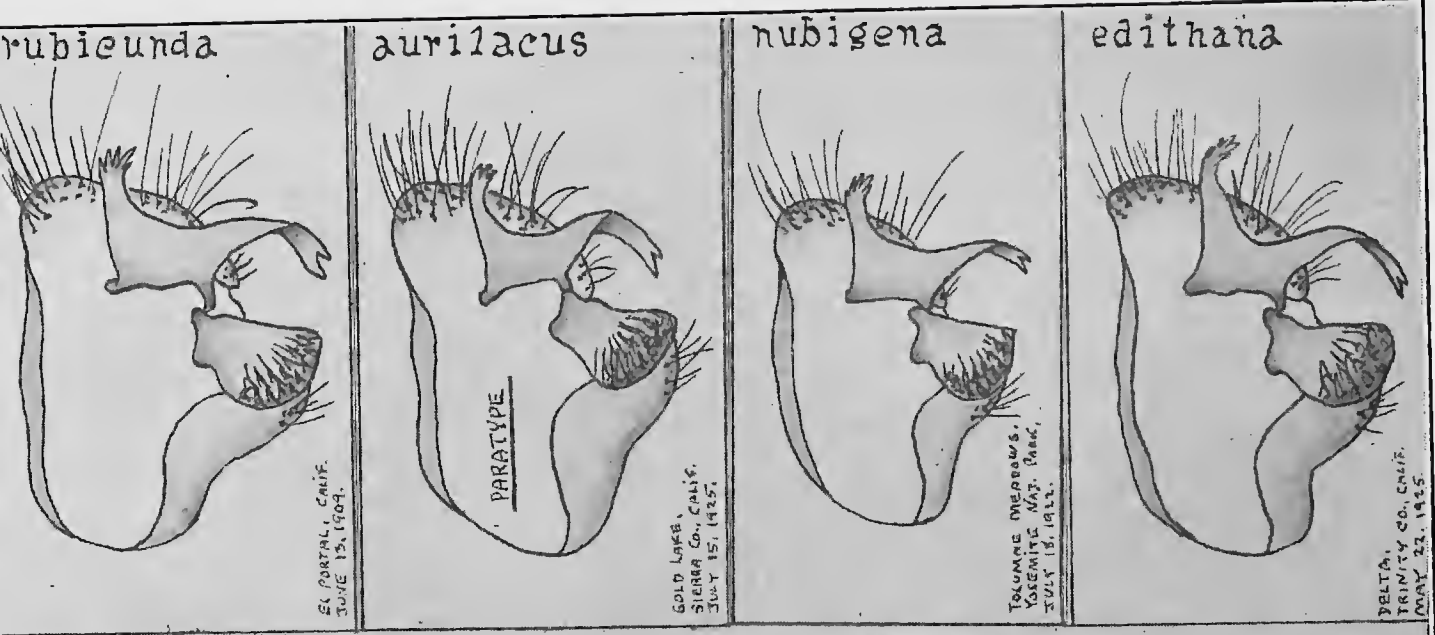
type wrighti



type augusta



type monoensis



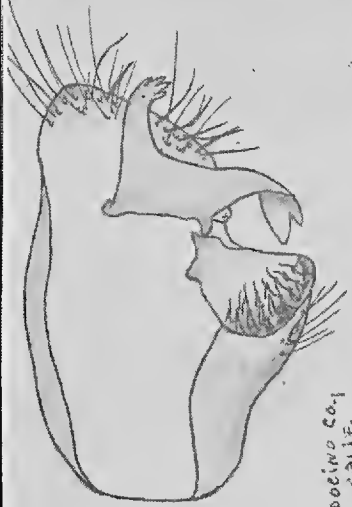
type rubicunda

type aurilacus

nubigena

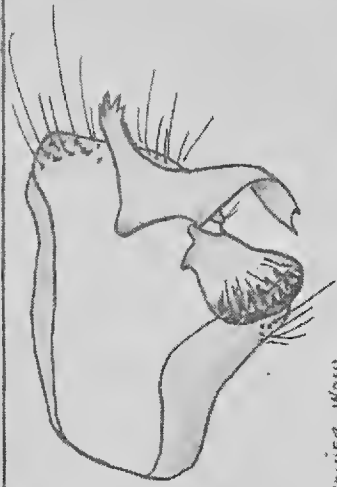
type ♂ edithana

baroni



MENDOCINO CO.,
MAY, CALIF.

colonia



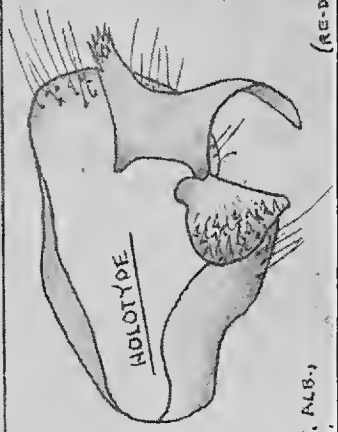
Mt. Rainier, WASH.
AUG. 1, 1919.

taylori



VICTORIA, B.C.,
CANADA,
APRIL 30, 1925.

beani



(RE-DRAWN)

LACLAKE, ALB.,
CANADA.



♀



♀



♀



♀



♂



♂



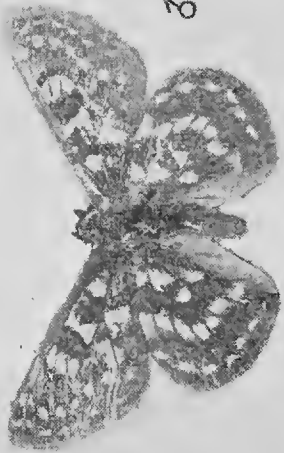
♂



♂



type baroni



type colonia



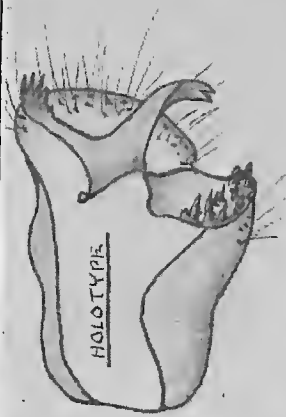
type taylori



type beani

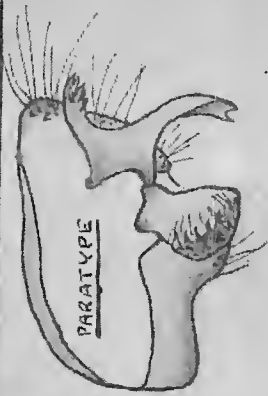
*Taylori
type
Victoria B.C.
Apr. 30, 1925*

hutchinsi



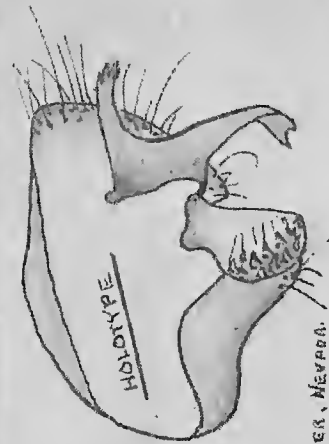
MILLIGAN CANYON,
JEFFERSON CO., MONTANA.
MAY 13.

montanus



MT. WASHINGTON, MT. PARK,
YELLOWSTONE NAT. PARK,
JULY 15, 1928.

lehmani



MT. WHEELER, NEVADA.
JUNE 4 1929.

gillettii



MARTINA, MONTANA.
JULY 7, 1926.



type hutchinsi



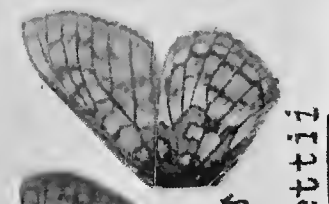
type montanus



type lehmani



Melipotis
gillettii
Type. Barnes
Yellowstone
Park Wyo. July
1926



type ♂ gillettii



THE *Chalcedona* GROUP
showing type localities

1. species *chalcedona* Dbldy. & Hew., San Francisco, Calif.
2. race *dwinellei* Hy. Edw., Shasta Co., Calif.
3. race *colon* Edw., Columbia River, Oregon.
4. race *wallacensis* Gun., Wallace, Idaho.
5. race *perdiceas* Edw., Puget Sound, Washington.
6. loc. f. *paradoxa* McD., Lillooet, B. C., Canada.
7. race *mcglashanii* Rivers, Truckee, Calif.
8. form *truckeensis* Gun., Truckee, Calif.
9. race *sierra* Wri., Sierra Nevada Mts. (Glen Alpine Sprs., Calif.).
10. race *olancha* Wri., Olancha Peak or Mountain, Calif.
11. form *georgei* Gun., Casa Diablo Hills, Mono Co., Calif.
12. race *quino* Behr, San Diego Co. (eastern portion), Calif.



THE *Anicia* GROUP
showing type localities

1. species *anicia* Dbldy. & Hew., Rocky Mts. (Banff, Alb., Can.).
2. race *helvia* Scud., Alaska (between Whitehorse and Dawson).
3. race *eurytion* Mead, Colorado.
4. race *capella* Barnes, Manitou and Denver, Colo.
5. race *bernadetta* Leus., Monroe Can., Harrison, Sioux Co., Neb.
6. race *maria* Skin., Park City, Utah.
7. race *carmentis* B. & Benj., Pagosa Sprs., Archuleta Co., Colo.
8. race *magdalena* B. & McD., White Mts., Arizona.
9. race *aleana* B. & Benj., So. Utah (between Parowan and Panguitch?).
10. race *wheeleri* Hy. Edw., So. Nevada (probably mts. of central part).
11. race *morandi* Gun., Mt. Charleston, Clark Co., Nevada.
12. race *hermosa* Wri., So. Arizona (Camp Roosevelt at Roosevelt Dam).
13. race *irelandi* Gun., Alta Peak, Sequoia Nat. Park, Calif.



THE *Editha* GROUP
showing type localities

1. species *editha* Bdv., Calif. (typical in Kern County).
2. race *wrighti* Gun., San Diego, Calif. (coastal areas).
3. race *augusta* Edw., Mountains of San Bernardino Co., Calif.
4. race *monoensis* Gun., Mono Lake, Calif.
5. race *rubicunda* Hy. Edw., Mariposa Co., Calif. (typical).
6. race *nubigena* Behr, Tuolumne Meadows, Yosemite Nat. Park, Calif.
7. race *aurilacus* Gun., Gold Lake, Sierra Co., Calif.
8. race *baroni* Edw., Mendocino Co., Calif.
9. race *edithana* Strd., Lassen Co., Calif. (also Klamath Co., Oreg.).
10. race *colonia* Wri., Mt. Hood, Oregon.
11. race *taylori* Edw., Victoria, Vancouver Isl., B. C., Canada.
12. race *beani* Skin., Laggan, Alberta, Canada.
13. race *hutchinsi* McD., Jefferson Co., (Milligan Can.) Montana.
14. loc. f. *montanus* McD., Mt. Washburn, Yellowstone Nat. Park, Wyoming.
15. race *lehmani* Gun., Mt. Wheeler, (Lehman Cave Resort) Nevada.

GENUS EUPHYDRYAS SCUD.

1. phaeton Dru. ----- (Ill. Ins. 1, 42, pl. XXI, 1770)
phaetana Hbn. ----- (*Verez. bek. Schmett*, p. 28, 1818)
phaetontea Godt. ----- (*Enc. Method.*, 9, 288, 1819)
phaeton H.-S. ----- (*Corr. Blah. Regensb.*, vol. XIX, p. 105, 1865)
schausi Clark ----- (*Proc. U. S. Nat. Mus.*, v. 71, pp. 1-22, 1927)
 form *phaethusa* Hlst. ----- (*Bul. Brooklyn Ent. Soc.*, 3, 77, 1881)
 tr. f. *superba* Stkr. ----- (*Stkr. Syn. Cat.*, 125, 1878)
magnifica Clark ----- (*Proc. U. S. Nat. Mus.*, v. 71, p. 7, 1927)
 tr. f. *streckeri* Ellsw. ----- (*Ent. News*, 13, 104, 1902)

2. chalcedona Dbldy. & Hew. ----- (*Gen. Diur. Lepd.*, 1, 180, pl. XXIII, f. 1, 1847)
cooperi Behr. ----- (*Proc. Calif. Acad. Sci.*, 3, 90, 1863)
 form *dwinellei* By. Edw. ----- (*Papilio*, 1, 51, 1881)
 tr. f. *fusimacula* Barnes ----- (*Can. Ent.*, 32, 42, 3, 1900)
grundeli Cool. ----- (*Can. Ent.*, 40, 428, 1908)
lorquani Oberth. ----- (*Et. Lep. Comp.*, 9, (2), 76, pl. CCLIX, f. 2170, 1913)
suprafusa Comst. ----- (*Bul. So. Calif. Acad. Sci.*, 25, 30, 1926)
fuscunda Comst. ----- (*Bul. So. Calif. Acad. Sci.*, 25, 31, 1926)
 tr. f. *mariana* Barnes ----- (*Can. Ent.*, 32, 42, 1900)
supranigrella Comst. ----- (*Bul. So. Calif. Acad. Sci.*, 25, 30, 1926)
hemimelanica Comst. ----- (*Bul. So. Calif. Acad. Sci.*, 25, 31, 1926)
 tr. f. *omnilutefuscus* Gun. ----- (*Ent. News*, 56, 195, pl. 5, f. 4, 1925)
hemilutefuscus Gun. ----- (*Ent. News*, 36, 196, pl. 5, f. 5, 1925)
 a. colon Edw. ----- (*Papilio*, 1, 45, 1881)
 tr. f. *mcduunnoughi* Gun. ----- (*Can. Ent.*, v. LX, p. 163, f. 6, 1928)
wallacensis Gun. ----- (*Pan-Pac. Ent.*, v. 5, 2, p. 50, 1928)
 tr. f. *idahoensis* Gun. ----- (*Pan-Pac.*, THIS ISSUE)
 tr. f. *huellemani* Comst. ----- (*Bul. So. Calif. Acad. Sci.*, 25, 32, 1926)
 c. *perdiceas* Edw. ----- (*Papilio*, 3, 43, 1883)
 loc. form *paradoxa* McD. ----- (*Can. Ent.*, v. LIX, 7, p. 159, 1927)
 tr. f. *nigrisupernipennis* Gun. ----- (*Ent. News*, 37, 4, pl. 1, f. 5, 1926)
 d. *mcglashanii* Rivers ----- (*Proc. Calif. Acad. Sci.*, (2), 1, 102, 1888)
 form *truckeensis* Gun. ----- (*Ent. News*, v. XXXIX, 10, p. 205, 1928)
 tr. f. *hilli* Gun. ----- (*Ent. News*, v. XXXIX, 10, p. 206, 1928)
 e. *sierra* Wri. ----- (*Butt. West Coast*, p. 151, pl. XIX, 1905)
 tr. f. *magdelaenae* Gun. ----- (*Ent. News*, v. XXXVI, p. 197, f. 8, 1925)
 tr. f. *umbrobasana* Gun. (Comst.) ----- (*Bul. So. Calif. Acad. Sci.*, v. XXV, p. 32, 1926)
 f. *olancha* Wri. ----- (*Butt. West Coast*, p. 150, pl. XVIII, 1905)
 form *georgei* Gun. ----- (*Ent. News*, v. XXXIX, p. 396, pl. XIV, 1928)
 tr. f. *malcolmi* Gun. ----- (*Ent. News*, v. 38, p. 134, f. 3, 1927)
 g. *quino* Behr ----- (*Proc. Calif. Acad. Sci.*, 3, 90, 1863)

3. anicia Dbldy. & Hew. ----- (*Gen. Diur. Lep.*, 1, 179, pl. XXIII, f. 2, 1848)
 a. *helvia* Scud. ----- (*Proc. Bost. Nat. Hist. Soc.*, 12, 405, 1869)
 b. *bruytoni* Mead ----- (*Wheeler Rept. Geol. Surv.*, 5, 759, 1875)
brucei Edw. ----- (*Can. Ent.*, 20, 81, 1888)
 tr. f. *melanodisca* Comst. ----- (*Lepidopterist*, 2, 34, pl. VI, f. 1-3, 1918)
 c. *capella* Barnes ----- (*Can. Ent.*, 29, 41, 1897)
 tr. f. *rubrolimbata* Comst. ----- (*Lepidopterist*, 2, 34, pl. VI, f. 1-3, 1918)
 tr. f. *oslari* Gun. ----- (*Ent. News*, 36, 196, pl. 5, f. 7, 1925)

- d. *bernadetta* Leuss. ----- (*Ent. News*, 31, 102, 1920)
 tr. f. *leussleri* Gun. ----- (*Ent. News*, 38, 5, p. 138, f. 8, 1927)
 tr. f. *belli* Gun. ----- (*Pan-Pac.*, THIS ISSUE)
 e. *maria* Skin. ----- (*Can. Ent.*, 31, 12, 1899)
 tr. f. *skinneri* Gun. ----- (*Can. Ent.*, v. LX, p. 164, f. 9, 1928)
 tr. f. *spauldingi* Gun. ----- (*Can. Ent.*, v. LX, p. 165, f. 10, 1928)
 f. *carmentis* B. & Benj. ----- (*Bul. Co. Calif. Acad. Sci.*, v. XXV, p. 92, 1926)
 tr. f. *charloteae* Gun. ----- (*Can. Ent.*, v. LX, p. 165, f. 11, 1928)
 g. *magdalena* B. & McD. ----- (*Barnes Contrib.*, 4, (2), 71, pl. XI, f. 1-4, 1918)
 h. *alena* B. & Benj. ----- (*Bul. So. Calif. Acad. Sci.*, v. XXV, p. 92, 1926)
 i. *wheeleri* Hy. Edw. ----- (*Papilio*, 1, 52, 1881)
 j. *morandi* Gun. ----- (*Ent. News*, v. XXXIX, p. 304, pl. XIV, 1928)
 k. *hermosa* Wri. ----- (*Butt. West Coast*, p. 157, pl. XIX, 1905)
 l. *irelandi* Gun. ----- (*Can. Ent.*, v. LXI, p. 45, 1929)

- editha Bdv. ----- (*Ann. Soc. Ent. Fr.*, (2), 10, 304, 1852)
 tr. f. *fieldi* Gun. ----- (*Ent. News*, 35, 155, pl. 2, f. e, 1924)
 a. *wrighti* Gun. ----- (*Pan-Pac.*, THIS ISSUE)
 b. *augusta* Edw. ----- (*Can. Ent.*, 22, 21, 1890)
 tr. f. *augustina* Wri. ----- (*Butt. West Coast*, 154, pl. XIX, f. 170, 1905)
 c. *monoensis* Gun. ----- (*Pan-Pac. Ent.*, 5, 2, 49, f. a, 1928)
 d. *rubicunda* Hy. Edw. ----- (*Papilio*, 1, 52, 1881)
 tr. f. *cottlei* Gun. ----- (*Can. Ent.*, v. LX, p. 164, f. 7, 1928)
 e. *nubigena* Behr ----- (*Proc. Calif. Acad. Sci.*, 3, 91, 1863)
 form *rubrosuffusa* Comst. ----- (*Bul. So. Calif. Acad. Sci.*, 25, 32, 1926)
 tr. f. *tiogoensis* Gun. ----- (*Pan-Pac.*, THIS ISSUE)
 tr. f. *hobarti* Gun. ----- (*Pan-Pac.*, THIS ISSUE)
 f. *aurilacus* Gun. ----- (*Pan-Pac. Ent.*, 5, 2, 49, f. b, 1928)
 tr. f. *albiradiata* Gun. ----- (*Ent. News*, 37, 3, pl. 1, f. 4, 1926)
 tr. f. *foxi* Gun. ----- (*Ent. News*, 35, 155, pl. 2, f. d, 1924)
 g. *baroni* Edw. ----- (*Can. Ent.*, 11, 129, 1879)
 tr. f. *mirabilis* Wri. ----- (*Butt. West Coast*, 160, pl. XX, f. 184, 1905)
 tr. f. *dunni* Gun. ----- (*Pan-Pac.*, THIS ISSUE)
 tr. f. *sternitzkyi* Gun. ----- (*Pan-Pac.*, THIS ISSUE)
 h. *edithana* Strd. ----- (*Archiv fur Nat.*, v. 80, A, 11, p. 155, 1914)
 i. *colonia* Wri. ----- (*Butt. West Coast*, p. 158, pl. XX, f. 180, 1905)
 j. *taylori* Edw. ----- (*Can. Ent.*, 20, 82, 1888)
 tr. f. *victoria* Gun. ----- (*Ent. News*, 37, 4, pl. 1, f. 6, 1926)
 tr. f. *barnesi* Gun. ----- (*Can. Ent.*, v. LX, 10, p. 164, pl. a, f. 8, 1928)
 k. *beani* Skin. ----- (*Can. Ent.*, 28, 155, 1897)
 l. *hutchinsi* McD. ----- (*Ent. News*, 37, p. 4, pl. 1, f. 1, 1926)
 loc. form *montanus* McD. ----- (*Can. Ent.*, v. LX, 10, p. 248, 1928)
 m. *lehmani* Gun. ----- (*Can. Ent.*, v. LX, 10, p. 249, 1928)
 (*Pan-Pac.*, THIS ISSUE)

5. *gillettii* Barnes ----- (*Can. Ent.*, 29, 40, 1897)
glacialis Skin. ----- (*Ent. News*, 32, 80, 1921)
 tr. f. *herri* Gun. ----- (*Pan-Pac.*, THIS ISSUE)

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THE GENUS EUPHYDRYAS SCUD. OF BOREAL AMERICA (LEPIDOPTERA NYMPHALIDÆ)

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Pasadena, California

It is evident from genitalic study, as well as from superficial appearance based upon adequate series, that there are in reality only five known species of *Euphydryas* in North America, north of Mexico, namely, *phæton* Dru., *chalcedona* Dbldy. and Hew., *anicia* Dbldy. and Hew., *editha* Bdv., and *gillettii* Barnes. If we are to progress in evolutionary classification, we must subordinate many names to racial rank and try, as far as our present knowledge goes, to place each in the obvious light of their related development. This is sometimes difficult to do, in fact impossible to do, because we have to follow the nomenclature of an unnatural scheme of classification. For example, take the name *editha* Bdv. Being the first named of its kind, its name takes the rank of species and theoretically heads its group; whereas actually it probably is not the oldest in point of time or in line of descent. It, therefore, cannot claim proved prime position.¹ The same is true of *anicia* and perhaps of the others. However, we must follow code (in most cases) until we have definite proof to back up a more logical arrangement for classification; and until that time there is no other way of placing species names in list order except by the rule of priority. This subject is gradually becoming a serious matter and deserves more attention on the part of progressive entomologists.

In a check list the last listed name in a genus may in some cases be supposed to be the oldest or the most ancient species. *Euphy. gillettii* can, I believe, claim this position in its surviving and its unique relationship to old world species. *Editha*,

¹ See definitions of species, race, form, tr. form, etc., in November 1927 Entomological News.

with its barbed left projection of the uncus, somewhat like *gillettii*, comes next above, while *anicia* approaches nearer the *chalcedona* category because of its having several local forms and forms showing intergradation. *Phaeton* is in reality quite near *chalcedona*, but will probably always be listed as a species.

In making the genitalic slides for this article each genitalia has been uniformly pressed, so that the shape of the harpe and projections are not distorted any more than is necessary. This is very important. The projections of the uncus "tell the story," especially the left projection. In a kind there is not much variance to its style. It is fairly constant as a medium for comparative analysis. The shape or general contour of the harpe is helpful, but it is not as important a key to relationship as is the left projection. I might state here that the old style manner of simply opening up and spreading out the genitalia as a whole is practically useless because of the many lines and the mass distortion to be overcome. The drawings of the genitalia, herein illustrated, were made with a Spencer drawing machine, which is superior to a camera lucida.

I have illustrated the original types wherever possible, or examples from type localities, and I regret that these figures cannot be in color, but students having material from or in the region of type localities will probably find the halftones of help. In this article I have not the space to review the faults and misidentifications of others, including myself. Perhaps the trouble has been lack of original illustrations and of serious thought as to type locality. In a genus like *Euphydryas* the type locality is all-important. It is a genus in which the names cannot cover a great expanse of territory, except in the case of the species *phaeton*. For example, a *perdiceas* cannot come from Los Angeles County, a desert *monoensis* from the mountains of Montana, or a *nubigena* from Colorado, etc.

Regarding *Euphydryas* transition forms. There are only three kinds of these possible. Two albifusism and melanifusism come under maculation change, and the other, chromatism, under color change. No more names can be added except as they come under these divisions.

I wish to thank the following gentlemen for their help with photographs, loan of types or genitalic drawings: Barnes,

Leussler, Van Duzee, McDunnough, Williams, Holland and N. D. Riley of London. A few notes and some new descriptions follow.

Schausi Clark, a synonym. I have examined specimens of *phaeton* from New York, Massachusetts, Minnesota, Missouri, and North Carolina and they are similar to those from the type locality near New York City. Deviation as to blackness, size, or color of light maculation (cream to white) is not a constant factor, but is found "within the limits of the species" at the type locality and elsewhere. In his paper Mr. Clark has not considered the original type, its illustration, or its type locality.

Phæthusa Hlst., a form. Undoubtedly a mendelian form and not a transition form. This name represents examples in which the upper sides of the wings are quite dark, even to practically covering the red at outer margins. The black replaces the red or covers it especially at the margins, leaving light designs intact or slightly reduced. In a typical series the specimens will grade to *phæthusa*. *Chalcedona* on the west coast produces similar examples, only more commonly. They are not worthy of a special name, as we should not encourage the naming of mendelian forms.

Cooperi Behr, a synonym. Dr. Behr at the time he named *cooperi* could not have known the type of *chalcedona*, as both are similar and one within the locality range of the other. Illustration shows types (?) from Edwards' collection.

Dwinellei Hy. Edw., a form, in northern California, not as yet constant enough to deserve racial rank. Named from one male having considerable red on the upper side of its primaries.

Euphy. chalcedona Dbldy. and Hew., race **wallacensis** Gund, tr. f. **idahoensis** new tr. f.

Having the white spotting on both upper and under sides elongated through the interspaces after the style of *chalcedona fusimacula* Barnes. The red maculation remains the same. In the type the upper wings happen to be more fused than the lower. Tr. f. *huellemani* Comst. represents melanifusism. Classification: albifusism; fairly well developed.

Holotype ♀, expanse 47 mm., **Wallace, Idaho** (Huelleman), June 4, 1921. Type in the author's collection.

Note: There is a possibility that the name *huellemani* may have to take the species name with the name *wallacensis* as the normal form name. Questioned.

Perdiceas Edw. Distinct and deserving a racial classification. Common in June along the Columbia River, east of Portland. My illustration shows genitalia of a Victoria, B. C., example, also so-called Edwards' types, which he thought were synonymous with *cooperi* Bdv.

Paradoxa McD. represents a connecting link with the *anicia* group, but according to original description is more restricted than a form and, therefore, possibly a local form approaching the rank of race. Probably could be termed a race, as specimens from extreme northern Idaho are constant enough. Form *georgei* Gun. of *olancha* Wri. also approaches *anicia*, but is found with its species which makes it a straight form. An examination of tr. f. *nigrisupernipennis* Gun. places it with *perdiceas* rather than with *paradoxa*.

Sierra Wright is nothing but a very reddish race of *chalcedona*, very constant in its territories but grading through *truckeensis* to *mcglashanii* and hence to *chalcedona*. Dr. McDunnough first pointed out its relationship to *chalcedona*.

Anicia Dbldy. and Hew. Mr. N. D. Riley of the British Museum made the drawing of the genitalia of the type specimen from which my illustration was made. *Anicia* is constant at Banff with predominant red color. In regions way to the south in Colorado it produces darker specimens, some quite dark. For this reason the racial name, *eurytion* Mead is available, as *eurytion* was given for darker specimens out of the Edwards collection. Figure A attempts to show a dark specimen with figures B, C, and D as intergrades. *Brucei* is a synonym. More names cannot be applied from this district. *Capella* Barnes is distinct.

Euphy. anicia, Dbldy. and Hew., race **bernadetta** Leus., tr. f. **belli** new tr. f. Upper side.—Primaries entirely black except for marginal red row of spots which remain typical. Secondaries with typical marginal spots and rest of wing well clouded over with black except for traces of original design which is about covered, the lighter maculation showing through. Under side.—Usual design, heavy with black. White spots

misted over and indistinct, basal areas showing usual melanic transition. Classification: melanifusism, nearly final grade.

Holotype ♂, expanse 40 mm., **Harrison, Sioux County, Nebraska**, June 16, 1929. In author's collection, and named after Mr. E. L. Bell of Flushing, New York, who took this interesting specimen while on a collecting tour with Mr. Leussler of Omaha, Nebraska.

Maria Skin. From the type genitalia made by Mr. Williams. I am delighted to record for certain that this name comes under the *anicia* group. There is a possibility that the two tr. fs. placed under *maria* may have to be placed under *wheeleri* Hy. Edw. This point will be cleared up in the near future.

Alena B. and Benj. This name is misspelled on plate 14. Frank Morand secured a good series this year from near Cedar City, Utah.

Editha Bdv. This species has been taken at various points in southern California, but the examples taken by Mr. Ireland in the Greenhorn Mountains, up from Bakersfield in Kern County, are nearest the type, having the strong red bands across the wings on the upper sides. This region is probably the general old mining country from whence the types came. The types are in the Barnes collection at Decatur, Illinois.

Euphy. editha Bdv., race **wrighti** new race

Constantly smaller than *editha* Bdv. and more of a brownish red, a deeper red. Red bands across wings less defined. Black maculation heavier and dominant. Basal areas darker. All designs less clear-cut.

Holotype ♂, expanse 40 mm. Allotype ♀, expanse 46 mm. **San Diego, California** (George Field), March 7 and 8, 1907. Types in author's collection. Twelve pairs of paratypes, same dates and location. Examples placed in the Barnes collection and Canadian collection at Ottawa, Canada.

Note: Slightly atypical *editha* occurs in the hills north of San Diego, at old Camp Kearney. This new race probably finds its metropolis in the mountains of Lower California, reaching north. The types were taken within the city slightly south at a place which Mr. Field calls "forty acres" upon low sea-level hills, which are now being built over. Tr. f. *fieldi* is

referable to the parental species. At the special request of Mr. Field I am naming this race after his old friend, Mr. William S. Wright, of the San Diego Museum.

Rubrosuffusa Comst. is a form of *nubigena* Behr in which the outer half of the secondaries on the upper side is nearly clear red and almost free of transverse design. They grade in, and are not uncommon wherever *nubigena* occurs.

Euphy. editha Bdv., race **nubigena** Behr, tr. f. **tiogaensis** new tr. f. Having the white maculation of both upper and under sides elongated or fused through the interspaces. Illustrated (upper side) by Comstock in *Butterflies of California* as plate 35, figure 6. The type has been personally examined. Classification: albifusism.

Holotype ♂, expanse 32 mm., **Tioga Pass in Yosemite National Park, California** (Comstock), August 3, 1922. Type in collection of the Los Angeles Museum, Los Angeles, California.

Euphy. editha Bdv., race **nubigena** Behr, tr. f. **boharti** new tr. f. Having the maculation of the inner half of both wings on the upper sides quite melanic, especially the basal portions. The black lines on the under sides are dense through the basal portions also. The left wing of the primary is slightly torn. Classification: melanifusism, a 50 per cent development.

Holotype ♀, expanse 37 mm., **Tuolumne Meadows, Yosemite National Park, California**, July 5, 1928. In author's collection and named after Mr. R. M. Bohart of Berkeley, California, who is an energetic collector of lepidoptera. (Unfortunately Mr. Bohart's name is misspelled on plate 16.)

Euphy. editha Bdv., race **baroni** Edw., tr. f. **dunni** new tr. f. Upper wings on both sides quite dark except for marginal red edge and submarginal row of white spots. Lower wings slightly blurred dark, more so on upper side. Classification: melanifusism, upper wings especially. (The tr. f. *mirabilis* Wright represents albifusism.)

Holotype ♂, expanse 43 mm., **Mendocino County, California** (Eastman), 1912. Type in author's collection. Named after Mr. Norman R. Dunn of Berkeley, who is a coming young lepidopterist.

Euphy. editha Bdv., race **baroni** Edw., tr. f. **sternitzkyi**

new tr. f. Maculation entirely as in typical *baroni*, but the color is buff instead of red. Classification: chromatism, red to yellow.

Holotype ♀, expanse 46 mm., **Hillsboro**, near San Mateo, **San Mateo County, California** (Sternitzky), April 27, 1929. Type in author's collection. Named after Mr. R. F. Sternitzky of San Francisco, who took this example with typical specimens in this locality, just south of San Francisco.

Edithana Strd. Northern California produces specimens which might at first thought seem redder and smaller *baroni* (between *baroni* and *rubicunda*). This race was distinct, so I sent to Berlin and secured photos of the type of *edithana* Strd. and they matched, so we must raise *edithana* out of the synonymy.

Beani Skin. I had some misgivings about this name until Mr. R. C. Williams of Philadelphia made a slide of the type for me which places it with the *editha* group. A slide of tr. f. *blackmorei* Gun. is altogether similar.

Hutchinsi McD. Mr. Hutchins has procured for me this year a long series of this race which, as Dr. McDunnough says, approaches *taylori* Edw. A long series of *taylori* proves this. *Beani* is redder and strangely comes nearer *colonia* Wright. I have a good series of what really matches *colonia* from Priest River district in Idaho, therefore I think that *beani* is nothing more than a small *colonia* Wright. A percentage of my *hutchinsi* are small and dark like *montanus* McD. I have not a series of these specimens, but the name might stand as a local form until compared in a proper series to prove a racial constancy.

Euphy. editha Bdv., race **lehmani** new race. Looks like a small *augusta* Wright, but has its maculation less clear-cut. The ground color is white, however, which makes it lighter than *augusta*. Undoubtedly from the southern California *editha-augusta* stem, as is *hutchinsi*, from the northern *taylori* branch of the family.

Holotype ♂, expanse 30 mm., allotype ♀, expanse 35 mm., **Lehman Caves Resort, Mount Wheeler, White Pine County, Nevada**, June 4, 1929. Types in author's collection. Ten pairs of paratypes, same locality with early June dates. Examples

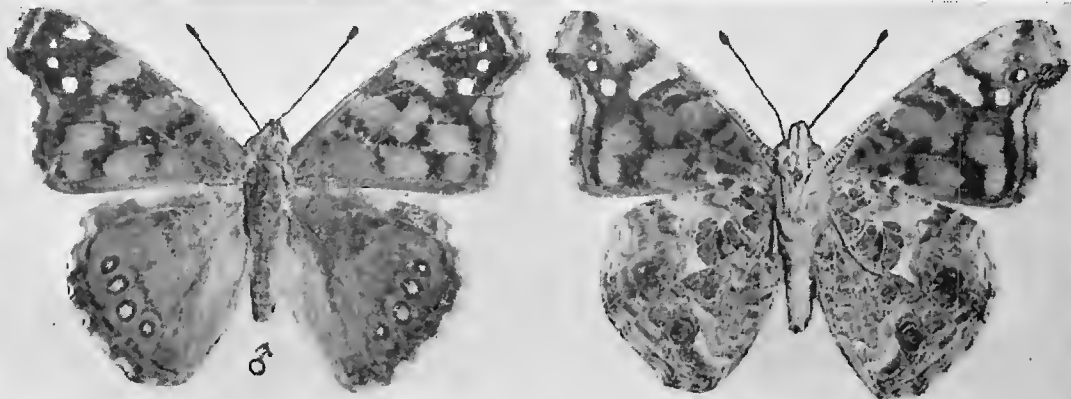
placed in the Barnes collection at Decatur, Illinois, and in the Canadian national collection at Ottawa, Canada. All specimens collected by Mr. Frank Morand of Los Angeles.

Euphy. gillettii Barnes, tr. f. **herri** new tr. f. In typical *gillettii*, on the upper sides the white rows of spots closely parallel the conspicuous red band across both wings. In this tr. f. these spots are clouded over and barely visible with black fusion. The basal areas are also shaded over at the expense of the red design. The white maculation on the under sides is also sprinkled over with misty black and the base is narrowed to black design and loses its white, which is usual in melanifusism. Classification: melanifusism, final degree unknown.

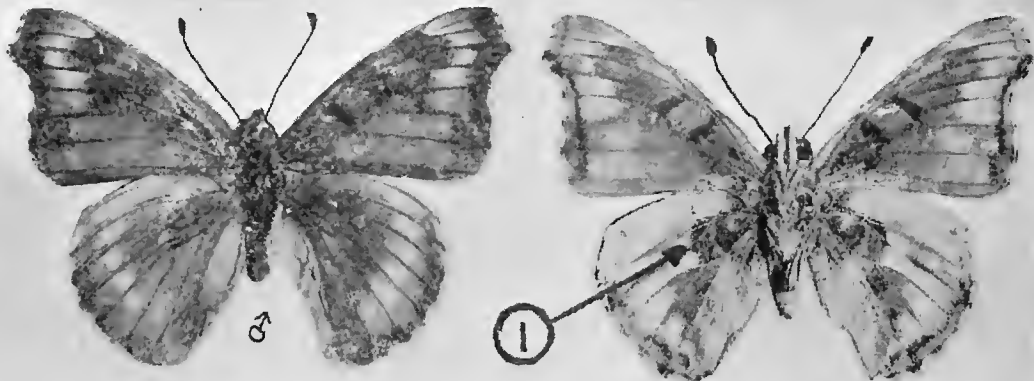
Holotype ♀, expanse 43 mm., **Martina**, near Stark, **Missoula County, Montana**, July 9, 1929. In author's collection and named after Mr. C. W. Herr of Priest River, Idaho, who was fortunate enough to take this interesting specimen.

BRACHYRHINUS (OTIORHYNCHUS) CRIBRICOLLIS (Gyll.)

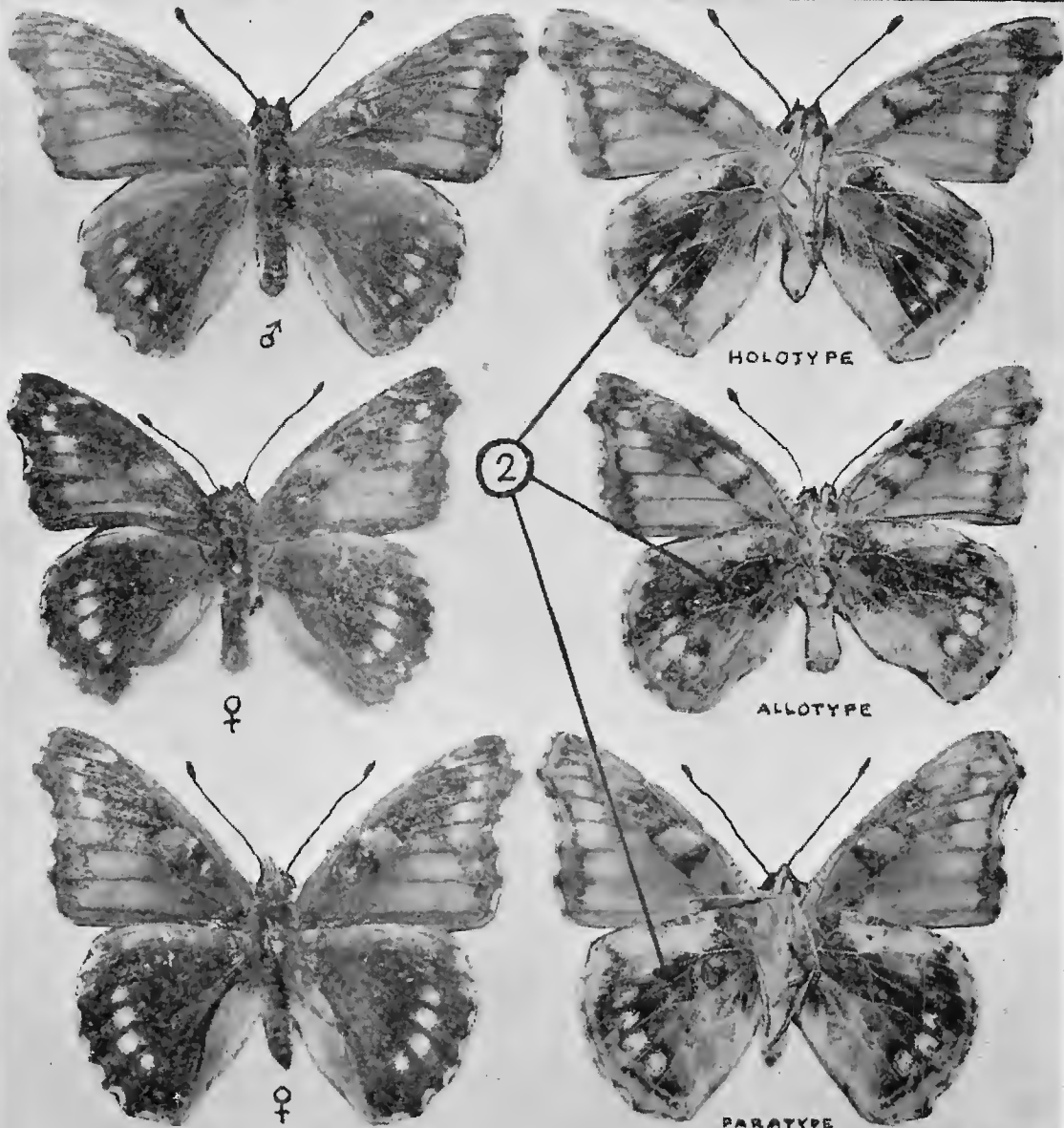
This, the fourth species of the genus to be found in western North America and the first record of it for the continent, was first taken by Mr. Haymaker on the roots of *Viburnum tinus* at Montebello, Los Angeles County, October 3, 1928. In June and July of this year other specimens have been collected in Los Angeles County, as well as at Montebello, San Fernando and Pasadena, by Mr. H. M. Armitage, Deputy Horticultural Commissioner, and his associates. It has in the main been taken from privet and viburnum though also recorded by Mr. Woglum from lawns. The determination was kindly made for me by Mr. L. L. Buchanan of the United States National Museum. It is a native of southern Europe. The other three species, also natives of Europe: *sulcatus* Fab., *rugosostriatus* Goeze (not *rugifrons* Gyll. as formerly labeled), and *ovatus* (Linn.), have long been established in northeastern and northwestern America, the last two destructive as strawberry-root feeders, the first mainly a greenhouse pest. *B. sulcatus* Fab. is now well established in several places in California, and the other two are found from time to time in our strawberry fields.—Edwin C. Van Dyke.



typical *Cynthia carye* Hbn.



tr.f. *muelleri* Letch.



tr.f. *schraderi* Gun.

AN ADDITION TO CYNTHIA CARYE HBN.
(LEPIDOPTERA, NYMPHALIDÆ)

BY J. D. GUNDER
Pasadena, California

Cynthia carye Hbn., tr. f. **schraderi** new tr. f.

On page 270 of the November 1927 *Entomological News* I illustrated in the sequence of their transition a number of examples of tr. f. *muelleri* Letch., which represent albifusism or the progressive trend for the species *carye* Hbn. Therein I expressed a hope that melanifusistic or retrogressive specimens would soon be found. Mr. William Schrader of Los Angeles has been fortunate this year in securing several of these specimens, which I recognized as new, and I am pleased to give them his name.

Cynthia cardui L. and *Cynthia carye* Hbn. are closely related species, in consequence their transition forms would naturally be similar; therefore *elymi* Ramb. of *cardui* parallels *muelleri* Letch. of *carye* and thus is *ate* Stkr. like *schraderi*. The type of *ate* Stkr. is illustrated in the above mentioned reference. *Schraderi* generally resembles *muelleri* in maculation change on the upper sides except that in *muelleri* the white spots elongate or fuse out more, while in *schraderi* this light pattern is restricted and the darker areas are usually more extended. On the under side of the secondaries in well-developed examples the real difference is obvious, making identification easier, to wit: *muelleri* has white in the vein interspaces opposite the cell, as indicated on Plate 17, arrow marked No. 1; while in *schraderi* this area of the wing is always black or dark as shown by arrows marked No. 2. In extreme degrees or in well-developed examples these areas would be quite extended and dark. (See accompanying Plate 17.)

Holotype ♂, expanse 47 mm., May 13, 1929, **Los Angeles, California**. Allotype ♀, expanse 41 mm. (not average), May 6, 1929, Los Angeles, California. Types in author's collection. One paratype ♀, May 28, 1929, in author's collection and one paratype ♀, date unknown, in collection of the Los Angeles Museum. All types from Mr. Schrader.

Note: The synonymy of Grinnell's *intermedia* and *letcheri*, both albifusism, has been discussed in the above mentioned reference.

A NEW CORIMELÆNA (HEMIPTERA)

BY E. P. VAN DUZEE

Corimelæna californica Van Duzee, n. sp.

Form and size of *interrupta* nearly, but with the head much shorter, the humeri less tumid, the interruptions of the pale elytral border smaller and located at apical third, and nearly the whole surface closely and strongly punctured. Short, oblong-ovate, pale portion of corium produced mesad of cubitus. Length, 3 mm.

Head broad and short, its length almost equal to the width between the eyes; surface uniformly, closely deeply punctate, omitting only two basal spots between the ocelli; tylus broad, flat, uniformly punctured like the cheeks; margins of cheeks strongly sinuate. Pronotum broad anteriorly, the sides strongly arcuate, the humeri but feebly tumid; surface strongly punctate, but little less so on the disk posteriorly; callosities represented by small smooth areas. Scutellum punctured like the pronotum, a little more closely so toward the margins. Pale yellowish portion of the corium nearly impunctate, indistinctly interrupted at about the apical third; antennæ pale, as in *interrupta*; legs black, tibiæ piceous; tarsi pale; margin of sixth ventral segment and of genital plates of female with a pale spot. Rostrum piceous, attaining hind coxæ. Genital segment of male short, broadly feebly sinuate.

Described from the types and six female paratypes taken by Mr. Paul Baldwin, July 21, 1929, at Guerneville, Sonoma County, California.

Type, male, No. 2519, Museum California Academy of Sciences, taken July 21, 1929, by Mr. Paul Baldwin of Oakland, at Guerneville, California; allotype, female, No. 2520, Museum California Academy of Sciences, taken May 8, 1922, by Mr. Louis S. Slevin at Paraiso Springs, Monterey County, California.

This species has the posterior tibiæ without postero-dorsal spinules, and in Malloch's key of 1919 would run to the section containing his *nanella* (= *marginella* Dall.), but the pale margin of the corium extends mesad of the cubitus. *C. extensa* is quite distinct by its elongate form, more triangular head, and the obvious smooth median line on the scutellum. One paratype is retained in the collection of the California Academy of Sciences, one will be deposited in the United States National Museum, and four (one immature) are in the collection of Mr. Robert Usinger of Oakland.

NEW MEXICAN THYSANOPTERA

BY DUDLEY MOULTON

This paper includes the descriptions of eight new species of Thrips collected by Professor G. F. Ferris while on a trip through Mexico, for the most part on the west coast, during 1925 and 1926.

***Elaphrothrips albospinosus* Moulton, n. sp.**

Female, holotype: Color blackish brown, including all femora, middle and hind tibiae; fore tibiae yellowish brown in outer third, darker at margins; fore tarsi yellowish brown, middle and hind tarsi brown. Antennal segments I and VI to VIII blackish brown, II dark brown at base shading to yellow at tip, III yellow clouded with brown in distal fifth, IV yellow in basal two-thirds, dark brown in distal third, V brown in basal third, blackish brown in distal two-thirds; all prominent head and body spines clear yellow.

Total body length 2.8 mm.; head length .51 mm., width .21 mm.; head summit, length .057 mm.; width .114 mm.; prothorax, length .225 mm., width .39 mm.; pterothorax, width .40 mm.; abdomen, width .57 mm.; tube, length .44 mm., width at base .105 mm. Antennae: length (width) I, 45 (45); II, 70 (42); III, 150 (36); IV, 120 (36); V, 105 (33); VI, 90 (30); VII, 75 (27); VIII, 60 (18); total length 750 microns. Length of spines: anteoculars 90 microns, postoculars 180 microns, on anterior angles of prothorax 30 microns, mid-laterals 70 microns, on posterior angles 120 microns, on ninth abdominal segment 375 microns, at tip of tube 300 microns.

Length of head including summit 2.5 longer than width across eyes, broadly constricted behind eyes, head summit twice as wide as long. Cheeks slightly swollen and widest at about one-fifth the head's length from posterior margin. Anteocular spines short, about one-half as long as prominent postoculars, both pairs sharply pointed. Cheek spines small, transparent and inconspicuous. Eyes large. Ocelli present but very small. Mouth cone short with rounded tip. Antenna 1.5 times longer than head, segments III to V elongate-clavate, VI and VII elongate-ovate and pediculate, VIII spindle-shaped; III with two sense cones, one on outer margin and a second on ventral inner margin, IV with four sense cones.

Prothorax .45 as long as head, spines along anterior margin and on anterior angles vestigial, mid-laterals moderately small, those at posterior angles long and prominent with blunt tips. Pterothorax only very slightly wider than prothorax with sides straight and parallel. Legs long and slender, fore femora thickened, fore tarsi armed with a short broad-seated tooth. Wings wanting.

Abdomen elongate-ovate with segments six to nine reduced gradually. Tube .85 as long as head. Spines on ninth abdominal segment slightly shorter than tube.

Type material: Female holotype taken on common grass, 1925-1926 (Professor G. F. Ferris). Type in author's collection (Moulton, No. 2565).

Type locality: **Jalisco, Nayarit, Mexico.**

This is the smallest of all known species in this genus. It may be separated from *angusticeps* Crawford and *tener* Priesner known from Mexico, as follows: In *angusticeps* the antecular spines are much longer than the postoculars, while in this species the postoculars are much the longer. In *tener* the basal third of the fifth antennal segment is yellow, body bristles are dark, light colored only on abdomen, and the third antennal segment is 210 microns long, while in *albospinosus* the fifth antennal segment is brown in the basal third, all body bristles are clear, and the third antennal segment is 150 microns long.

Hoplothrips mexicanus Moulton, n. sp.

Female, holotype: Color blackish brown including all legs except only fore tarsi, which are brown. Antennal segments I, II and V to VIII uniformly dark brown except tip of II and base of V, which are lighter; III clear yellow with a shading of brown in outer third; IV yellowish brown in basal half, dark brown in distal half, prominent body spines dark brown. Wings clouded, each with a dark median band extending two-thirds its length.

Total body length (abdomen distended) 2.66 mm.; head length .28 mm., width across cheeks .216 mm.; prothorax length .20 mm., width, including coxæ, .45 mm.; pterothorax width .50 mm.; abdomen width .50 mm.; tube length .25 mm., width at base .096 mm., at tip .050 mm. Antennæ: length (width) I, 24 (36); II, 60 (38); III, 84 (34); IV, 84 (39); V, 81 (36); VI, 75 (33); VII, 60 (30); VIII, 36; total length 495 microns. Length of spines: postoculars 111 microns, on anterior margin of prothorax 72 microns, on anterior angles 36 microns, mid-laterals 90 microns, on posterior angles, outer 138 microns, inner 144 microns, on ninth abdominal segment 300 microns, at tip of tube 210 microns.

Head 1.3 longer than wide; cheeks slightly arched, constricted at the base but not necklike. Postocular spines long, placed 45 microns back from posterior margin of eyes, with blunt tips. Cheek spines short and inconspicuous. Eyes large, ovate, occupying more than one-third the length of the head. Ocelli fully developed, posterior pair contiguous with median inner margins of eyes. Mouth cone short, extending three-fifths over prosternum. Labrum pointed and slightly overhanging, labium broadly rounded. Antenna 1.75 longer than head, intermediate segments elongate-clavate, IV to VII pedicu-

late, VIII broadly joined to VII, III with one sense cone, IV with three.

Prothorax .7 as long as head and including coxæ more than twice as wide as median length of pronotum. All normal spines developed, those on anterior margin approximately twice as long as pair at anterior angles, pair at posterior angles very long, mid-laterals also well developed but shorter than those on posterior angles. Pterothorax broad and strong. Fore femora thickened, each fore tarsus armed with a broad-seated tooth. Wings fully developed, with parallel sides, fore pair with sixteen double-fringe hairs along posterior margin.

Abdominal segments II and VI of uniform width. Tube .9 as long as head. Abdominal spines strong, those on ninth abdominal segment somewhat longer than length of tube.

Male allotype: Similar in shape and color to female, but with fore femora more noticeably enlarged and outer pair of spines on ninth abdominal segment shortened.

Type material: Female holotype, male allotype, and nineteen female paratypes taken on *Pithecolobium* sp., July 26, 1927 (Professor G. F. Ferris). Types in author's collection (Moulton, Nos. 2562 and 2571).

Type locality: **Mazatlan, Mexico.**

This species may be compared with *Hoplothrips fuscus* Morgan, but is easily separated by the color of the intermediate antennal segments. In this species segment III is yellow and IV yellowish brown only in basal half; in some paratypes the fourth segment is almost uniformly dark brown. In *fuscus* segment III is "yellow; IV and V yellow, very slightly infusate at the sides near the tip; six yellow in basal half, infusate in apical half."

Holopothrips ferrisi Moulton, n. sp.

Female, holotype: Color uniformly brown including all legs and antennal segments I and II, III to VI clear yellow except for a faint cloud of brown in distal third of segment V and a slightly darker shade in distal half of VI, VII and VIII light brown. Wings clear, prominent body spines light yellowish brown.

Total body length: 2.5 mm.; head length .316 mm., width .233 mm.; prothorax length .20 mm., width, including coxæ, .33 mm.; pterothorax width .416 mm.; abdomen width .43 mm.; tube length .20 mm., width at base .075 mm. Antennæ: length (width) I, 30 (36); II, 60 (30); III, 105 (30); IV, 78 (30); V, 87 (30); VI, 72 (24); VII, 60 (21); VIII, 36; total length 580 microns. Length of spines: post-oculars 45 microns, on anterior angles of prothorax 36 microns, mid-laterals 45 microns, on posterior angles, outer 81 microns, inner

54 microns, on ninth abdominal segment 180 microns, at tip of tube 180 microns.

Head 1.36 longer than wide, cheeks almost straight, back of head with numerous transverse, indistinct, wavy lines. Postocular spines moderately short and stout, with dilated tips, cheek spines inconspicuous. Eyes large, reniform, and contiguous with anterior ocellus in front, protruding inward behind so that their interval is about one-third the greatest width of a single eye. Ocelli closely placed and anterior in position. Mouth cone extending past posterior margin of prosternum and broadened at tip. Labrum distinctly pointed. Antenna 1.8 longer than head. Segment VII with wide pedicel, VIII broadly united to VII; sense cones moderately short, segment III with three and IV with 3 + 1.

Prothorax .66 as long as head and .3 wider than long. Well developed spines on anterior angles and middle of sides which are about half as long as those at posterior angles, all with dilated tips; pair along anterior margin vestigial and with pointed tips. Transverse, semireticulated lines of pronotum indistinct, more clearly defined on mesonotum and clearly defined on metanotum but longitudinal in position. All legs slender, fore tarsi unarmed. Wings fully developed with parallel sides, thirteen to fifteen double-fringe hairs on fore pair.

Abdomen slender, tube .7 as long as head and slightly less than three times as long as width at base.

Type material: Female holotype, thirteen female paratypes taken on *Coccoloba* sp. in 1926 (Professor G. F. Ferris), and named in honor of Professor Ferris. Types in author's collection (Moulton, No. 2555).

Type locality: **San Blas, Nayarit, Mexico.**

This species may be separated from *H. tenuis* Hood by the following characters: It has well-developed, blunt-tipped spines on anterior angles of prothorax, but those on the anterior margin are vestigial and pointed, the head is 1.36 longer than wide, and antennal segments III to V are uniformly clear yellow. *H. tenuis* Hood has a minute bristle on each anterior angle, but those along anterior margin are well developed; the head is 1.6 longer than wide, and the bases of antennal segments III to V are darker.

Holopothrips elongatus Moulton, n. sp.

Female, holotype: Color uniformly dark brown including all legs and antennal segments I and II (III to VIII broken off). Wings shaded light brownish yellow especially along borders.

Total body length 3.3 mm.; (abdomen distended); head length .42 mm., width across eyes .22 mm.; prothorax length .18 mm., width, including coxæ, .39 mm.; pterothorax width .48 mm.; tube length .27 mm., width at base .08 mm. Length of spines: postoculars 60 microns, on anterior margin of prothorax 30 microns, at posterior angles, outer and inner subequal 93 microns, on ninth abdominal segment 255 microns.

Head twice as long as width across eyes; cheeks straight and parallel. Postocular spines well developed but short, with blunt tips; cheek spines inconspicuous. Eyes large, slightly protruding, reniform as in other members of the genus. Ocelli large, anterior in position, almost completely surrounded and obscured. Mouth cone elongate, extending to posterior margin of prosternum, truncate at end, labium sharply pointed. Maxillary palpi with first segment very short, second very long, together 95 microns.

Prothorax .44 as long as head and approximately twice as wide as long. Spines along anterior margin well developed but short, those on anterior angles and the mid-laterals vestigial; pair on posterior angles long and stout. Pterothorax clearly wider than prothorax; sculpturing on pronotum indistinct, on mesonotum clearly defined and largely transverse but continued backward to a point in the center; sculpturing of the metanotum clearly defined, the broken wavy lines longitudinal in position, becoming semireticulate toward posterior margin. Legs slender, fore tarsi unarmed. Wings fully developed, with parallel sides but noticeably narrowing toward their tips. Fore pair with nineteen to twenty double-fringe hairs.

Abdomen slender, tube .64 as long as head and about 3.5 longer than width at base. Spines on ninth abdominal segment approximately as long as tube.

Type material: Female holotype, one female paratype taken on *Lonchocarpus sericeus*, 1925-1926 (Professor G. F. Ferris). Types in author's collection (Moulton, No. 2568).

Type locality: **Mexico** (exact location not given).

This species may be compared with *H. tenuis* Hood, but is easily distinguished by the longer head, the absence of developed spines along anterior margin of prothorax and at the middle of the sides, and by the larger number of double-fringe hairs, 19 to 20 as compared with 10 to 12.

Diceratothrips brevitubus Moulton, n. sp.

Female, holotype: Color blackish brown with abdominal segments II to VI lighter, legs blackish brown, also antennæ except segment II which is lighter toward the tip, and III which is yellow clouded brown at tip. Wings brownish at base with a median dark line extending to near middle, borders of fore wings light brownish. Prominent body spines and wing cilia dark brown.

Total body length 3.64 mm.; head length .45 mm., width at eyes .266 mm., at cheeks .250 mm.; prothorax length .20 mm., width, including coxæ, .32 mm.; pterothorax width .50 mm., abdomen width .48 mm.; tube length .20 mm., width at base .10 mm. Antennæ: length (width) I, 54 (42); II, 75 (39); III, 156 (39); IV, 126 (42); V, 90 (36); VI, 75 (33); VII, 60 (30); VIII, 45; total length 633 microns. Length of spines: anteculars 105 microns, postocellars 45 microns, postoculars 210 microns, on anterior margin of prothorax 60 microns, on anterior angles 60 microns, mid-laterals 60 microns, on posterior angles, outer 126 microns, inner 135 microns, on ninth abdominal segment 360 microns, at tip of tube 270 microns.

Head 1.8 longer than width at eyes, vertex swollen and overhanging basal segments of antennæ; cheeks straight and parallel. Post-ocular bristles long, extending across eyes and far in front of head, with pointed tips. A pair of well-developed spines on forehead which project to the middle of the second antennal segment a shorter spine placed close behind each posterior ocellus; cheek spines inconspicuous. Eyes large, anterior ocellus at tip of swollen vertex, posterior ocelli also large and contiguous with inner anterior margin of eyes. Mouth cone reaching three-fourths across prosternum, blunt at tip, labrum pointed. Antennæ 1.6 longer than head; sense cones normally developed.

Prothorax less than .5 head's length, all normal spines well developed, those on posterior angles more than twice as long as others, all with blunt tips. Pterothorax with slightly arched sides. Legs slender, noticeably spinose, fore tarsi unarmed. Wings fully developed, fore pair with twenty-two double-fringe hairs.

Abdomen elongate, narrower than pterothorax, reduced gradually beyond second segment. Segments II to VI reticulate in anterior two-thirds and cross-striate in posterior third. Tube short, less than .5 as long as head. Bristles on ninth segment and the tip much longer than tube.

Type material: Holotype, three female paratypes, four larvæ taken January 10, 1926, from an unknown host plant (Professor G. F. Ferris). Types in author's collection (Moulton, No. 2556).

Type locality: Along Cohahuayana River, State of **Colima, Mexico.**

This species may be compared with *D. brevicornis* Bagnall, from the Hawaiian Islands, but separated by its longer head, 1.8 as compared with 1.6 longer than wide, the short blunt sense cones as compared with the long, pointed cones and the much shorter tube, .45 as compared with 1.12 as long as head.

***Liothrips colimæ* Moulton, n. sp.**

Male, holotype: Color dark chestnut brown with much red hypodermal pigment in thorax and abdomen. Legs concolorous with body except tips of fore tibiæ and fore tarsi, which are lighter. Antennal segments I and II dark brown, III to VI yellow, VII shading from yellow to light brown, VIII light brown. Wings shaded at base, otherwise clear. Prominent body spines brown.

Total body length 1.55 mm.; head length .20 mm., width .14 mm.; prothorax length .10 mm., width, including coxæ, .233 mm.; pterothorax width .266 mm.; tube length .108 mm., width at base .06 mm. Antennæ: length (width) I, 15 (27); II, 36 (27); III, 54 (27); IV, 48 (27); V, 48 (27); VI, 45 (22); VII, 39 (21); VIII, 30; total length 330 microns. Length of spines: postoculars 45 microns, on anterior angles of prothorax 30 microns, mid-laterals 18 microns, posterior angles, outer 60 microns, inner 39 microns, on ninth abdominal segment 135 microns, at tip of tube 120 microns.

Head 1.43 longer than wide, vertex slightly swollen; cheeks straight and parallel. Postocular spines short, with blunt tips. Eyes large, rounded. Ocelli anterior in position, fore ocellus at tip of vertex and directed forward. Mouth cone narrowed in the middle, pointed, reaching two-thirds over prosternum. Labrum sharply pointed. Antenna 1.65 longer than head.

Prothorax .5 as long as head, spines at anterior angles well developed but short, pair at posterior angles somewhat longer, those along anterior margin and on middle of sides vestigial. Pronotum with transverse wavy lines intermingled with smooth areas giving a blotched effect. Pterothorax with evenly formed sides. Legs normal, fore tarsi unarmed. Wings fully developed with parallel sides, fore pair with eight double-fringe hairs.

Abdomen reduced gradually beyond second segment. Tube .6 as long as head, spines on ninth segment and at tip somewhat longer than tube.

Female, allotype: Total body length 2.0 mm. Similar in shape and color to male, but with first abdominal segments somewhat broader.

Type material: Male holotype, female allotype, one male and one female paratype taken January, 1926, from leaves of an undetermined shrub (Professor G. F. Ferris). Types in author's collection (Moulton, No. 2557). Named after type locality.

Type locality: Along Cohahuayana River, State of **Colima, Mexico.**

This species is very closely related to *L. dampfi* Karny, and may be only a variety of that species. It is separated chiefly by the color of antennal segments III to VI, which are clear yellow, while in *dampfi* IV is slightly clouded brown at the tip,

and V is light brown at the tip. The mouth cone, like *dampfi*, is weakly truncate and in this respect it also approaches the genus *Gynaikothrips*, the labrum is sharply pointed.

Liothrips querci Moulton, n. sp.

Female, holotype: Color uniformly dark chestnut brown including all legs and first antennal segment, II dark brown at base, shading to clear yellow at tip, III to VI clear yellow with only a faint shading of brown at tip of VI, VII and VIII brown. Wings clear. Prominent body spines dark brown.

Total body length 2.83 mm.; head length .366 mm., width at eyes .216 mm., cheeks .20 mm.; prothorax length .20 mm., width, including coxæ, .366 mm.; pterothorax width .50 mm.; abdomen width .466 mm.; tube length .283¹ mm., width at base .083 mm. Antennæ: length (width) I, 30; II, 63; III, 138; IV, 120; V, 99; VI, 84; VII, 69; VIII, 42; total length 615 microns. Length of spines: postoculars 105 microns, on anterior margin and angles of prothorax 72 microns, mid-laterals 120 microns on posterior angles, outer 150 microns, inner 132 microns, on ninth abdominal segment 195 microns, at tip of tube 240 microns.

Head 1.75 longer than wide, broadest across at eyes, slightly narrower behind eyes; cheeks straight and narrowed again at the base. Postocular spines long and prominent, placed 75 microns back from posterior margins of eyes, with blunt tips. Eyes large, somewhat concave on inner margins where they have a tendency to surround the outer sides of the posterior ocelli which are contiguous with them. Anterior ocellus on swollen vertex. Mouth cone long and sharply pointed, reaching beyond posterior margin of prosternum. Antenna 1.66 longer than head, segment three increasing in width gradually from its broad base to the tip, not clavate in shape as in most species in this genus.

Prothorax .54 as long as head, with all normal spines strongly developed, with blunt tips. Pterothorax much wider than prothorax. Sculpturing on metanotum distinctly longitudinal from anterior margin. Legs long and slender, fore tarsi unarmed. Wings fully developed with parallel sides, fore pair with sixteen double-fringe hairs.

Abdomen elongate. Tube long and slender, .75 as long as head and about 1.3 wider at base than at tip. Spines on ninth abdominal segment long but much shorter than length of tube.

Male allotype: Similar in shape and color to female, but somewhat smaller.

Total body length 2.66 mm.; head, length .35 mm., width at eyes .21 mm.; at cheeks .183 mm.; prothorax, length .166 mm., width .30 mm.; mesothorax width .416 mm.; abdomen width .366 mm.; tube length .30 mm.; width at base .07 mm. An-

tennæ: length (width) I, 30; II, 54; III, 150; IV, 126; V, 105; VI, 78; VII, 66; VIII, 42; total length 645 microns. Length of spines: postoculars 90 microns, on anterior margin of prothorax 69 microns, on anterior angles 60 microns, mid-laterals 90 microns, on posterior angles, outer 126, inner 120 microns, on ninth abdominal segment 240 microns, at tip of tube 210 microns.

Type material: Female holotype, male allotype, two male and two female paratypes and one larva taken on oak foliage, January 18, 1926 (Professor G. F. Ferris). Types in author's collection (Moulton, Nos. 2558 and 2567).

Type locality: **Coalcoman, Michoacan, Mexico**, altitude 7500 feet.

This species seems to be most closely related to *L. major* Buffa, but I am unable to make a comparison because of the brief description of the latter species. *L. micurus* Bagnall, Egypt, has a much more prominent and swollen vertex, a shorter and broader tube and greatly reduced thoracic bristles.

Rhynchothrips brevitubus Moulton, n. sp.

Female, holotype (macropterous): Color dark chestnut brown to blackish brown including all legs and antennal segments I, II and V to VIII, II yellow in first and third quarters and brown in second and fourth quarters, IV dark brown with a light band in third quarter. Thorax and abdomen with red hypodermal pigment. Wings brownish in basal third, clear in distal two-thirds, all prominent body spines dark brown.

Total body length 1.82 mm.; head length .23 mm., width .20 mm.; prothorax length .183 mm., width, including coxæ, .383 mm.; pterothorax width .466 mm.; abdomen width .516 mm.; tube length .15 mm., width at base .083 mm. Antennæ: length (width) I, 36 (36); II, 51 (36); III, 69 (33); IV, 69 (39); V, 66 (34); VI, 66 (33); VII, 48 (27); VIII, 30; total length 450 microns. Length of spines: postoculars 66 microns, on anterior margin of prothorax 42 microns, on anterior angles 42 microns; mid-laterals 51 microns on posterior angles, outer 105 microns, inner 84 microns, on ninth abdominal segment 81 microns, at tip of tube 111 microns, basal wing spines 48, 51, and 51 microns, respectively.

Head .2 longer than wide; cheeks slightly arched. Postocular spines as long as eyes, with blunt tips. Postocellar spines somewhat longer than diameter of ocelli. Eyes large, subovate. Anterior ocellus on slightly swollen vertex and directed forward; posterior ocelli large and contiguous with anterior inner margins of eyes. Mouth cone extremely long and pointed, extending halfway across

mesosternum. Antenna moderately stout, twice as long as head, segment III clavate with one sense cone on outer surface, IV to VII oval-pediculate, VIII broadly joined to VII and sharply conical.

Prothorax .3 shorter than head and twice as wide as median length of pronotum, the latter with short median thickening. All spines present with blunt tips, pair on each posterior angle longest, the outer somewhat longer than the inner. Pterothorax broad. Legs fairly stout, fore femora thickened, each fore tarsus armed with a broad, blunt tooth.

Abdomen large. Tube very short, .65 as long as head and approximately twice as long as basal width.

Male allotype (brachypterous): Similar in shape and color to female, except that the fore femora are more noticeably enlarged and the tooth on each fore tarsus is more prominent, angular, and bears two spines on its outer surface.

Total body length 1.6 mm.; head length .216 mm., width .17 mm.; prothorax length .183 mm., width, including coxæ, .40 mm.; pterothorax width .39 mm.; abdomen width .43 mm.; tube length .15 mm., width at base .08 mm. Antennæ: length (width) I, —; II, —; III, 75 (30); IV, 78 (33); V, 72 (30); VI, 69 (27); VII, 54 (27); VIII, 36; total length 450 microns. Length of spines: postoculars 81 microns, on anterior margin of prothorax 45 microns, on anterior angles 48 microns, mid-laterals 60 microns, on posterior angles, outer 105 microns, inner 96 microns, on ninth abdominal segment, spines 120 microns, spurs 45 microns, at tip of tube 120 microns.

Type material: Female holotype, two macropterous and nine brachypterous female paratypes, male allotype and two brachypterous male paratypes, found deforming leaves of an unknown host plant, July 26, 1927 (Professor G. F. Ferris). Types in author's collection (Moulton, No. 2561).

Type locality: **Mazatlan, Mexico.**

This species is most closely related to *R. dentifer* Hood, but may be separated by its somewhat larger size, longer third and fourth antennal segments, 69, as compared with 54-57 m., respectively, in the latter species, and by the striking bandlike coloration of the third antennal segment. *H. dentifer* has the third antennal segment brownish yellow, shaded with brown at the sides and over distal two-thirds. The fore wings of *brevitubus* are brownish in basal third, while in *dentifer* they are brownish in the middle.

MISCELLANEOUS STUDIES IN THE COLEOPTERA,
NUMBER THREE

BY DR. FRANK E. BLAISDELL, SR.

*Stanford Medical School, San Francisco, California***Blapstinus falli** Blaisdell, n. sp.

Form oblong-oval, slightly more than twice as long as wide, moderately convex. Color black; trophi, four basal joints of antennæ and legs, dark rufous; distal joints of antennæ and tarsi, rufo-piceous. Pubescence moderately abundant, inconspicuous, slender, moderately short, recumbent and fuscous in color. Wings a little longer than the elytra.

Head wider than long, a little less than half as wide as the pronotum; sides quite evenly arcuate from the tempora to the rounded epistomal angles, and moderately convergent before the eyes; epistomal apex broadly, slightly emarginate; frons evenly and less than moderately convex, evenly and rather closely punctate, punctures moderately small, more or less oval, finer anteriorly and laterally, with some evidence of coalescing in longitudinal lines, separated by a distance equal to from one-half to one times their own diameter; frontal and oblique sutures obliterated. Eyes moderately coarsely faceted, upper segment slightly unevenly circular and in diameter equal to the length of third antennal joint; lower segment larger and oval, in greatest diameter equal to the combined length of second and third antennal joints. Antennæ rather slender, moderate in length, about attaining the pronotal base; distal four joints slightly incrassate; joints two, three, and four quite cylindrical, two about two-fifths as long as three, four a fourth longer than two, five about three-fourths as long as four; five, six, and seven subequal and as long as two; eight a little wider and as long as wide; nine and ten noticeably transverse, ten one-fourth wider than long; eleven obovate, as long as three, sides converging to the truncate apex, rufous in apical half; last four joints very slightly compressed.

Pronotum less than twice as wide as long, apex truncato-emarginate between the obtusely rounded apical angles; base broadly arcuate in middle three-fifths, broadly but not deeply sinuate laterally, angles subrectangular to slightly obtuse; sides parallel, broadly, evenly and moderately arcuate, converging slightly anteriorly, marginal bead rather fine; disk evenly and moderately convex, rather densely punctate, punctures oval, larger than those of the head, slightly irregular in distribution, somewhat denser laterally where there is some coalescence in longitudinal lines; centrally the punctures are separated by a distance equal to one or two times their diameter.

Propleuræ longitudinally rugose. Pronotal margin appearing explanate when viewed from beneath, projecting in anterior three-

fourths to a distance equal to the length of the fifth antennal joint, the abruptly inflexed surface slightly convex and smooth and defined from the rugose surface by a rather sharp impressed line.

Elytra about a half longer than wide, base feebly emarginate opposite the basal pronotal lobe, slightly wider than the pronotal base; humeri obtusely rounded; sides parallel, feebly arcuate, broadly rounded at apex; disk moderately convex, less so on the dorsum; striate, striæ composed of scarcely impressed punctures in the sutural area, outer striæ feebly impressed where the intervals become very slightly convex; stria punctures about three times as large as those of the intervals and separated by a distance equal to two or three times their diameter; interstitial punctures irregular, small, separated by a distance equal to two to four times their diameter. Surface very finely and microscopically reticulate. Scutellum triangular, punctate centrally. Epipleuræ not distinctly punctate.

Undersurface of the body quite evenly punctate, punctures small, smaller on middle of the abdominal segments, the latter more or less rugulose laterally and the punctures somewhat larger; punctures not dense on the fifth segment which is more or less broadly and very feebly impressed in the central area against the apex in both sexes. Legs moderate in length and stoutness.

Male: Noticeably narrower, a little less robust. Abdomen broadly, rather abruptly and feebly impressed along the middle third of segments one and two and basal part of three, the impression subfusiform; impression of the fifth rather more strongly marked. Protarsi moderately broadly dilated, joints two and three subequal in width and transverse, second just noticeably longer than the third, length about equal to the apical width of the first; fourth small and triangular; mesotarsi feebly dilated; dilated joints densely clothed beneath with yellowish pubescence. Female: Broader and a little more robust. Abdomen moderately and evenly convex. Tarsal joints not dilated.

Measurements (types): Length, 5.1-5.4 mm.; width, 2.2-2.5 mm.

Holotype, male, No. 2515, and allotype, female, No. 2516, and five paratypes in the collection of the California Academy of Sciences; two are to be placed in the collection of Mr. H. C. Fall, Tyngsboro, Massachusetts. Nine specimens studied.

Type locality: **Naples, Santa Barbara County, California.** Collected in April, 1918, by H. C. Fall, to whom the species is dedicated.

A study of the metatarsi give the following results: Male—Second joint slightly longer than the third, together about a fourth longer than the first. Female—Second and third joints quite equal, together subequal to the first; fourth three times as long as the third and a little longer than the first.

According to Casey's table *falli* is to follow *histricus* Casey in the sequence of species. *Falli* differs from the latter in being more robust and black in color; *histricus* is elongate oval in form and brownish piceous in color. *Coronadensis* Blais. should precede *histricus* in the list of species and is to be differentiated from *falli* by its piceous color, dull luster, much less dilated protarsi of the male and coarser fulvous pubescence. In the three species the wings are slightly shorter or a little longer than the elytra. Those species of *Blapstinus* with well-developed wings are very rarely observed in flight. The author on two occasions has seen *dilatatus* Lec. in actual flight. The flight is heavy and labored.

Mecomyceter liebecki Blaisdell, n. sp.

Form oblong-ovate, a little more than twice as long as wide, sides noticeably convergent anteriorly. Color nigro-piceous; prothorax and legs rufo-testaceous; antennæ similarly pale with the three distal joints black and joints seven and eight rufo-piceous; muzzle more or less pale beneath, palpi more or less piceous, epistoma pale. Pubescence moderately abundant, short, fine, recumbent, inconspicuous and cinereo-fuscous in color, slightly more abundant and paler on the pronotum; on the elytra abundantly intermixed with darker, nearly erect setæ of similar length; the latter less evident on the pronotum; marginal fimbriæ absent in specimens examined, although very widely spaced and erect setæ are occasionally seen on the lateral pronotal and elytral margins. The pronotal disk is often blackish centro-apically, the area varying greatly in size and intensity.

Head moderately small, a little longer than wide, quite equal in width to the pronotal apex, muzzle moderately prolonged; frons flat, feebly and longitudinally impressed each side within the eyes and antennal insertions, sides not distinctly margined, fronto-antennal articulation quite visible from above; surface rather coarsely and densely punctate, interspaces with scattered punctules, coarser punctures most noticeable at sides and vertex, finer centrally and anteriorly. Eyes rather large, moderately convex, setose and moderately prominent. Basal joints of the maxillary palpi prominent each side of the base of mentum, the latter longitudinally oblong. Antennæ rather short, not attaining the pronotal base, first joint oval and rather stout, second shorter and subglobular, third feebly obconical, less than twice as long as wide; fourth and fifth a little longer than wide, sixth noticeably shorter and smaller than the fifth, seventh to tenth inclusive slightly wider than long, eleventh short obovate.

Pronotum about a third wider than long, widest and subangulate at about basal third, where the marginal bead is visible for a short

distance when viewed from above; sides rather straight and moderately convergent in anterior two-thirds, in basal third feebly arcuate to the very obtusely rounded basal angles; base moderately arcuate and beaded in middle three-fifths; apex moderately arcuate in feeble circular arc, apical angles broadly rounded with the sides; viewed from the side the marginal acute line descends arcuately on the flanks, continuing the basal line, to a point in front of the middle of the flank, then more rapidly curving upward to become arcuately continuous with the apical line; disk moderately convex, rather coarsely punctate, punctures separated by a distance equal to their diameter, a fine groove against the basal bead.

Elytra about one-half longer than wide, slightly dilated posteriorly, apex broadly rounded, slightly reëntrant at suture with the angles obtusely rounded; base distinctly wider than the pronotal base, humeri rather broadly exposed, rounded and moderately tumid; very moderately convex on the dorsum, more strongly so laterally, coarsely but not strongly punctate, punctures separated by a distance equal to one or two times their diameter, surface slightly subrugulose basally, more finely sculptured apically. Body finely punctured beneath, pubescence short, pale and recumbent. Legs moderate in length and stoutness.

Male: Usually a little smaller and narrower. Pronotum less transverse, usually with a black apical cloud attaining the apical margin and variable in size. Elytral base less noticeably wider than the pronotal base. Antennæ gradually and distinctly incrassate in distal five joints, eleventh slightly more robust than the preceding joints, ninth and tenth transverse, about a fourth wider than long, seventh and eighth smaller and very feebly transverse and more rounded. Female: Usually larger and broader. Pronotum entirely pale, more transverse, sides less noticeably convergent anteriorly. Antennæ less stout, eleventh joint less robust, usually quite equal in width to the tenth and ninth; seventh and eighth stouter and more noticeably transverse.

Measurements (types): Length, 24 to 28 mm.; width, 1 to 1.3 mm.

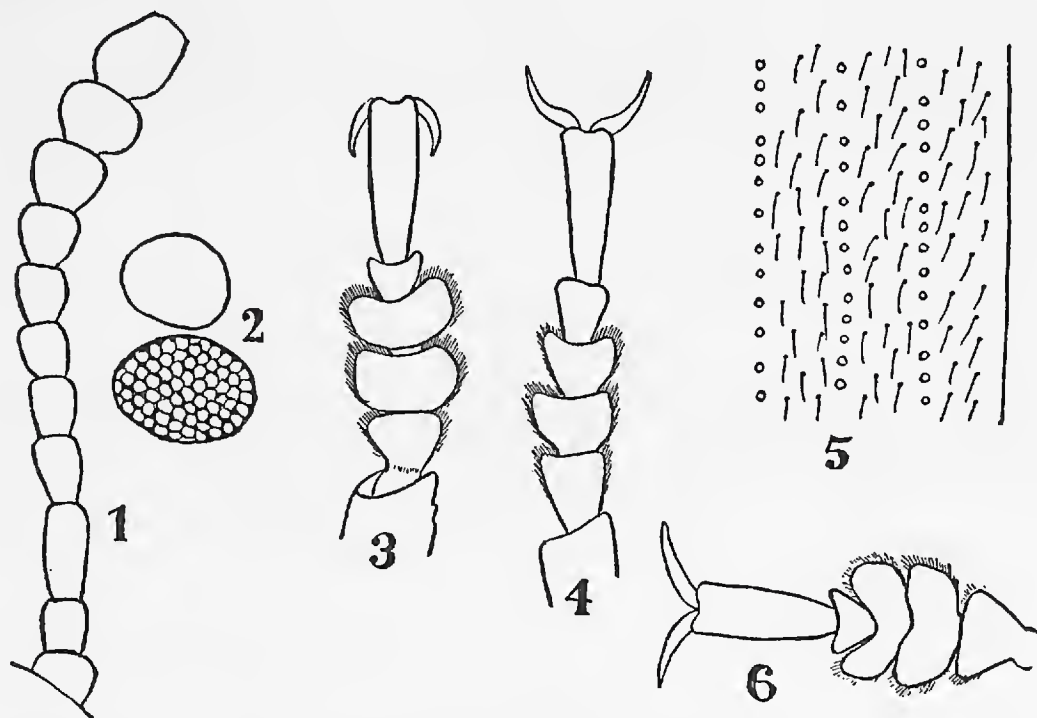
Holotype, male, No. 2517; allotype, female, No. 2518, and four paratypes, all in the collection of the California Academy of Sciences. Eight paratypes in the collection of Charles Liebeck, Philadelphia, Pennsylvania, to whom I am indebted for the specimens and opportunity to describe the species.

Type locality: **Laredo, Texas.** Fourteen specimens studied, collected on June 4. I take pleasure in dedicating the species to Mr. Liebeck.

Liebecki is very distinct in coloration from *omalinus* Horn and *facetus* Casey. *Facetus* is pale testaceous in color with some piceous clouding of the elytra, and the pronotal disk has

a black apical cloud. The muzzle is shorter in a specimen of *facetus* in the Liebeck collection than in *liebecki*. The head is missing in the type of *facetus*. In Liebeck's specimen the bases of maxillary palpi are less prominent, the mentum is oblong, smooth and truncate at apex. The edeagophore is partly protruded showing the specimen to be a male.

In *Mecomyceter* the claws are slender and without appendages. The epipleuræ are subhorizontal, moderate in width and obsolete behind the middle; the pronotum is without an impressed submarginal line. The head is very moderately prolonged before the antennal insertions, epistoma feebly chitinized, and the base of the maxillary palpi are obtusely prominent beneath.



1, Left antenna of *Blapstinus falli*, n. sp., female; 2, Left eye of *Blapstinus falli*: a, upper segment; b, lower segment; 3, Left protarsus of *Blapstinus falli*, male; 4, Right mesotarsus of *Blapstinus falli*, male; 5, Elytral sculpturing in sutural area, hairs directed backward, *Blapstinus falli*; 6, Broadly dilated protarsus of *Blapstinus rufipes* Casey.

NOTES ON THE ORIGIN OF THE WAX SECRETION
OF CERTAIN COCCINELLID LARVÆ

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The systematic and comparative study of the Coccidæ by modern workers has brought to light many facts regarding the production of wax in scale insects, the types of wax-producing pores and ducts, the function of waxy secretions, and the formation of tassels and tests. The superficial resemblance in life of certain wax-covered Coccinellid larvæ, such as *Scymnus*, *Cryptolæmus* and *Hyperaspis* to mealy bugs (Coccidæ), leads to an inquiry regarding possible analogies in the origin of the wax. A search of all the available literature failed to produce any satisfactory knowledge. Essig, in describing *Cryptolæmus montrouzieri* larvæ in 1910, mentioned the fact that "the body was covered with white, woolly secretions of various shapes—the covering arranged in long filaments, each filament arising from the dorsal and lateral spine areas and extending in all directions." J. H. Gage, who studied the morphology of the Coccinellid larvæ, devised an elaborate terminology for the parts of the body and arranged tables for the identification and classification of a few of the more common species, but regarding the production of wax, merely stated that the larvæ of the tribe Hyperaspini cover themselves with flocculent masses of waxlike excretion.

The purpose of this paper is to present a few facts and figures regarding the wax-producing pores found in several of the common species of Coccinellids and in an unidentified larva from Central America, all of which were covered in life with masses of white wax and projecting waxy tassels. Figures are also given of the wax-producing ducts found in a common mealy bug, *Pseudococcus gahani* Green.

My acknowledgments are due to Professor G. F. Ferris, Messrs. F. T. Scott, P. F. Wright, and L. E. Myers for the collection of valuable material used in this paper.

According to the Coccinellid terminology devised by Gage, a *struma* is a distinct moundlike projection of the body wall upon which are situated a few *chelazæ*, a *chelaza* being a slight

pimplelike projection of the body wall, usually wider than long, and bearing on its distal end a stout seta.

UNKNOWN LARVA FROM CENTRAL AMERICA

This specimen, apparently belonging to the Coccinellini, was taken by quarantine officials at San Francisco on bananas from Central America, and in life resembled a mealy bug in appearance with long lateral tassels of white wax. A prepared slide showed the presence of one struma on the dorso-lateral margins of each thoracic and abdominal segment and two strumæ on the dorso-cephalic margins of the prothorax. The dorsum of the thorax had a fair number of small and medium-sized setæ which were also more sparsely scattered over the dorsum of the abdomen.

Each struma in this species (Fig. 7) bears at the apex one long, fairly stout seta and fifteen or twenty very much smaller setæ, four around the base of the large seta being a little larger than the rest. Surrounding each seta is a band of pores arranged in spherical pattern, six pores surrounding the small setæ (Fig. 2) and sixteen pores surrounding the bases of the large setæ (Fig. 4). All the setæ scattered over the dorsum of the thorax and abdomen have these bands of pores, the number of pores varying from six to twelve, depending on the size of the setæ.

In life this larva was covered with white wax and had long, lateral tassels of wax. The presence of pores on the dorsum indicates that the body wax may be a secretion of these pores and the arrangement of pores around the groups of setæ in the lateral strumæ shows the probable source and production of the long, lateral tassels of wax. The wax is poured from the pores as a fluid, runs out over the setæ and hardens to form filaments.

CRYPTOLÆMUS MONTROUZIERI Mulsant

This well-known species, commonly known as the mealy-bug destroyer, has the body covered with white wax arranged in long tassels on the dorsum and dorso-lateral margins, and with little or no wax on the venter. Early instars, as well as mature larvæ, have this heavy covering of wax. Prepared slides show that the segments of the thorax bear a struma on the dorso-lateral margins and four or five dorsal strumæ arranged in a

transverse row, while the abdominal segments, with the exception of the ninth, bear a struma on the dorso-lateral margins and a transverse row of six to eight strumæ on the dorsum. The ninth segment is chitinized and bears numerous long setæ along the margins. The dorsum is covered with many tiny circular pores arranged in more or less circular groups (Fig. 5).

Strumæ.—The strumæ (Fig. 1) in this species are mound-like projections of the body wall bearing ten to fifteen setæ, four or five of which are long and fairly stout while the remainder are somewhat smaller and shorter. A few groups of minute circular pores are scattered among the setæ. There is considerable space between the seta and the alveolus, but there is no group of pores surrounding the seta as in the unknown larva previously described (Fig. 3).

Pores.—The dorsum is covered with groups of very minute pores, each group being somewhat circular in form and consisting of eight to twelve pores forming an outer circle with two or three enclosed pores (Fig. 5). These pore groups are very thickly arranged over the flat derm, but are only sparsely scattered over the elevated strumæ. Wax is probably poured from these hundreds of pores as a fluid and some of it runs out over the long setæ of the strumæ, and hardens to form long, waxy tassels. The production of wax and waxy filaments in *Cryptolæmus montrouzieri* is then probably similar to the production in the unknown Coccinellid larva, the wax in both species being produced from small pores as a fluid and hardening upon associated setæ to form filaments.

HYPERSPIS LATERALIS Mulsant¹

Pores.—The dorsum is literally covered with many pores which are of two distinct types. One type is tubular, fairly thick-walled with a slightly capitate apex in longitudinal section (Fig. 10), and in cross section is crescent-shaped, indicating that the tube is not completely closed. This form is more numerous and is noticeably larger than the second form and is considerably larger than any of the pores in other Coccinellid larvæ that I have studied. The other type of pore is tubular with the apex slightly chitinous and somewhat knoblike (Fig. 11). Pores of this smaller form are more often found

¹ The identification of this species is not certain.

around the bases of the large setæ, although not confined to those areas. The derm is tessellated so that it is divided into small, faintly outlined cells.

HYPERASPIS MOERENS (Lec.)

Pores.—The dorsal pores of this species are fewer and less conspicuous than in *Hyperaspis lateralis* Mulsant, and are of two types. The more numerous type is very small and indistinct, but appears to be ovate or subovate in shape and the pores are thinly distributed all over the dorsum (Fig. 6). The derm is tessellated and divided into small cell-like plates, each plate having two or a few more pores (Fig. 6). The tessellations fade out in parts of the derm and are not always as distinct as the figure shows. The second type of pore in *H. mœrens* is essentially the same as the tubular, capitate form found in *Hyperaspis lateralis* Mulsant, although they are considerably smaller. Like those in *H. lateralis* they are distributed rather thickly around the bases of the larger setæ.

SCYMNUS NEBULOSUS Le Conte

In this species there are two kinds of dorsal pores, each distinct in appearance and in arrangement. The smaller pores are found close to the strumæ and in the immediate surrounding area (Fig. 14), and they are arranged in more or less circular groups of four or five. Also around each of the larger single dorsal setæ there are ten to fifteen of these small pores, all arranged singly, however, instead of in groups. They seem to be simple, round pores, and are very small, about .5 mm. in diameter or less. There are also many larger, round pores, about 1 or 1.5 mm. in diameter (Fig. 13), which are generally distributed over the dorsum, but are more numerous and closer together along the lateral margins of the body where there is an indication of a cellular arrangement, but which is not as distinct as in *Hyperaspis mœrens* (Lec.).

Each struma bears one long, large seta and two shorter slender setæ of unequal size, and they are arranged in a transverse row across each abdominal and thoracic segment, each segment bearing about seven strumæ. The single setæ are more numerous and are variable in size, but are all smaller than the large setæ of the strumæ. In life this species has white wax

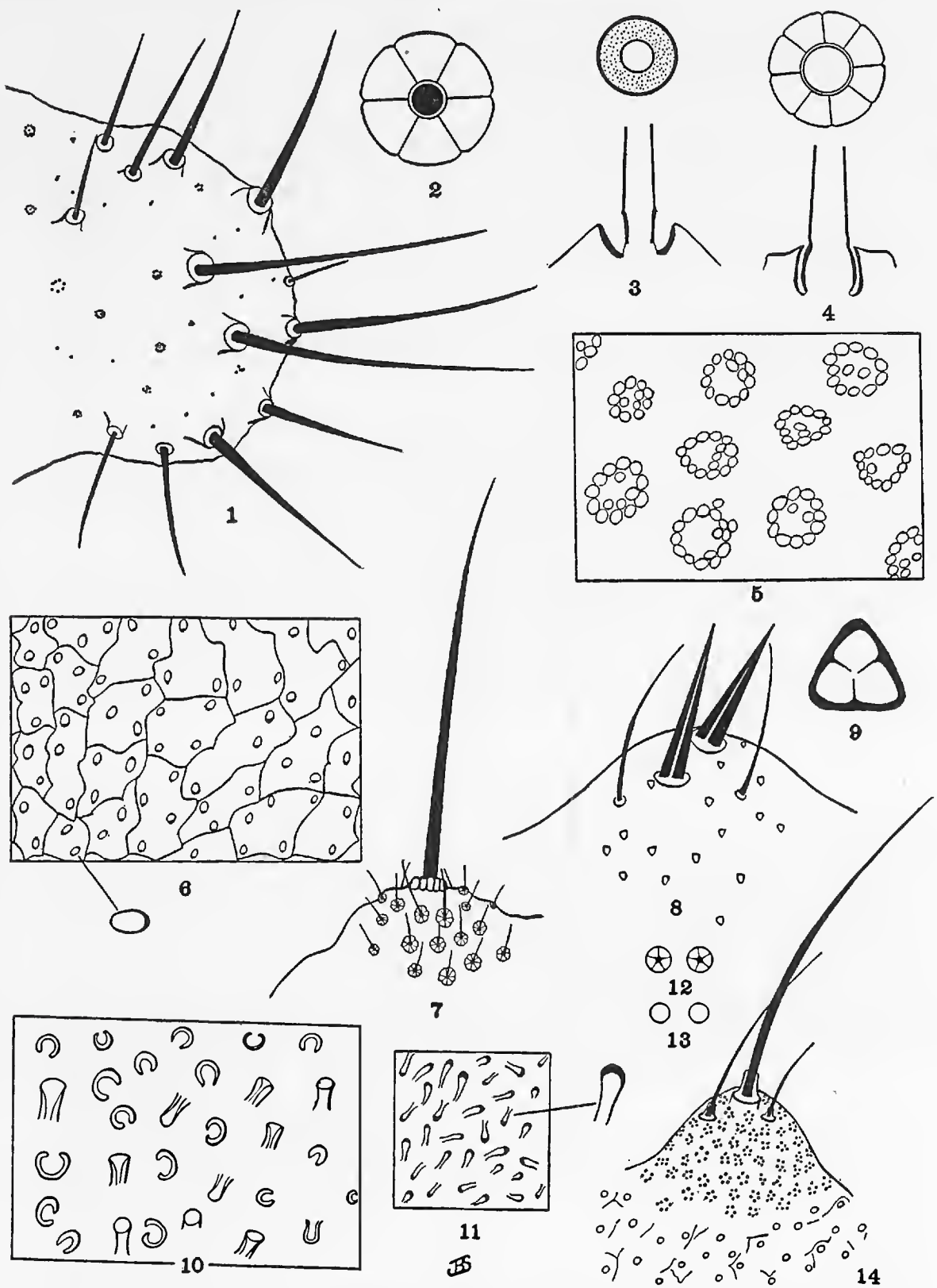
on the dorsum which is arranged in rather short tassels except on the lateral margins where the tassels are sometimes fairly long.

SCYMNUS GUTTULATUS Le Conte

The arrangement of pores and of strumæ in this species is very similar to that in *Scymnus nebulosus* Le Conte, there being small pores surrounding the strumæ and setæ, and many larger pores all over the dorsum. The smaller pores are the same as the corresponding ones in *nebulosus* (Fig. 12), but the larger pores appear to be compound instead of simple, having four, five or six locelli, usually five, and resemble the stellate pores found in many of the Coccidæ, although they are very much smaller. They are slightly larger than those in *nebulosus*, however, and this may account for the visibility of the locelli, although I have studied specimens of *nebulosus* very carefully under the oil immersion objective and all the pores appeared to be the simple type without locelli. In life the wax on the dorsum is arranged in fairly long tassels, both dorsally and laterally.

It seems probable from the nature of the pores and their arrangement around the strumæ that the wax and waxy filaments in these four latter species is produced in the same manner as described for *Cryptolæmus montrouzieri* and the unknown larva.

Wax of several forms is produced by certain of the scale insects (Coccidæ), and the mealy bugs (Pseudococcinæ) are covered with white wax and wax tassels which give them a resemblance to the wax-covered Coccinellid larvæ. In order to compare the wax-secreting structures of the two groups a cerarius (Fig. 8), and a few wax pores of one of our common mealy bugs is figured. This species, *Pseudococcus gahani* Green, is covered in life with white wax except for four longitudinal rows of conspicuous dots on the dorsum. There are short, stout marginal tassels and a single pair of long, stout, caudal tassels. Among the morphological characters are the presence of seventeen pairs of cerarii, the anterior three or four pairs with three spines, the remainder with only two, those of the anal pair being considerably larger than the others. Each cerarius has numerous triangular pores and several small aux-



1, *Cryptolæmus montrouzieri*, struma; 2, Central American larva, 3, *Cryptolæmus montrouzieri*, strumal seta; 4, Central American larva, large strumal seta; 5, *Cryptolæmus montrouzieri*, section of derm; 6, *Hyperaspis mærens*, section of derm; 7, Central American larva, struma; 8, *Pseudococcus gahani*, cerarius; 9, same, triangular cerarian pore (enlarged); 10, *Hyperaspis lateralis*, section of derm with large pores; 11, same, with small pores; 12, *Scymnus guttulatus*, large pores; 13, *Scymnus nebulosus*, large pores; 14, same, struma.

iliary setæ. There are a few cylindrical ducts scattered over the derm and many triangular porès (Fig. 9) on the dorsum which secrete the mass of white wax. The liquid wax runs out upon the cerarian setæ and spines to harden and forms tassels, which is probably analogous to the condition in the Coccinellid larvæ. However, the pores are of a different type and size and their arrangement around the lateral setæ is somewhat different, so that there is no true homology. It is evident, therefore, that a very similar appearance in life may arise from morphologically quite different bases.

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A NEW CODLING MOTH PARASITE

During the month of August 1928 the field inspectors of the Saticoy Walnut Growers' Association observed an ichneumonid which appeared to be attracted to the infested fruit. It was very active and difficult to capture. The first of September fifty immature larvæ from fruit collected at random in one orchard, where the parasite was observed, were brought in to the laboratory and examined. Fifteen had been stung and paralyzed, and on each a large elongate egg had been deposited. The female evidently oviposits through the green tissue of the husk. In one instance a parasitized larva was found in the kernel.

The size of the adults reared varied greatly, due to the variation in the size of the larvæ attacked.

Adults obtained in the field and reared in the insectary were identified by Mr. R. A. Cushman as *Calliephialtes* n. sp.—Stanley E. Flanders.

APHID NOTES FROM UTAH¹BY GEORGE F. KNOWLTON²

PTEROCHLORUS ROSÆ (Cholodkovsky)

This large, brown bark feeder was very abundant upon *Rosa fendleri*, on the Utah Agricultural College campus during the latter part of May and throughout June 1928. Specimens were first collected by Miss Verda Dowdle, on May 28. At this time wingless forms and nymphs were fairly abundant, but no alates were found. Early in June winged forms began appearing and were present in small numbers throughout the month. By the beginning of July, the colonies were becoming scarce, containing few individuals, and soon disappeared entirely.

This aphid is very active and easily disturbed. If an infested twig is disturbed, many of the individuals drop off; others run up or down the stem to get away or to find a hiding place. This bronze aphid was attended by large numbers of the common ant, *Formica rufa*.

Apterous vivipara. Color brown; body and appendages covered with numerous long, curved hairs; size 2.7 to 3 mm. long and about 1.7 mm. wide across the abdomen; rostrum long, reaching abdomen; head somewhat rounded, with a prominent median suture; antennæ about half the length of the body; antennal III, 0.53 to 0.58 mm. long, and armed with 4 to 7 large, oval sensoria; IV, 0.22 mm., with 1 to 3 sensoria; V, 0.21 mm.; VI, 0.15 + 0.03 to 0.16 + 0.35 mm.; legs rather long; cornicles merely raised rings on hairy, broadly cone-shaped black bases; cauda and anal plate black, rounded.

Alate vivipara. Color brown with blackish brown appendages; body and appendages covered with long, curved hairs; rostrum long, reaching abdomen; head somewhat rounded in front, with a prominent median suture; ocular tubercles moderately developed; median ocellus under the vertex of the head; antennæ reaching the abdomen; antennal III, 0.39 to 0.47 mm. long, and armed with 4 to 10 large, oval sensoria; IV, 0.17 to 0.21 mm., with 1 to 3 sensoria; V, 0.22 to 0.25 mm.; VI, 0.13 + 0.03 to 0.15 + 0.45 mm.; legs moderately long and black; wings with normal venation; front wing with radial sector curved and inserted some distance back of the point of the stigma, media indistinct; a dark pigmented patch on the membrane

¹ Contribution from the Department of Entomology, Utah Agricultural Experiment Station. Publication authorized by the director, January 26, 1929.

² The writer wishes to thank O. W. Oestlund, P. W. Mason, M. A. Palmer, and A. C. Maxson for examining certain of the forms discussed in this paper.

back of proximal part of the stigma; cornicles mere rings on broadly conical, black, hairy bases; cauda and anal plate black, rounded.

When placed alive in balsam, on a slide, like most dark aphids, this form discolors the balsam and makes a mount that is unsatisfactory for examination. Most of the specimens of this species, collected by the writer, were killed and stored in 70 per cent alcohol, punctured with a sharp needle, and left to fade out for several days, with one or two changes of alcohol to aid in the clearing process. After the specimens stopped discoloring the alcohol, they were run up through 85 and 95 per cent alcohol for about two hours in each solution. After this, the alcohol was drawn off, the excess moisture taken up with blotting paper, and a quantity of clearing cedar oil poured on. After remaining in cedar oil for about twenty-four hours, the specimens were mounted directly in balsam. This provided good, clear mounts, with practically no breaking of antennæ, legs, or distortion of wings.

Fig. 1. *Pterochlorus rosæ* (Chol.). A, antenna of alate viviparous; B, antenna of apterous viviparous; C, rostrum or beak of apterous; D, front wing of alate; E, head of alate; F, cornicle of apterous.

PERIPHYLLUS NEGUNDINIS (Thomas)

This pale yellowish, hairy aphid is very commonly found in Utah, sometimes causing damage to the box elder, *Acer negundo*, upon the leaves of which it feeds. The tiny, very much depressed dimorphs, with their fan-like setæ are encountered on the leaves during the summer months, apparently making no growth for weeks at a time. The writer has collected this species in Utah from Bountiful, Brigham City, Brigham Canyon, Centerfield, City Creek Canyon, Emigration Canyon, Farmington Canyon, Logan, Logan Canyon, Mona, Newton, Provo, Salina, Salt Lake City, Spanish Fork, and Tremonton. Collections have also been made in Idaho at Clifton, Dayton, Malad, and Preston.

CHAITOPHOROIDES MIDDLETONII (Thomas)

This long-beaked dandelion aphid was collected on one of the Utah Agricultural Experiment Station farms in North Logan, Utah, on September 4 and 7, 1926. The first collection was made by Mr. A. C. Burrill and the writer while they were examining aphid and ant associations in connection with ant behavior and control studies.

This greenish blue to yellowish green aphid was very numerous, feeding on the crown and root of the common dandelion, *Taraxacum officinale*. All of the aphids were under the surface of the ground, and those on the roots extended to a depth of about three inches. Ants, *Formica rufa*, were very abundant, and had formed a sort of thatch of alfalfa straws and grass around the infested dandelions.

This species is interesting because of its subterranean habits, its reticulated and pruinose-covered body, and the possession of numerous long, fine, Chaitophorus-like hairs on the legs and antennæ.

Apterous vivipara. Body greenish blue to yellowish green, grayish pruinose, and covered with reticulations; lateral and dorsal black areas cover part of each body segment; size 1.8 to 2.3 mm. long and 1.25 mm. wide across the abdomen; antennæ 1 mm. long and black, except distal ends of III, IV, and V, which are light; antennal III, 0.22 to 0.27 mm. long and armed with 0 to 14 sensoria (usually 7 to 12) which are more numerous on the distal half of the segment; IV, 0.14 to 0.16 mm., with 1 to 8 sensoria (usually 2 to 7); V, 0.13 to 0.17 mm., with 0 to 3 sensoria in addition to the primary sensorium which is situated well back from the apex of the segment; VI, 0.1 + 0.18 to 0.1 + 0.2 mm., with 0 to 1 secondary sensorium on basal portion of the segment; legs short and covered with a great number of fine sensilla; abdomen with lateral tubercles which are best developed on the first abdominal segment and back of the cornicles; cornicles black, cylindrical with a weak flange, and 0.15 mm. to 0.18 mm. long; cauda black, moderately long, tapering beyond the broad basal portion, and with numerous sensilla; anal plate black, rounded.

Alate vivipara. Color of head, thorax and appendages, blackish to black, abdomen green with lateral patches of black; size 1.5 to 1.8 mm. long; rostrum long, reaching third coxæ; antennæ black except apical ends of III, IV, and V, which are light; antennal III, 0.31 to 0.35 mm. long, and armed with 21 to 32 wide margined sensoria of various sizes, occurring in larger numbers on the distal half of the segment; IV, 0.15 to 0.18 mm., with 8 to 15 sensoria; V, 0.14 to 0.16 mm., with 5 to 8 secondary sensoria in addition to the hair-fringed primary sensorium; VI, 0.1 + 0.18 to 0.11 + 0.21 mm., with 0 to 1 secondary sensorium on basal part of segment; prothorax with well-developed tubercles; wings with normal venation; legs moderately developed and armed with numerous sensilla; abdomen with lateral tubercles which are largest on the first segment and back of the cornicles; cornicles black, 0.15 mm. long, cylindrical and with a weak flange; cauda black, tapering gradually from broader base to rounded apex, and armed with numerous hairs.

Apterous ovipara. Color green, yellowish green or reddish green; body covered with reticulations, grayish pruinose, with fewer black areas than in the apterous viviparous; size 1.75 to 2.2 mm. long and 1.1 mm. wide across the abdomen; rostrum reaching third coxæ; antennæ black, seldom reaching 1 mm. in length, and situated on poorly developed tubercles; antennal III, 0.17 to 0.19 mm. long, and without sensoria; IV, 0.11 to 0.13 mm.; V, 0.11 to 0.13 mm.; VI, 0.1 + 0.16 to 0.1 + 0.19 mm.; prothoracic tubercles well developed; legs short and covered with numerous fine sensilla; abdomen with lateral tubercles, the first and last pairs being largest; cornicles black, cylindrical, with a weak flange, and 0.15 mm. long; cauda slightly shorter and more blunt than in apterous viviparous, and with about 12 to 14 sensilla; anal plate black, rounded.

Eggs 0.52 to 0.55 mm. long and about 0.22 mm. thick.

Alate viviparous, apterous viviparous and apterous oviparous females were all present when the first collection was made in early September, 1926.

This aphid seems to be *Aphis middletonii* Thomas. It has a bushy cauda, hairy legs, and is a root feeder. Instead of having a body of almost a uniform lead gray, it differs from the original description³ in having the head black, and black lateral and dorsal areas on the thorax and abdomen of the apterous viviparous forms. The antennæ are blackish to black, instead of lighter than the body, and the cornicles and cauda are black, instead of lead gray or lighter colored. This is the same species as that collected by H. L. Sweetman⁴ from the roots of dandelion at Ames, Iowa, August 12, 1924, and determined *middletonii* Thomas, by Dr. E. M. Patch. Mr. Sweetman very kindly lent the writer slides of this species, for comparison with the Utah material.

Fig. 2. *Chaitophoroides middletonii* (Thomas). A, antenna of alate viviparous; B, antenna of apterous viviparous; C, antenna of apterous oviparous; D, section of reticulated body surface from side of abdomen of apterous viviparous; E, apterous viviparous; F, cornicle of oviparous; G, cornicle of apterous viviparous; H, cornicle of alate; I, cauda of oviparous; J, cauda of apterous viviparous; K, cauda of alate.

CHAITOPHOROIDES POPULIFOLIÆ (Fitch)

This speckled poplar aphid was present in Smithfield Canyon, Utah, on August 24, 1925. Enormous numbers of both winged

³ Thomas, Cyrus. Eighth Report of the State Entomologist on the Noxious and Beneficial Insects of the State of Illinois, pp. 99-100, 1877.

⁴ Sweetman, H. L. Notes on Insects Inhabiting the Roots of Weeds. Annals of the Ent. Soc. of America, Vol. 21, No. 4, p. 595, 1928.

and wingless females were attacking the apical leaves and tender bark on nearly all branches of infested trees. Both surfaces of the leaves were commonly attacked by this aphid so that handling of the infested parts of the plant stained the hands reddish brown from the body liquids of individuals that became mashed. A large black ant was attending this aphid, and numerous syrphid larvæ were feeding upon it.

Additional collections of this species have been made at Birch Canyon and Big Cottonwood Canyon in Utah, and in Immigration Canyon, Idaho.

Apterous vivipara. Color brownish red with white flocculent patches over parts of the body; size 2.5 to 2.8 mm. long and 1.4 to 1.6 mm. wide across the abdomen; rostrum scarcely reaching third coxæ; head, antennæ and legs armed with numerous long, slender hairs; antennal III, 0.51 to 0.53 mm. long, and armed with 14 to 23 round sensoria; IV, 0.27 to 0.31 mm.; V, 0.21 to 0.25 mm.; VI, 0.11 + 0.45 mm.; prothoracic tubercles present; legs fairly long; abdomen with three pairs of lateral tubercles; cornicles black, 0.6 to 0.7 mm. long, somewhat cylindrical but thicker toward base; cauda black, elongate with constriction near base and armed with numerous hairs; anal plate black, rounded.

Alate vivipara. Head and thorax black, abdomen reddish brown with white areas of waxy secretion; size 2.3 mm. long; rostrum nearly reaching third coxæ; antennæ and legs armed with numerous elongate, thin hairs; antennal III, 0.41 to 0.47 mm. long and armed with 20 to 32 round sensoria; IV, 0.22 to 0.24 mm., with 0 to 3 sensoria; V, 0.21 to 0.23 mm.; VI, 0.1 + 0.37 to 0.1 + 0.4 mm.; prothoracic tubercles well developed; wings large, with normal venation; legs moderately long; abdomen with three pairs of lateral tubercles; cornicles black, 0.36 to 0.5 mm. long, slightly thickened toward the base; cauda black, elongate, and armed with numerous hairs; anal plate black, rounded.

Alate male. Size 1.5 mm. long; rostrum reaching third coxæ; body in general resembles the alate viviparous forms, except in size; antennæ black; antennal III, 0.43 mm. long and armed with 35 to 40 round sensoria; IV, 0.27 mm., with 10 to 17 sensoria; V, 0.21 mm., with 4 to 13 secondary sensoria; VI, 0.1 + 0.36 mm.; prothoracic tubercles well developed; wing venation normal; legs moderately long and slender; cornicles black, 0.21 mm. long; cauda black, elongate, tapering beyond the base, and armed with numerous hairs; anal plate black, broadly rounded.

Described from one male collected in Smithfield Canyon on August 24, 1925. This is early for the sexual forms of most species to occur in Utah.

Fig. 3. *Chaitophoroides populifoliae* (Fitch). A, antenna of apterous viviparous; B, antenna of alate viviparous; C and D, cornicle and antenna of alate male; E, cauda of alate viviparous; F, cauda of apterous viviparous; G, cauda of male; H, cornicle of alate; I, cornicle of apterous viviparous.

***Aphis chrysothamnicola*⁵ *infrequens* Knowlton, n. sp.**

This greenish black aphid was collected at Trenton, Utah on June 16, 1927, on the leaves of the common sagebrush, *Artemisia tridentata*.

Alate vivipara. Color black with green and black abdomen; size 1.5 mm. long and fairly broad; anterior margin of head rounded, with antennal tubercles undeveloped; antennæ dusky to black and slightly shorter than body; antennal III, 0.3 mm. long and swollen throughout the median half, which carries four round sensoria arranged in a row; IV, 0.24 mm.; V, 0.21 mm.; VI, 0.13 + 0.21 mm., with the filament slightly thicker toward distal end; prothorax with prominent tubercles; wing venation regular, veins dusky with slightly shaded borders; legs fairly short; cornicles black, 0.11 mm. long, larger toward apex, with a well-developed flange; cauda black, upturned, elongate, with a slight constriction near base; anal plate black, rounded.

Aphis infrequens resembles *Aphis hermistonii* Wilson in many respects. It differs from the latter species in having a larger body, slight shading along the wing veins, longer antennal segments, and having antennal III noticeably swollen throughout its middle one-half.

Fig. 4. *Aphis infrequens*. A, antenna; B, wings; C, D, cornicles; E, prothoracic tubercle, of alate viviparous.

APHIS POMI De Geer

This green apple aphid is very common in Utah, and often does considerable damage. The writer has collected this species from Farmington, Garland, Kaneshville, Logan, Mendon, Provo, River Heights, St. George, Salt Lake, Tremonton, and Trenton, in Utah, and from Clifton, Idaho.

ANURAPHIS ROSEUS Baker

This rosy apple aphid was rather abundant at Provo, Utah, on June 13, 1923, and some damage was resulting to the apple leaves. Usually this form is rather rare in Utah orchards.

⁵ Gillette, C. P., and Palmer, M. A. 1929. New Colorado Aphididae. In *Annals Ent. Soc. America*, Vol. 22, No. 1, pp. 5-7. In preparing this paper the species was described as new, but after the manuscript was in the hands of the printer, Prof. Palmer suggested that the species might be only a variety of a form that Dr. Gillette and she then had in the hands of the publisher, which apparently is the case.

ANURAPHIS PERSICÆ-NIGER (Smith)

During the summer of 1924 the writer collected this species on peach trees in Utah from Perry and Provo.

MYZOCALLIS DISCOLOR (Monell)

This smoky-winged aphid occurs rather commonly in Utah, feeding upon the oak, *Quercus gambellii* and *Q. utahensis*. Collections have been made at Bountiful, City Creek Canyon, Devil's Gate (in Weber Canyon), Farmington, Ogden, Parley's Canyon (elevation 7000 feet), Provo, Salt Lake City, Sugar House, and Willard, in Utah.

Alate vivipara. Size 1.2 to 1.83 mm. long; rostrum short, not reaching second coxæ; head triangular to pointed in front, antennæ slender, about as long as the body, pale, except distal ends of III, IV, V, and most of VI, which are dusky, and armed with a few short, bristle-like hairs; antennal III, 0.35 to 0.46 mm. long with 2 to 6 large round or oval sensoria on somewhat thicker basal portion; IV, 0.23 to 0.31 mm.; V, 0.25 mm.; VI, 0.11 + 0.2 to 0.13 + 0.23 mm.; wings with normal venation, and with smoky areas covering part of the membrane and at distal ends of veins of forewing; abdomen yellowish, with dusky areas on sides and dorsum; cornicles dusky to pale, short, truncate 0.06 to 0.07 mm. long; cauda knobbed; anal plate bi-lobed.

Apterous ovipara. Body covered with long capitate hairs; size 1.7 to 2.3 mm. long; rostrum short, barely reaching second coxæ; antennæ armed with a few strong, capitate hairs; antennal III, 0.35 to 0.38 mm. long; IV, 0.24 to 0.27 mm.; V, 0.21 mm.; VI, 0.1 + 0.18 to 0.11 + 0.19 mm.; hind tibia swollen and covered with numerous sensory areas; tip of abdomen very elongate.

Described from specimens collected at Bountiful, Devil's Gate, and Willard in Utah, September 14, 1925.

Alate male. Size 1.3 mm. long; antennæ thicker than that of females; antennal III, 0.5 mm. long, with 24 to 28 large sensoria; IV, 0.33 mm. with 10 to 14 sensoria; V, 0.31 mm. with 5 to 8 secondary sensoria; VI, 0.15 + (? , broken off) with 2 to 4 sensoria on basal portion; wings with dusky areas as in the winged female.

Described from specimen collected at Bountiful, Utah, September 14, 1925.

Fig. 5. *Myzocallis discolor* (Monell). A, antennal III; B, wings; C, cauda; D, cornicle; E, anal plate; F, cornicle; G, hooks on anterior margin of hind wing (much enlarged); H, head, all of alate viviparous; I, head of apterous oviparous.

Amphorophora accidentalis Knowlton, n. sp.

This aphid was collected on the apical growth of sagebrush,

Artemisia tridentata, near Dry Lake, Utah, on August 10, 1927. The dark wing veins are its most conspicuous feature.

Alate vivipara. Size 1.5 mm. long; head with prominent antennal tubercles; rostrum just reaching third coxæ; head and antennæ armed with prominent, apically spear-shaped sensilla about as long as thickness of antennal III; antennæ dusky to base of III and black beyond; antennal III, 0.66 mm. long, and armed with 24 to 37 small, round sensoria; IV, 0.5 mm., with 12 to 15 sensoria; V, 0.42 mm., with 9 or 10 sensoria; VI, 0.09 + 0.53 mm.; wings with venation normal, veins blackish brown, and with very slight dusky shading at margins of veins on front wings; legs long; hind tibia 1.3 mm. long; cornicles light to slightly dusky, 0.27 mm. long, smooth, and with a prominent flange; cauda slightly dusky, elongate, blunt at end, with 4 or 5 lateral hairs on each side; anal plate dusky, broadly rounded.

This species is near *Amphorophora pergandei* Mason, but differs in having shorter cornicles and antennal segments, and considerably fewer sensoria on antennals III and IV. It differs from *A. aridus* in having longer sensilla on head and antennæ, fewer sensoria, and smooth, thicker and shorter cornicles.

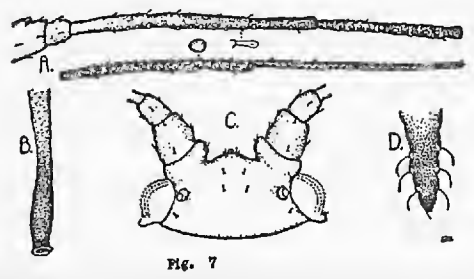
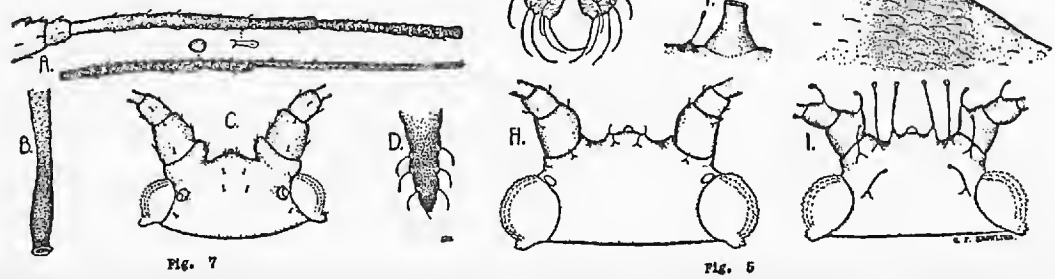
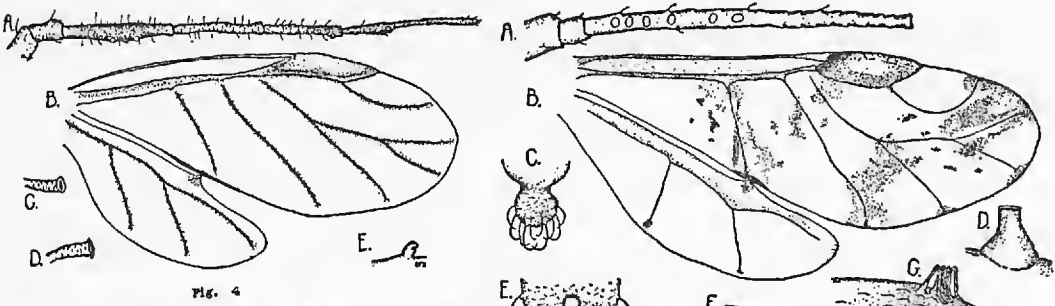
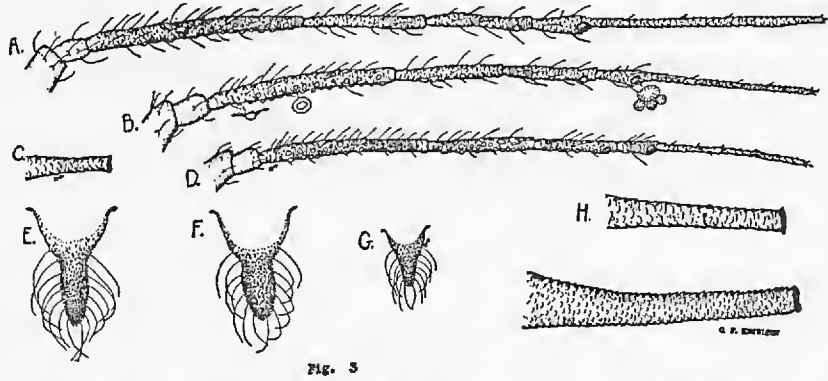
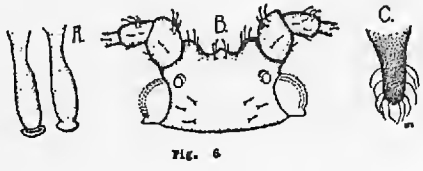
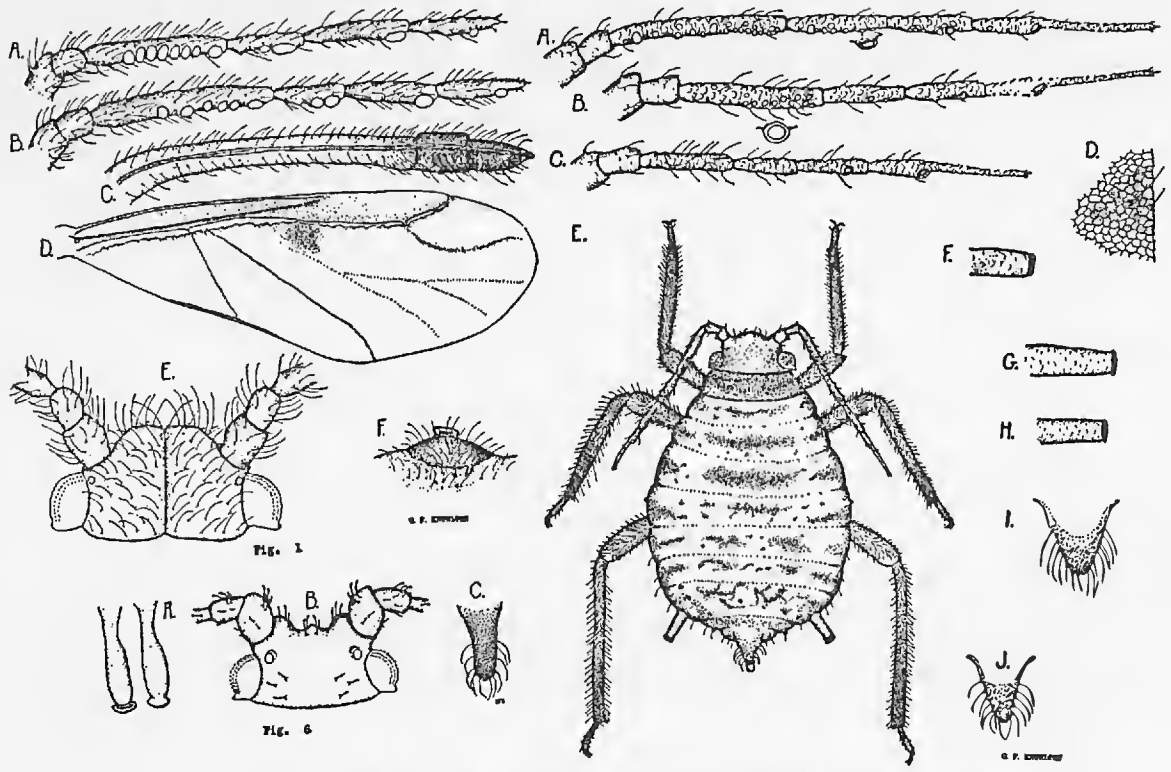
Fig. 6. *Amphorophora accidentalis* n. sp. A, cornicles; B, head; C, cauda, of alate viviparous.

Amphorophora aridus Knowlton, n. sp.

This shiny green aphid was collected from the apical growth of sagebrush, *Artemisia tridentata*, at Amalga, Utah, on May 12, 1928.

Alate vivipara. Size 1.65 mm. long; rostrum scarcely reaching second coxæ; head, prominent antennal tubercles and antennæ armed with a few short, apically enlarged sensilla; antennæ longer than the body and black beyond basal portion of III; antennal III, 0.6 mm. long and armed with 17 round sensoria in a fairly regular row; IV, 0.36 mm. with 2 or 3 sensoria; V, 0.35 mm.; VI, 0.12 + 0.5 mm.; lateral tubercles lacking; wings large, venation normal, veins slender and blackish brown; legs long; hind tibia 1.3 mm. long, with tarsus 0.1 mm. long; cornicles lighter on basal portion, black beyond, 0.43 mm. long, surface imbricated, and with two or three rows of closed reticulations before the flange; cauda green to slightly dusky, long, with three hairs on each side and two on dorsal surface near distal end; anal plate dusky, rounded.

This species differs from *Amphorophora brittenii* Theobald in having fewer sensoria on antennals III and IV and with cornicles much less inflated. It differs from *A. reticulata* Mason in having a longer cauda compared with length of cornicles, and less reticulated areas on cornicles, and from *A. spiræcola* Patch in having sensoria on antennal IV.



The type slides are retained in the collection of the writer.

Fig. 7. *Amphorophora aridus* n. sp. A, antenna; B, cornicle; C, head; D, cauda, of alate viviparous.

ACYRTOSIPHON PISI (Kaltenbach)

This green pea aphid was very abundant in Utah during the summer of 1928 and did considerable damage to alfalfa in the seed-growing areas of Millard County. Slight damage to field and garden peas in northern Utah was also noted.

WORK OF THE PACIFIC OAK TWIG GIRDLER CONSPICUOUS IN THE YOSEMITE VALLEY

Many of the California black oaks (*Quercus kelloggii* New.) in the Yosemite Valley during August, 1929, were spotted thickly with small patches of yellowing leaves. Examinations indicated that this is the work of the Pacific oak twig girdler, *Agrilus angelicus* Horn. In practically all cases the flat oval scale-like shiny black egg was found on the bark near the tip of last year's growth, and the small white borer was found in a spiral mine beneath the bark of the twig. Apparently the beetles which produced the present infestation came from the canyon live oak, *Quercus chrysolepis* Lieb. So far as known, the insects which attack the black oak do not complete their development, but die before the end of the first year. Those that attack the live oak do complete their development and furnish the beetles which carry on the species.—H. E. Burke.

NOTE ON NOTOXUS

While classifying the species of *Notoxus* in the collection of the California Academy of Sciences it was noted that the illustrations given in the *Biologia Centrali Americana* (Coleoptera, Vol. IV, Pt. 2, Tab. 9, Figs. 21 and 21a) of *calcaratus* Horn do not agree with the description of that species. In *calcaratus* the horn is coarsely serrate and the crest carinate; this is not so in figs. 21 and 21a. Fig. 20a, of *Notoxus hirsutus* Champ., agrees with Horn's description of *calcaratus*. Evidently a mistake has been made, either in drawing or in the position of the figure.—Frank E. Blaisdell, Sr.

A NEW SPECIES OF THE ENCYRTID GENUS
METAPHYCUS FROM WASHINGTON
(HYMENOPTERA)

BY P. H. TIMBERLAKE

Citrus Experiment Station, Riverside, California

The parasite described herewith was reared by Professor Trevor Kincaid from *Eulecanium coryli* (Linn.) at Seattle, Washington, and its work is thought to be the cause of the practical extermination of this scale around Seattle.

***Metaphycus kincaidi* Timberlake, n. sp.**

The female is similar to *M. coquilletti* (How.) from which it differs in having the ocellar triangle equilateral, the frontovertex rather less than twice as long as broad, the wings moderately wide, with the cut-off portion of speculum separated from the hairless streak of the posterior margin, the abdomen piceous above instead of pale yellowish, the annuli of the tibiæ broad and entire, the scape conspicuously white only at apex, etc. The male is similar to *M. maculipennis* (Timb.) and *M. melanostomatus* (Timb.). It differs from *maculipennis* in having the tibiæ annulated, the wings uniformly hyaline, pubescence of mesonotum short and whitish, the antennæ much paler in color and less densely hairy, etc. From *melanostomatus* (considered by Silvestri and Mercet to be the true *punctipes* Dalman, but this is at least doubtful) it differs in having the frontovertex no wider than long, the ocellar triangle equilateral, the cheeks and malar region not almost entirely black, the flagellum less densely hairy, etc.

Female. Head as long as wide, rather thick fronto-occipitally. Frontovertex about one and three-fourths times longer than wide. Ocelli nearly in an equilateral triangle, the posterior pair slightly closer together than distance from either to anterior ocellus, and nearly their own diameter from the eye margin. Antennal scrobes rather deep, united above and separated below by the facial prominence, which is as long as broad. Malar space about as long as width of eyes. Scape, excluding radicle joint, one-third as wide as long and widest slightly beyond the middle. Pedicel a little more than twice as long as thick and a little exceeding the length of the first two funicle joints combined. Funicle increasing gradually in thickness distad, the first four joints subequal and about as long as thick. The last two funicle joints much larger, the fifth somewhat

longer than wide and the sixth a little wider than long. Club broadly oval, obliquely rounded at apex and slightly exceeding one-half the funicle in length. Thorax twice as long as wide. Parapsidal lines of mesoscutum distinct laterad but becoming very faint mesad. Wings and venation normal, the discal setæ fine, dense, and uniform. Speculum slightly widened below, the cut off portion separated by one row of setæ from a very narrow, obscure branch of the basal hairless streak on the posterior margin of wing. Legs and abdomen normal, the ovipositor not protruded. Sculpture normal, the microscopic granulation of mesonotum slightly coarser than in *melanostomatus*. Mesonotum with thin appressed whitish setæ as in allied species. Eyes with a fine short pubescence.

Frontovertex, face and cheeks very pale orange yellow (nearly ochraceous buff, Ridgway). Line across oral margin of face and a large spot anteriorly on the cheeks, piceous. Notum of thorax and abdomen piceous, the mesonotum dull, slightly brownish, and with the lateral margins of mesoscutum more or less shading into pale yellowish. Collar of pronotum white with a fuscous dot at each end. Tegulæ white with a fuscous spot on outer margin. Under parts of thorax, legs and venter toward base dusky creamy white, the mesopleura clouded with pale fuscous at the middle beneath. Apex of last joint of tarsi, apex of front and hind femora, apex of front tibiæ and base and apex of middle tibiæ narrowly piceous. Tibiæ with two rather broad oblique piceous annuli, obscure on the front pair. Antennæ piceous, with the apex of scape, narrow line on dorsal margin of scape, extreme base of scape proper, apical half of pedicel and last three funicle joints, white, the fourth funicle joint, however, more or less dark on outer side toward base. Apical margin of club obscurely whitish. Wings hyaline, the venation yellowish.

Length of body, (1.10 to) 1.26; length of head, 0.419; width of head, 0.424; width of frons at anterior ocellus, 0.146; length of antenna, 0.770; length of scape, excluding radicle, 0.242; width of scape, 0.087; width of mesoscutum, 0.487; length of fore wing, 1.48; width of fore wing, 0.63 mm.

Male. Head about as broad as long, moderately thin fronto-occipitally, subquadrate as seen in frontal view, with the sides gently rounded, the cheek converging broadly toward the mouth and the dorsal margin very slightly rounded. Malar space almost as long as eyes. Occiput moderately concave, with the neck inserted very slightly above the center. Eyes as seen in frontal view strongly divergent below. Frontovertex about as long as wide, Ocelli in an equilateral triangle, the posterior pair about their own diameter from the eye margin and a little farther removed from the occipital margin. Antennal sockets placed somewhat above the clypeal margin and about the width of vertex apart. Scrobal impressions joined above, shallow and broad. Prominence between antennæ low, broad, and angled above. Scape compressed, subfusiform, widest before

the middle, and slightly less than one-third as wide as long, excluding the radicle joint. Pedicel barely longer than wide and shorter than the first funicle joint. Flagellum hardly increasing in thickness distad and clothed with numerous outstanding hairs, which are about as long as the thickness of the joints. Funicle joints 1, 2, and 5 somewhat longer than the others and about one-fourth to one-third longer than thick, the others not or hardly longer than thick. Club entire, conically tapering to the blunt apex and about as long as the last two funicle joints combined. Maxillary palpi four-jointed, the labial palpi two-jointed and extremely short. Mandibles with three very short blunt teeth. Thorax about twice as long as wide. Parapsidal lines of mesoscutum obliterated. Scutellum as long as mesoscutum and rather strongly acute at apex. Wings and venation normal, the discal setæ short, uniform and rather dense. Speculum hardly widened below, the cut-off portion separated from the main portion and from the basal hairless streak on posterior margin of wing by two lines of setæ. Spur of middle tibiæ as long as the basitarsus. Middle tarsi hardly thicker than the hind pair. Mesonotum with thin whitish rather inconspicuous short appressed setæ. Eyes virtually bare.

Head pale yellowish, with upper half of occiput piceous, the dark area extending triangularly on to vertex as far as the anterior ocellus, or sometimes entire vertex dark. Dark area also rather faintly and narrowly extending along margin of cheeks and occiput to the mouth, the cheeks on each side of mouth having a definite dark area which extends narrowly across oral margin. Thorax above and abdomen dull piceous, the lateral margins of mesoscutum sometimes somewhat yellowish. Tegulæ, except fuscous spot on outer margin, and collar of pronotum, except fuscous dot at each end, white. Under parts of thorax and legs dusky creamy white. Extreme tip of front femora and tibiæ, last joint of tarsi, and two obscure annuli on middle and hind tibiæ, fuscous. Antennæ pale dusky yellowish, the scape along dorsal margin and pedicel, except at apex, fuscous. Wings hyaline, the venation dusky yellowish.

Length of body, (0.75 to) 0.91; width of mesoscutum, 0.288; length of antenna, 0.771; length of scape, excluding radicle joint, 0.173; width of scale, 0.055; length of fore wing, 1.03; width of fore wing, 0.452 mm.

Described from two females, three males (holotype ♀, allotype, and paratypes), reared from *Eulecanium coryli* (Linn.), Seattle, Washington, June, 1926 (T. Kincaid).

Types in United States National Museum.

MR. WALTER M. GIFFARD—AN APPRECIATION

BY E. P. VAN DUZEE

In the death of Mr. Walter M. Giffard, which occurred at Honolulu, June 30, 1929, the California Academy of Sciences has lost an active member and a true friend.

Born in England in 1856, he removed to the Hawaiian Islands in 1875 when but nineteen years of age, where he has since resided. He soon became connected with the Hawaiian sugar interests at a time when they were rapidly developing. His special interest in the Experiment Station of the Hawaiian Sugar Planters Association began in 1903, when he took a leading part in the organization of a department of entomology and instigated an almost world-wide search for natural enemies of the cane leafhopper by Mr. Albert Koebele and others. The biological control measures applied to the sugar-cane industry, then threatened with extinction in the islands, proved very efficient and practically saved the industry. Mr. Giffard took a large part in the organization of the very considerable and efficient entomological activities on the islands, including the quarantine regulations adopted by the Hawaiian Government to prevent the introduction of additional pests. This association with entomologists and entomological work on the islands aroused Mr. Giffard's interest in the insects themselves and he built up a large collection of native Hawaiian insects, especially complete in certain groups of the Coleoptera, Hymenoptera, and Hemiptera. In his earlier work, that on genus *Odynerus* in the Hymenoptera and *Plagithmysus* in the Coleoptera is perhaps best known. Probably his best work was done later in the Homopterous family Fulgoridæ, in the Delphacids and Cixiids. In these two groups he made large collections, both in the Hawaiian Islands and in California, publishing the result in the Proceedings of the Hawaiian Entomological Society. In the Delphacids he collaborated with Mr. Frederick Muir, making most of the genitalic mounts and drawings for certain of their joint papers, both of which were beautifully done and very accurate. He also made the drawings for a joint paper on the Delphacid genus *Pissonotus* which it is hoped may soon be published. Probably the best taxonomic

paper published by him was that on Hawaiian Cixiidæ, published in the Proceedings of the Hawaiian Entomological Society, Vol. VI, pp. 51-172, plates I-VIII, 1925.

Mr. Giffard was a life member and a Fellow of the California Academy of Sciences, a member of the Pacific Coast Entomological Society, Fellow of the Entomological Society of London, a member of the American Association of Economic Entomologists, and a charter and life member of the Entomological Society of America as well as of the Hawaiian Entomological Society. He was also a Fellow of the American Association for the Advancement of Science and a member of the Biological Society of Washington. In California he will perhaps be best known for the deep interest he took in the welfare of the California Academy of Sciences. He was instrumental in the securing by the Academy of the large collection of insects made by the late Mr. Albert Koebele, presented to the Academy by Mrs. Koebele at Mr. Giffard's suggestion. Mr. Giffard also presented to the Academy of Sciences interesting series of Hemiptera taken by him in California, some characteristic Hawaiian Delphacids, and more recently his entire collection of North American Delphacids. Mr. Giffard was a true friend and a genial companion, and his passing will be a real loss to all who had the good fortune to know him.

A RARE WASP FROM OREGON

In the valuable collection of Hymenoptera left to the California Academy of Sciences by the late Charles L. Fox is one pair of *Odynerus margaretellus* Rohwer (Proc. U. S. Nat'l Mus., LXIV, 242, 1915), taken by Mr. Fox at Klamath Falls, Oregon, May 10, 1924. This species is peculiar in its genus in the bright red markings on the body and legs. The male possesses the black central spot found in the type female. The second sternite is without the black spot in both sexes. Mr. Rohwer took the type in Colorado.—E. P. Van Duzee.

THE PAN-PACIFIC ENTOMOLOGIST

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in coöperation with the California Academy of Sciences

E. P. VAN DUZEE, Editor S. B. FREEBORN, Ph.D., Treasurer

EDITORIAL COMMENT

An annoying typographical error occurred in the April number of THE PAN-PACIFIC ENTOMOLOGIST. On page 167 the description of the type female of *Triepeolus subnitens* was designated as that of the male and in the next paragraph the description of the male was designated as that of the female. Again on page 169 the description of the female of *Triepeolus trichopygus* was designated as the male, while the male in the next paragraph is correctly designated. Subscribers are requested to make these corrections in their copies.

Most of our local entomologists have returned from their summer's field work and all report excellent success. The weather was cold and windy until about the eighth of June, with a heavy fall of snow in the Sequoia National Park down to the 7000-foot level. Butterflies and most Coleoptera were very scarce in Owens Valley, but higher up in Mono County and at Carson City, Nevada, and at Tahoe they were becoming more abundant. Dr. Van Dyke found the development of insect life in the Sequoia National Park about as that in Mono County. In Nevada Dr. Blaisdell found conditions very dry for insect life, but he brought home some interesting species.

Dr. A. S. Fawzy, Department of Plant Quarantine and Control, Alexandria, Egypt, and Dr. and Mrs. Mortimer D. Leonard of Cornell University, were welcome visitors at the California Academy of Sciences about April 1. Other visitors at the Department of Entomology were Mr. R. H. Beamer and party and Dr. P. W. Lawson of the University of Kansas and Dr. Otto Swezey of Honolulu.

Twelve new metal-covered cases have recently been added in the Department of Entomology at the Academy. These will hold 288 drawers of the standard size used by the Academy (17 x 19 inches), a portion of which will have glass on both top and bottom for the reception of the diurnal lepidoptera. The remaining drawers will be used for the Coleoptera, Hemiptera, Diptera, and other insects as they are rearranged into the unit boxes now being used by the Academy.

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THE PAN-PACIFIC ENTOMOLOGIST

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San Francisco, California
1929

THE PAN-PACIFIC ENTOMOLOGIST

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RECORDS OF WESTERN SPECIES OF PERDITA WITH DESCRIPTIONS OF TWO NEW SPECIES (HYMENOPTERA)

BY P. H. TIMBERLAKE

Citrus Experiment Station, Riverside, California

No species of Penurgid bees of the genus *Perdita* have been recorded from the Pacific Northwest except *P. albipennis* Cresson from the State of Washington, and even *albipennis* has been considered an adventive species that had followed the sunflower in its western dispersion. It is interesting, therefore, to note the occurrence of two species in Oregon and another from Vancouver Island, British Columbia. The Oregon species were found east of the Cascades in a region where the fauna is distinctly of a desert type much like that of Nevada. Dr. Cockerell has recorded many species of bees from this fauna even as far north as Pasco, Washington. The Vancouver *Perdita*, however, belongs distinctly to another fauna that has been developed in the more humid region of the Pacific Coast.

1. *PERDITA ZEBRATA* Cresson

Two females and one male, collected June 30, 1927, at Nixon, Nevada (E. P. Van Duzee). These have the pale markings bright yellow, but the male genitalia agree exactly with typical *zebrata* from Colorado and New Mexico.

2. *PERDITA ZONALIS* Cresson

Three females and five males, collected August 10, 1926, at Sisters, Oregon; and one male, collected August 11, 1926, at White Branch Meadow, Three Sisters, Oregon, 5675 feet (H. A. Scullen).

These specimens I am unable to separate satisfactorily from the little known *P. zonalis* Cress., although they may ultimately prove to be separable when *zonalis* becomes better known. The females agree well with the original description and with

Cockerell's notes on one of the types, except that the first tergite of abdomen has a continuous dark band across the middle instead of a small black spot on each side. I had thought, after reading what has been published about *zonalis*, that the wings were colored as in *P. zebrata* Cress., that is, more or less milky hyaline with very pale veins. Having recently seen the types at Philadelphia I can affirm, however, that the wings are slightly tinted with fuscous with the veins distinctly brownish.

The male, previously unknown, runs to *P. zebrata* Cress. in Cockerell's table (1896) and is easily distinguished from that species by the darker wings and veins, the much evened banding of abdomen and by having the hind femora yellow with only a small dark spot above at apex.

Male. General form as in other species of the *zebrata* group. Head not enlarged, somewhat wider than thorax, slightly wider than long and well rounded on the sides and above. Cheeks narrow and simple. Eyes about twice as long as wide, a little wider toward lower end than above, and with the inner orbits very slightly converging below. Clypeus moderately convex and projecting for about one-half of its length in front of ocular line; the disk about one-half wider than high, with its dorsal margin rather broadly transverse between dog-ear plates; the lateral extensions short, very broad, well inflexed anteriorly and approximately one-half visible in frontal view of head. Dog-ear plates about twice as long as wide and rather acute at lower end. Supraclypeal plate as long as broad, slightly narrowed above, where it ends between the antennal sockets in a sharp declivity toward the frons. The declivity strongly tectiform and somewhat carinate medially as it approaches surface of frons on to which it intrudes only for a short distance. Frons with a distinct, impressed, shining, median line reaching to, or nearly to, tectiform declivity and becoming more evident close to the median ocellus. Lateral plates of face rather strongly widened at lower end, and opposite middle of dog-ear plates, each covering slightly less than one-fourth the total width of face. Mandibles curved, tapering, simple and acute at apex and reaching to far margin of labrum. Abdomen oval, convex, about twice as long as broad and with the apex moderately reflexed toward venter. Seventh tergite broadly rounded at apex. Membrane of wings rather densely covered, especially in apical field, with very fine short setæ. Stigma narrowly lanceolate, a little shorter than first submarginal cell and emitting radius distinctly beyond the middle. Marginal cell considerably wider and somewhat shorter than stigma, with the apical truncation more or less oblique and the poststigmatal and substigmatal parts about equal. Second submarginal cell narrowed one-half to two-

thirds above. Recurrent veins interstitial with the intercubiti. Subdiscoidal vein and second recurrent, except a short spur above, obsolete. Claws rather large, strongly bent, cleft and with the inner tooth a little thicker and considerably shorter than outer tooth.

Frons very finely granular tessellate, subopaque, with obscure, minute, sparse punctures. Vertex similarly sculptured but a little less dull and impunctate. Face below antennæ smooth, shining and sparsely and finely punctured. Cheeks tessellate, shining and rather closely punctured except in a smooth strip along orbits. Thorax polished and shining, but disk of propodeum distinctly tessellate. Punctures of mesonotum fine and very sparse, and those of mesopleura similar and much closer. Abdomen with the usual microscopic lineolate sculpture. Pubescence whitish and fine; dense and moderately long on cheeks, similar but thinner on occiput, pleura and sides of propodeum, and rather sparse and shorter on mesonotum and face.

Head and thorax dark bluish green, with the frons and vertex greener and the propodeum dark blue. Mandibles except reddish tips, labrum, and face below antennæ, except dog-ear plates, bright yellow. Dog-ear plates black with a small yellow spot above, or sometimes almost all yellow except around the margins. Lateral marks of face obliquely truncate above about from the middle of outer margin of antennal sockets to a point on orbits just below the foveæ. Cheeks narrowly margined with yellow anteriorly, on margin of gular cavity for a short distance and along posterior orbits nearly to middle of eyes. Prothorax mainly dark, but tubercles, and frequently narrow anterior margin and a small spot at posterior corners of notum, yellow. Thorax otherwise entirely dark. Abdomen bright yellow, with the venter nearly or quite immaculate and the seventh tergite rather brownish yellow. First tergite black, but often with a small yellow spot on each side subapically that joins laterally with a thin marginal yellow line running toward the base. Basal band on second tergite, mostly covered by preceding segment but triangularly enlarged on each side to cover the lateral foveæ, a rather broad band at juncture of tergites 2-3 to 5-6, and broad band on apical margin of six piceous, or varying to brownish on apical segments. Dark bands on tergites 2 to 4 slightly bulging anteriorly just before the end on each side. Yellow intervals about as wide as the dark bands, reaching to lateral margins but more or less constricted laterally on tergites 2 to 4. More rarely the yellow interval on two is reduced to a narrow basal band entirely enclosed and ending far from lateral margins, and those on three and four at the same time more or less nubulously cut off at lateral margins. Legs bright yellow, the front and middle tarsi paler, a large blotch above and behind on front and middle femora and tibiæ, a spot at apex of hind femora above, hind tibiæ except beneath and hind tarsi, except under side of basitarsus, brownish fuscous. Labio-maxillary structure piceous but the

maxillary blades, maxillary palpi and the glossa more or less testaceous. Antennæ fuscous or dark brown, becoming paler toward apex, the scape except a spot above at apex and pedicel beneath bright yellow, and the flagellum rather broadly dull yellowish beneath, except last joint which is nearly all brown. Tegulæ hyaline with a yellow spot at base. Wings hyaline but just perceptibly tinted with fuscous; veins and margins of stigma rather pale brown, subcosta much darker and the stigma otherwise pallid.

Length about 4.25 to 5.0 mm.

3. *Perdita oregonensis* Timberlake, new species

Two males (holotype and paratype), collected August 10, 1926, at Sisters, Oregon (H. A. Scullen).

The male runs to couplet 42 in Cockerell's table (1896), and among other species since described that run to the same place, it is very similar and closely allied to *P. stottleri* Ckll. It differs from *stottleri* in having the head much wider (considerably wider than long, but in *stottleri* about as wide as long), the white pubescence of head and thorax somewhat longer, denser and more conspicuous, the frons less densely sculptured and more shining, the mesonotum less distinctly tessellate and more shining, and in having one more dark band on abdomen. These distinctions are rather weak, but there are also differences in the genitalia which indicate two distinct species, although the genitalia show that the two are very closely allied.

Male. General form of body as in other species of the *zebrata* group. Head not enlarged, but wider than thorax, considerably wider than long, well rounded on sides and gently rounded above. Cheeks rather narrow and simple. Eyes about twice as long as wide, broader toward lower end than above and having the inner orbits very slightly converging below. Clypeus convex and only slightly projecting beyond ocular line; the disk about one-half broader than high, rather well rounded above but subtransverse medially between dog-ear plates; the lateral extensions very broad and well inflexed anteriorly but still visible in large part in frontal view of head. Dog-ear plates about one-half longer than wide and obliquely truncate at lower end. Supraclypeal plate about one-third wider than high, extending upward between antennal sockets and ending in a sharp declivity toward frons. This declivity extending only a short distance on to frons and rather weakly tectiform. Lateral plates of face somewhat widened at lower end and opposite middle of dog-ear plates, each covering about one-fourth the total width of face. Frons on dorsal half with a strongly impressed shining median line. Mandibles rather long, curved, tapering to simple

acute apex and reaching somewhat beyond far margin of labrum. Antennæ ordinary, the scape about twice as long as thick and the middle joints of flagellum about as long as thick. Abdomen oval, convex, about twice as long as wide, with the apex moderately reflexed toward venter. Seventh tergite with a rather narrow rounded apex. Membrane of wings rather densely covered in apical field with fine weak setæ. Stigma narrowly lanceolate, nearly as long as first submarginal cell and emitting radius somewhat beyond the middle. Marginal cell about as long as stigma, with the apical truncation slightly oblique and the substigmatal and poststigmatal parts about equal. Second submarginal cell narrowed about one-half above. First and second recurrent veins either interstitial, or very nearly so, with the intercubiti. Subdiscoidal and second recurrent veins obsolete, except a short stub of the recurrent vein above and a small section at its middle. Claws rather large, strongly bent and cleft with the inner tooth about two-thirds as long as outer tooth.

Face below antennæ smooth and obscurely punctured, the punctures of clypeus very sparse. Frons strongly and finely tessellate, moderately shining and rather closely and finely punctured. Cheeks smooth and closely punctured except in a polished strip along the orbits. Thorax polished and shining, but the propodeum rather delicately tessellate. Mesoscutum and scutellum with fine, widely spaced punctures, which become more numerous anteriorly on the scutum. Mesopleura with numerous microscopic punctures. Abdomen shining and with the usual microscopic lineolate sculpture. Pubescence white, rather abundant and conspicuous; long and rather dense on cheeks, occiput, metanotum, pleura and sides of propodeum, and somewhat shorter and considerably thinner on face and mesonotum.

Head and thorax very dark brassy green, becoming bluish on pronotum and propodeum and to a less extent on the pleura. Mandibles except reddish tips, labrum, mark on cheeks anteriorly, and entire face below level of antennæ, except the usual clypeal dots, bright yellow. Mark on cheeks rather large, broadening toward gular cavity, and continued as a thin line along orbits not quite to middle of eyes. Lateral marks of face extending along orbits not quite to level of frontal foveæ and obliquely truncate above to outer upper margin of antennal sockets, but sometimes the truncation is broken within by a rather wide extension of the green along the outer side of the antennal sockets to the level of their lower margin. Prothorax yellow with a rather broad bluish transverse band which broadens medially to cover the posterior margin of pronotum except at sides, and on each pleuron sends a slender subhyaline dark streak to the tubercle. Abdomen yellow above and beneath, with a piceous band at juncture of tergites 1-2 to 5-6. First tergite piceous with a rather narrow subapical yellow band strongly interrupted medially. The yellow and dark bands on following segments about equal in width, the dark bands having very slight sublateral bulgings anteri-

only, especially on tergites 3 and 4, and the dark portion at base of tergites 2 and 3 triangularly widened at ends. The dark bands also, except the first, not quite reaching to lateral margins. Legs entirely bright yellow except a fuscous streak on dorsal side of hind tibiae and except that the last two or three joints of hind tarsi are slightly infuscated. Antennae yellow, the scape and pedicel beneath concolorous with face, the flagellum beneath a little duller and more brownish yellow. Pedicel and flagellum above fuscous but becoming much paler toward apex. Basal half of labium on axillae and first joint of labial palpi fuscous, the remaining parts of the labio-maxillary structure yellowish. Tegulae whitish hyaline with a large yellow spot at base. Wings slightly milky hyaline, the veins very pale brownish yellow, with subcosta, margins of stigma and sometimes veins of marginal cell brown, the stigma otherwise pallid.

Length 4.0 mm.

Type in collection of the Oregon Agricultural Experiment Station, Corvallis, Oregon.

4. *PERDITA CROTONIS* Cockerell

Three females, Santa Fé, New Mexico, July 22, 1926 (E. C. Van Dyke), in collection of the California Academy of Sciences.

5. *Perdita nigricollis* Timberlake, new species

One female (holotype), Victoria, British Columbia, June 29, 1920 (E. C. Van Dyke).

This runs in Cockerell's table (1896) to *P. affinis* Cress., var. (couplet eighty), but is not closely allied to that species. It differs from *P. affinis* in the shining black disk of mesonotum, spiniform antero-lateral angles of disk of clypeus, head considerably broader than long, etc. It belongs to the group of *P. californica* Cress., and is most similar to another new species from San Diego, California.

Female. General form ordinary. Head considerably wider than long, gently rounded on side and subtransverse above. Cheeks moderately broad. Face below antennae gently convex. Clypeus projecting moderately in front of ocular line; the disk about one-half broader than high, moderately broadly truncate above between dog-ear plates and with the anterolateral angles strongly spiniform; the lateral extensions very broad, triangularly tapering toward base of mandibles, well inflexed along anterior margin, yet visible to a large degree in frontal view of head. Dog-ear plates hardly longer than wide. Lateral plates of face slightly widened at lower end, and opposite the middle of dog-ear plates, each covering slightly more than one-fourth the total width of face. Prominence between

antennæ rather high and sharply tectiform, with the ridge extending well on to frons and continuous above with a fine impressed median line to anterior ocellus. Frontal foveæ elongate, separated from eye margins by a space nearly equal to their own width, and extending below almost to level of lower margin of antennal sockets. Mandibles moderately stout, gently curved, blunt at apex and reaching to far margin of labrum. (In the type the mandibles are closed so that the inner tooth if present is not visible.) Antennæ ordinary, with the middle joints of flagellum as long as wide. Abdomen oval, about twice as long as wide and gently convex above. Pygidium very narrow and acute at apex. Membrane of wings in apical field with dense but extremely fine and short setæ. Stigma nearly as long as first submarginal cell, moderately narrow and emitting radius slightly beyond the middle. Marginal cell as long as stigma, with the substigmatal and poststigmatal parts about equal and the apical truncation strongly oblique and about two-thirds as long as the metacarpus. Second submarginal cell very broad below, narrowed about two-thirds above, and receiving the recurrent veins a short distance respectively from base and apex, or the first recurrent may be interstitial. Claws tapering from the thickened base, gently curved, simple and very acute at apex.

Frons and vertex strongly tessellate and rather dull, the frons with rather close fine punctures becoming much sparser above, and the vertex behind ocelli with rather numerous fine shallow punctures, which in some aspects appear elongate and sulcate. Cheeks polished, rather closely and very finely punctured, except in a narrow strip along the orbits. Face below antennæ smooth and with sparse, comparatively coarse punctures. Anterior part of mesoscutum finely tessellate and with numerous shallow sulcate punctures. Remainder of mesonotum polished and very sparsely and finely punctured. Thorax otherwise finely tessellate, the mesopleura with rather close fine punctures. Abdomen microscopically lineolato-tessellate and shining. Pubescence short, whitish and mostly erect; moderately dense on cheeks, occiput, punctured part of frons, rather sparser on mesopleura, sparse on face below antennæ and on mesonotum, the disk of latter being nearly bare, but dense and subappressed on mesosternum. Scopa of hind tibiæ sparse and moderately long, the hairs on anterior side of tibiæ somewhat longer and curved.

Head and thorax very dark green, the propodeum bluish, the mesoscutum, except anteriorly, scutellum and metanotum black. Mandibles except reddish piceous tips, most of clypeus, lateral and supraclypeal marks pale yellow. Labrum, anterior margin of clypeus, and two somewhat curved submedian vittæ on disk of clypeus, continuous with dark anterior margin but not quite reaching to dorsal margin, piceous. Lateral face marks large, about as broad as high, strongly rounded toward clypeus and extending along orbits to lower end of frontal foveæ. Supraclypeal mark strongly trans-

verse. Dog-ear plates and prominence between antennæ black. Thorax entirely dark except the pale yellow tubercles. Abdomen piceous, the first tergite with a very slight metallic green luster. Tergites one to five each with a marginal yellow spot on each side, the spots very small on one, two and five, subapical on one, contiguous to posterior end of lateral foveæ on two, and nearly concealed by preceding segment on five, those on three and four much larger but separated by one-half the width of segment and composed of a quadrate portion on the lateral margin at middle of segment and a lobe from inner half of anterior margin of quadrate portion, that projects obliquely forward and mesad to base of segment and is also somewhat curved. Pygidium brownish piceous. Venter entirely dark except the whitish hyaline margins of segments. Legs piceous, a spot at apex of front and middle femora anteriorly, front tibiæ anteriorly, and a streak on anterior side of middle tibiæ yellow, the front tarsi pale brown, and the middle tarsi brownish at apex. Labio-maxillary structure piceous. Antennæ piceous, the apical joint brownish and the flagellum dull brownish yellow beneath. Tegulæ testaceous, subhyaline with a yellow spot at base anteriorly. Wings hyaline, slightly tinted with fuscous, the veins and margins of stigma fuscous, the subcosta piceous, and the stigma otherwise pale.

Length about 5.0 mm.

Type female, No. 2615, Museum California Academy of Sciences.

6. PERDITA ALBIPENNIS Cresson

Three females, collected July 23, 1924, at Mesa, Arizona (E. P. Van Duzee).

A STATE BUTTERFLY

On another page Mr. Gunder tells us of the selection of a state butterfly for California. The motive leading to the selection of a state butterfly was the hope that it may help to arouse a more general interest in the study of entomology and thus to place this branch of zoölogy on a par with certain of the more popular branches such as ornithology and botany. Butterflies are the most beautiful and showy of all insects. They make the strongest appeal to the general public and undoubtedly are most suitable for arousing an interest in, and attracting the attention of the public to the work being done by our entomologists for the public welfare, work that is of the highest importance to the human race but that has only begun to receive the attention it deserves. Any little gesture such as the selection of a state butterfly, insofar as it serves to attract the interest of the public, is well worth while.—E. P. Van Duzee.

MISCELLANEOUS STUDIES IN THE COLEOPTERA,
NUMBER THREE

BY DR. FRANK E. BLAISDELL, SR.

Stanford Medical School, San Francisco, California

Genus NOTOXUS

Several years ago Dr. Edwin C. Van Dyke submitted to the writer a small series of a species of *Notoxus*, collected in Inyo County, California. A casual examination indicated that it was an undescribed species. Having been recently arranging and identifying the species in the collection of the California Academy of Sciences, I take the opportunity to describe this new species and to make comparisons with other well-known species.

Notoxus vandykei Blaisdell, n. sp.

Form slightly robust, about two and a third times longer than wide, moderately shining, prothorax notably so. Color more or less piceous; prothorax rufo-piceous beneath, disk nigro-piceous, paler at base and along median third and crest; horn slightly darker, head piceous; palpi and legs rufo-testaceous, femora more or less suffused with piceous; meso- and metasternal regions and abdomen more or less nigropiceous. Elytra rufo-testaceous with a large subquadrate basal scutellar spot, a transverse fascia at apical third which extends rather widely along the suture nearly to the basal spot, gradually and slightly widening anteriorly, lateral transverse and anteriorly lobed spots at about basal third that may attain the lateral margin and the middle of each elytron, black; the black sutural area may be abbreviated or there may be a coalescence between the lateral, sutural and basal spots.

Pubescence pale and somewhat yellowish, brownish to black on the dark areas; recumbent, abundant and moderately fine; on the elytra intermixed with very sparse and nearly erect pale and longer hairs, most noticeable when viewed from the side; on the prothorax the hairs are softer, more or less recumbent, and with scattered long, erect bristling pale hairs; on the disk the erect setæ are blackish, on lateral thirds short, arcuately curved black setæ are observed; on the head the hairs are longer, notably so on the tempora and above the eyes. On the under surface of body the hairs are moderate in length and finer, recumbent and ashy in color.

Head longer than wide and about four-fifths as wide as the prothorax, truncate at base, tempora as long as the eyes, moderately and arcuately convergent to the distinct and obtuse basal angles; front flat between the eyes, sides finely margined, surface closely but not coarsely punctate, punctures separated by a distance equal to one

or two times their diameter, some coalescence is observed; vertex moderately convex, smooth, punctures slightly larger and more widely separated. Eyes rather large, somewhat coarsely faceted, facets individually convex, short interstitial setæ are present; vertical diameter slightly longer than the longitudinal, posterior margin less arcuate. Antennæ moderately slender, long, attaining about the basal fourth of the elytra, feebly incrassate in distal half, joints 2 and 4 equal in length, 3, 5, 6, 7, 8, 9, and 10 quite equal in length.

Prothorax wider than long not including the horn, quite globular; sides strongly arcuate, widest at middle, noticeably convergent toward base and somewhat broadly and slightly sinuate, there obscured by the well-developed latero-basal fimbriæ; basal bead coarse, giving some prominence to the basal angles; basal impressed area narrow at middle broadening laterally; discal basal lobe quite sharply and arcuately defined by the impression; surface polished between the sparsely placed and small punctures which are separated by a distance equal to two to four times their diameter; pubescence transversely directed from each side, meeting in the median line and there more or less backwardly directed; horn moderate in width, rather coarsely crenate, except at apex, three or four crenures each side, scarcely constricted and parallel at base, surface and side of crest with asperities; crest well defined by a raised dentellate margin, the latter best seen from the side, slightly narrowed at apex, surface with small discrete asperities, about two-thirds as long as the horn; margin of the crest and crenate border of the horn, black, the latter very moderately reflexed. Scutellum small and triangular.

Elytra a little more than twice the total length of the prothorax and distinctly wider at base, not strongly convex on the dorsum, markedly so laterally, slightly impressed within the feebly marked humeral umbones; humeri well exposed and quite broadly rounded; sides nearly parallel, slightly divergent posteriorly and feebly arcuate, gradually and arcuately convergent to apex in apical third, apices truncate, truncature very feebly oblique toward the obtusely rounded sutural angles and limited laterally by a small subdentiform salient; surface moderately finely punctate, punctures rather evenly distributed, smaller apically, separated by a distance equal to three or four times their diameter.

Body finely punctate beneath, quite densely so on the abdomen. Legs moderately long.

Male. Elytral apex truncate; last ventral segment feebly arcuately emarginate at middle of apex, adjacent surface somewhat impressed. Anterior tibiæ mutic. Female unknown.

Measurements (types): Length, 3.8 mm.; width, 1.4 mm.

Holotype, male, No. 2616, and seven paratypes, all males, in the collection of the California Academy of Sciences.

Type locality: **Little Cottonwood Creek, Inyo County,**

California. Collected by Dr. E. C. Van Dyke on July 16, 1908, at an elevation of 8000 feet. I take pleasure in naming the species after the discoverer.

For the present *vandykei* may follow *anchora* Hentz in the list of species. The figures given below are to show five types of modification of the elytral apices of the male and the pattern of maculation in each species. The following remarks apply to the males:

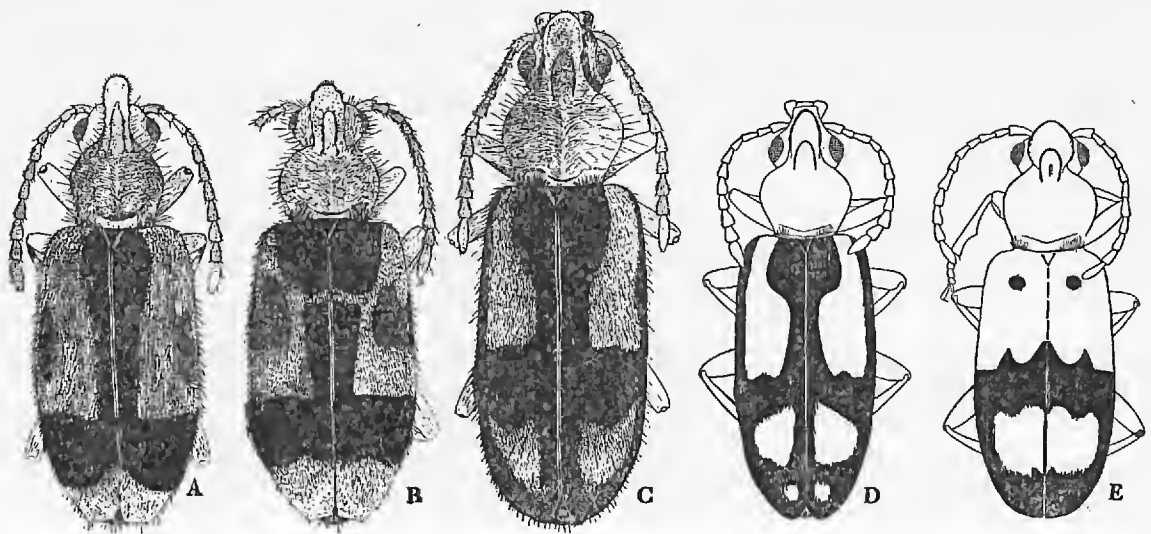
In *vandykei* (fig. B) the elytral apices are truncate and slightly oblique. The pattern of maculation is similar to that of *anchora*; the punctuation is much finer than in that species and sparsely placed erect hairs are distributed over the upper surface. The prothorax is quite globular and its surface is smooth and shining, color more or less piceous.

In *anchora* Hentz (fig. A) the elytral apices are given as being obliquely truncate by Dr. George Horn. The thoracic horn is but slightly wider than the crest, the latter feebly elevated and not very distinctly margined, very poorly defined at apex; the elytral punctuation is moderately coarse and the pronotal surface is rather finely asperate and dull in luster. The recumbent pubescence is intermixed with erect pale hairs, best seen when viewed from the side.

Nuperoides Fall (fig. C) is more elongate and parallel, the elytral pattern of maculation is precisely that of *nuperus* Horn (Fall). The upper surface is sparsely clothed with long, nearly erect, pale hairs and the recumbent pubescence is denser and finer. The head and prothorax are rufo-testaceous. The sutural angles of the elytra are separately rounded and just perceptibly produced, with a feeble external situation.

In *nuperus* Horn (fig. D) the elytral apices are separately rounded at apex, pubescence devoid of erect hairs; the last ventral of the male presents a large deep fovea.

Calcaratius Horn (fig. E) has the anterior tibiae armed with a tooth that is best observed when viewed from the outer side. The prothoracic horn is broad and the margin crenate; the crest has a short median carina. An examination of the figures with a hand lens will prove helpful in recognizing the characters in part mentioned above.



Detailed camera lucida drawings of: (A), *Notoxus anchora* Hentz; (B), *Notoxus vandykei*, n. sp.; (C), *Notoxus nuperoides* Fall; (D), *Notoxus nuperus* Horn; (E), *Notoxus calcaratus* Horn. The head of each species is shown in the position it happened to be in at the time of making the drawings. Figures D and E are camera lucida outline drawings.

Genus DIAPERIS

From other genera of the Tenebrionid Tribe Diaperini the genus *Diaperis* is characterized by the broadly oval and strongly convex form of body, covered pygidium, emarginate eyes, with the first joint of the metatarsi not longer than the second. Elytra orange-red and maculate.

Diaperis californica Blaisdell, n. sp.

Form narrower, less robust with sides less arcuate, besides being noticeably more parallel than in *maculata* Oliv., maculation similar except that the posthumeral elongate black spot is absent or occasionally represented by an obsolescent dark cloud.

In the male the form is more parallel, the antennæ less robust, dilated joints slightly shorter; the pronotal apical margin is arcuate at middle and not modified, the epistoma is more convex, somewhat concentrically punctured and coarsely punctate at center, but not bituberculate at middle; the front, between the eyes, is broadly and more deeply impressed and rather more strongly punctate on the vertex than in the opposite sex.

The form in the female is slightly more robust and a little more arcuate at the sides; the dilated antennal joints somewhat longer and appear stouter; the eyes are larger and the front is less deeply impressed. Pronotal apical margin arcuate and simple as usual.

Measurements (types): 5-5.8 mm.; width, 3-3.2 mm.

Holotype, male, No. 2617, and allotype, female, No. 2618, and six paratypes in the collection of the California Academy of Sciences, one in the collection of H. C. Fall, Tyngsboro,

Massachusetts. The species should follow *floridana* Blatch. in our lists.

Type locality: **Davis Meadow, near Railroad Flat, Calaveras County, California.** Collected on July 8 at an elevation of 2800 feet, taken from a large fungus on a dead white oak. Nine specimens studied.

Distribution. Besides the type locality, specimens have been taken at Chiquito Creek, Madera County, California, by Henry Dietrich of Lucedale, Mississippi; Placer County California, by E. C. Van Dyke. All collected in California.

The following synoptic statement may be given at the present time:

- Mesepimera very sparsely punctate; elytra bifasciate; prothoracic apical margin arcuate and entire at middle, adjacent discal surface feebly and rather broadly impressed in median line; second antennal joint distinctly constricted in basal half, apical portion slightly swollen; prosternal process subhorizontal and submucronate at apex. Europe.....*boleti* Linn.
- Mesepimera densely punctate 1
1. Prothoracic apical margin emarginate at middle and impressed on the discal surface at that point in the male..... 2
- Prothoracic apical margin entire and arcuate at middle in both sexes; prosternal process arcuate..... 3
2. Elytra maculate, an elongate black spot behind the humeri, large macule at apical third not uniting with sutural black stripe; epistoma feebly bituberculate at middle in the male. Eastern United States and Mexico. (Syn. *hydractina* Fab., *suturalis* Chev. and *hydni* Fab.).....*maculata* Oliv.
- Elytra fasciate across apical third, posthumeral elongate black spot absent. Florida*floridana* Blatch.
3. Elytra bifasciate; strial punctures of elytra coarse and strong; second antennal joint feebly constricted in basal half, slightly swollen apically; pronotal disk at apex behind margin very feebly and broadly impressed on median line in the male. Lower California, Southeastern California, Arizona.....*rufipes* Horn.
- Elytra maculate as in *maculata*, posthumeral elongate black spot absent or obsolescent; form less robust and more parallel; second antennal joint almost evenly obconical; pronotal disk not visibly impressed on the median line in the male. Central California.....*californica* n. sp.

The degree of rufous coloration of the head and appendages is very variable and often there is a reddish tinge to the pronotal disk. The European species *boleti* Linn. has been intro-

duced for comparison and contrast, as specimens at hand have the genital organs protruded which serve as a criterion for the comparative determination of the secondary characters that are not well marked in the American species, least in *californica*.

NOTE ON GENUS CLASTOPTERA

Volume XVIII, Number 1, of the University of Kansas Science Bulletin contains a monographic paper on the Homopterous genus Clastoptera by Miss K. C. Doering. In this paper she recognizes thirty distinct species and five varieties. I have not yet had an opportunity to make any adequate test of this work, but my first impression is that she has made too many species, as some of her new forms are certainly very close to others. She has recognized no subspecies and undoubtedly further studies will show that many of her so-called new species are really subspecies of others. On the other hand, some of her recognized varieties seem to be true subspecies or geographic races. A subspecies occupies either a distinct geographical or a distinct ecological area and never exists independently in company with the parent species. A variety is merely a color phase or a mendelian unit that may develop within any brood of the parent species. Where a "variety" persists independently in company with the parent species but does not mix, it undoubtedly should be placed as a distinct species.

I cannot subscribe to the custom, now quite prevalent in this country, of placing a species as a "variety" of itself, as we see in this paper by Miss Doering. "*Clastoptera obtusa* var. *obtusa*" and "*Clastoptera proteus* var. *proteus*" are examples. The forms so placed are not varieties at all but they are the type species. A variety is a variation from the normal of the species and the type form cannot be a variation of itself. The case is decidedly different when we divide a species up into subspecies the typical form of which must bear the name of the species. In this case we use trinomials, repeating the name of the species for the typical form. It is a disputed question whether we should give names to mendelian or color forms that may crop out in any brood. Seasonal races seem to stand with geographical races, and for those a trinomial is convenient.—
E. P. Van Duzee.

THE "COFFEE-POT" COCOON AND THE INSECT
THAT MAKES IT

BY A. L. PICKENS

Because of the neatly hinged lid and the spout-like protuberance in front, the cocoon of *Megalopyge crispata*, or *Lagao crispata* as it is sometimes called, has won, among inhabitants of the Carolina foothills, the name of "Coffee-pot." These are found chiefly on, or in close proximity to, oak trees, especially on the twigs of the narrow-leaved water oak, which on account of rapid growth is much used for shades on lawns and streets in the southern hill towns. Popular knowledge of the species and its allies, however, extends no further than a bare acquaintance with the cocoons.

Investigations extending over a period of years, chiefly in the upper and middle regions of the Savannah River Valley, brought to me opportunity to observe eggs, larvæ, and adults of the "Coffee-pot" maker.

The caterpillar is very woolly, with the hairs on the sides of the body a dull gray, while a scalloped crest along the mid-dorsal line is of a rich brown shade. Just below the middle of the crest, on each side of the caterpillar's body, is a series of three white tufts of hair contrasting with the surrounding gray, while the rear of the body terminates in a tassel-like tail of brown hair. If the hair of the body be parted, a surprisingly smooth and light-colored skin is visible.

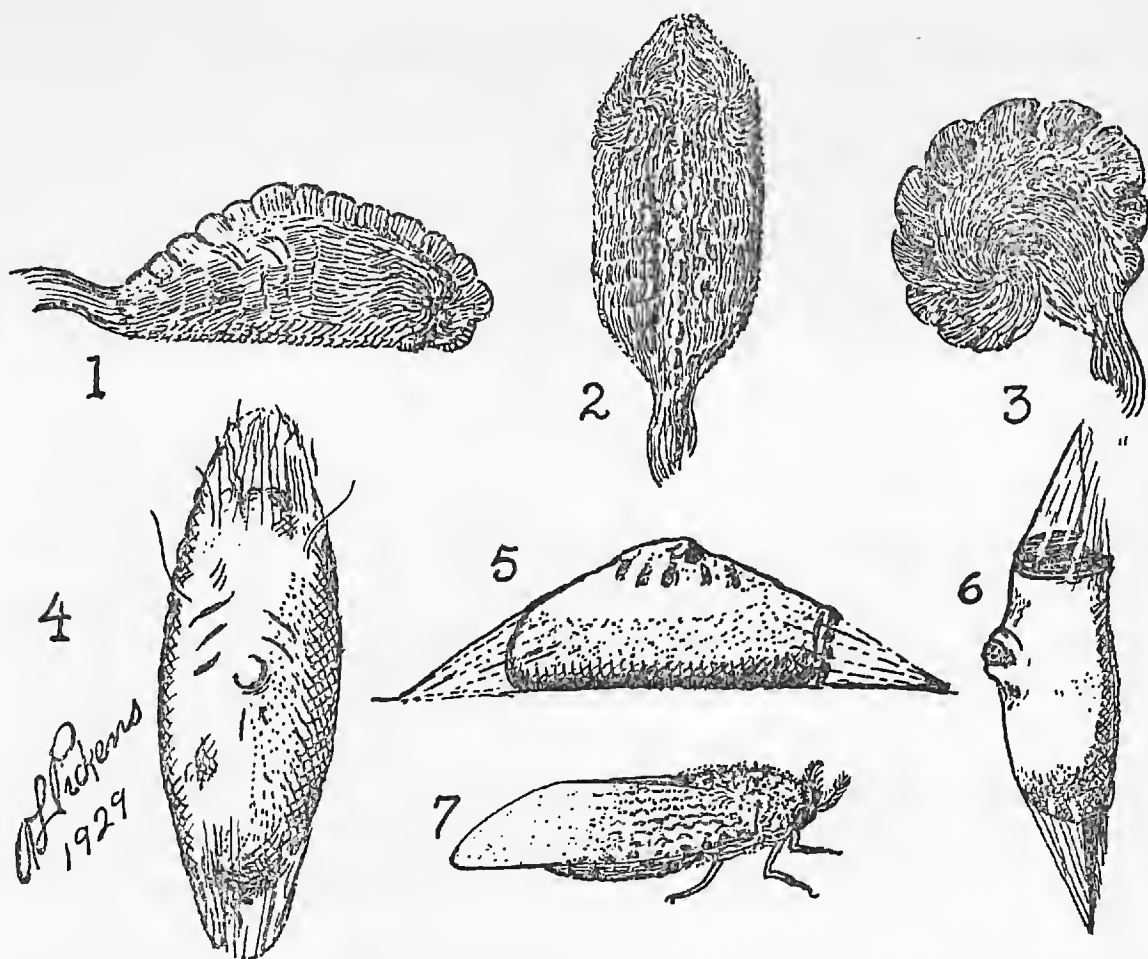
When the larva is irritated it draws up into a knot, somewhat like a hedgehog, tucking the head back under the ventral regions, and sticking the tail out in a very conspicuous manner, as shown in the sketch at No. 3. In addition to this protective action it resorts to the offensive by emitting a very strong and unpleasant odor, resembling that of the shucks of Indian corn that have been piled on damp earth until decay has set in. They are apparently very well formed for concealment, and are much harder to find than are the cocoons which contain them later. These cocoons are found sometimes on planks, beams or other timbers on the outside of buildings, again on the trunks of broad-leaved oaks, or even blackberry vines but, as previously indicated, are most successfully sought on the twigs of the

water oak. Different individuals build the pupating chamber in different positions. Some are placed vertically with the lid at the top; some are fastened against a wall horizontally with the spout and lid in horizontal relations; others, placed on the lower side of twigs, swing down at an angle, the lid nearer the ground below the levels of the spout and the base.

The cocoon is constructed in the autumn, at the time when many other larvæ of moths are preparing for the winter pupation period. First, without shedding the thick growth of hair, the insect covers its whole body with a spindle-shaped cocoon of silk so thin that the body within is plainly visible, with the skin revealed through the tightly compressed bunches of hair, for so close-fitting is this covering that one wonders how the insect manages to shape the remarkable parts of its habitation. For several days the work goes on, the covering still soft and yielding to the touch, and when disturbed the insect within still emits the offensive sour shuck-like odor. Gradually the walls become thicker, and the restricted space within is still further limited by the larva cutting off each end of the silken spindle. A sagittal section of the cocoon at this period would resemble an elongated capital D cut off at the top by a straight line, and at the bottom by a thin half-crescent. Gradually a peculiar wrinkle begins to show at the middle of the cocoon. As the work goes on we catch sight of part of the hair from the body of the larva sticking up here, and at last the wrinkle becomes so elevated and elaborated that we have a reasonable imitation of a bud, evidently developed for deceiving such birds as penetrate into smooth and conspicuous cocoons for the sake of the pupating insects inside. It is probable that the scalloped crest of the larva is of value in pressing and moulding this part of the pupal chamber into form, and a part of the woolly coat is evidently crammed into it from within. The walls have now grown so thick that the inmate can no longer be seen; but inside, judging from cocoons that have been opened, most of the hair has been discarded, though now and then an individual may cling for some time to its woolly covering, probably to tuck it and the cast skin, later, into the bottom of the cocoon on assuming the pupal form. About two weeks' time is required to complete the habitation. The door at the upper

part of the cocoon is the most remarkable part of the whole structure. It is a partial disk, made up apparently of several layers of silk with the curved edge as smoothly cut as if done with a cobbler's knife, the whole so hinged at the back that it can be opened and closed repeatedly without coming off, although the inmate makes use of the hinge but once in its life! What is more, this structure, so distinctly apart from the rest of the cocoon, is made along with the cocoon and sealed to it all about the edges until the time, perhaps as late as the following June, comes for the moth to emerge. Then the glue-like seal is loosened about the curved edge of the lid, the insect inside pushes against the door which swings outward. Another push, and the head of the moth, still covered with the pupal skin, is partially out. The struggle continues until the pupal covering is quite outside, whereupon the adult wriggles out of the dried skin, the rear part of which is caught by the door that, with a great deal of springiness, attempts to snap back into position once the pressure from the inside is withdrawn. Thus the lid, in addition to being a door-shutter is also something of an automatic undresser, and helps strip off the pupal covering, so permitting the moth to go on its way unimpeded. If not already blown away by the wind the loose silk at each end is eventually so disposed of, leaving the cocoons as usually found.

The adult is not an attractive moth; there is little of the beautiful, and less of the conspicuous in its make-up. It is dark-tinged, with brown and heavily shaded cream blending modestly in its markings, and near the fore part of the wings the long furry scales are crinkled and waved into a graceful series of convolutions that drop off all too easily, leaving the insect ragged and drabbed in appearance. It possesses, let it be remarked in passing, what has been designated in Kellog's "American Insects" as true hair, that is, scales so elongated and fine as to have passed from the scale stage into that of hair. This may account for the gracefully waved covering of the fore part of the wings. Whether or not it is an instinctive plan of the insect to warm and protect its eggs, I cannot say, but in my experiments I have found the eggs deposited in a mass, with the hair-like scales placed carefully about them as



if to form a rude nest. It is possible that these, carefully placed as a first impression might make them seem, were not the result of an unusually gentle maternal instinct, but of accidental pulling off during the process of attaching the eggs with the gluey secretion that held them in place. Unfortunately, however, I have not seen this, an important stage in the life cycle of the insect, except after actual deposit by the mother, and cannot speak with sufficient authority as to the care bestowed on the eggs.

A CORRECTION

In THE PAN PACIFIC ENTOMOLOGIST of July, 1929, p. 22, I gave the type locality of *Blapstinus falli* as Naples, Santa Barbara County, California. I have been informed by Prof. H. C. Fall and Mr. J. O. Martin that it should have been Naples, Los Angeles County, California. This latter locality is near and south of Long Beach. Regarding the former, Naples, Santa Barbara County, is the second railroad station north of Santa Barbara. The duplication of names is the cause of the error, as the county was not given on the locality label.—Frank E. Blaisdell, Sr.

NEW TERMITE RECORDS FOR LOWER CALIFORNIA

BY S. F. LIGHT

Banks and Snyder, in their "Revision of Nearctic Termites" (1920), mention but two termites from Lower California, *Kaloterme hubbardi* Banks (Cape San Lucas) and *Kaloterme occidentis* Walker (Angel de la Guardia Island and Cape San Lucas).

Through the kindness of Professor J. Grinnell, director of the Museum of Vertebrate Zoölogy of the University of California, and Mr. Chester C. Lamb, collector of the Museum, I have received for study three lots of termites collected by Mr. Lamb during the years 1926-1928.

These collections, small as they are, have added very materially to our knowledge of termite distribution, extending the known southern range of several species by many hundreds of miles, and serve to give some earnest of the interesting finds awaiting the termite collector in this region. I give below a list of the six species contained in these collections with localities, dates of collection and location of colonies, and, following the list, a discussion of the known range of each species.

1. *Termopsis nevadensis* Hagen. June 19, 1926, Vallecitos, San Pedro Martir Mountains (about 150 miles south of the border), 7500 feet, in rotten stump of Jeffrey Pine, all castes.
2. *Kaloterme occidentis* Walker. June 1, 1927, Santo Domingo Landing (on west coast about 400 miles south of the border), in Yucca, nymphs only; December 1928, La Paz (on east coast about 150 miles from tip of peninsula), from a Palo Verde stump, soldiers and nymphs.
3. *Kaloterme minor* Hagen. May 26, 1926, El Cajon Canyon, east base of San Pedro Martir Mountains (about 150 miles south of border), 3200 feet, "in partially dead willow stump," all castes; same locality and date, "in limb of willow," soldiers and nymphs.
4. *Kaloterme hubbardi* Banks. October 16, 1928, Todos

Santos (on west coast about 60 miles from tip of peninsula), two dealates, "crawling on work table at night."

5. *Neotermes simplicicornis* Banks, April 5, 1926, San Felipe Bay (130 miles south of Mexicali), "in dead mesquite stump," soldiers and nymphs.
6. *Reticulitermes tibialis* Banks. December 6, 1928, El Sauce, Victoria Mountains (at tip of peninsula), 4000 feet, in fallen oak limb, soldiers and workers.

It will be noted that we have here, as representatives of the termite fauna of Lower California, six species all of which occur in the nearctic region, several of which range into northern California, one as far north as Vancouver Island and another into Montana, and that no tropical species have been collected so far.

TERMOPSIS NEVADENSIS Hagen

The two coast species of *Termopsis*, *T. angusticollis* Hagen and *T. nevadensis* Hagen, have been distinguished (Banks and Snyder, 1920) on the basis of size and color difference between the alates. Color differences fail in incompletely pigmented individuals from nest series. Size differences, therefore, have been largely depended upon for diagnosing the two species. Study of large series shows that the size range for *T. angusticollis* must be revised downward and that for *T. nevadensis* upward, and hence many earlier determinations are in doubt. The alates collected by Mr. Lamb have been somewhat of a puzzle, lacking the dark pigmentation characteristic of *T. nevadensis* and ranging in size as they do into the lower limits for *T. angusticollis*. Unpublished studies by Mr. G. B. Castle and Miss Ethel Craig seem to present satisfactory criteria for differentiating the soldiers and the nymphs of these two species. On the basis, therefore, of head shape and other characters of the alates and of the characters of the single soldier included in the collection and the characters of the nymphs, I feel justified in diagnosing this collection as *T. nevadensis*.

Previous to this report, Los Angeles stood as the southernmost reported locality for *T. angusticollis* and Monterey for *T. nevadensis*. Recent collections made by Mr. G. Edward

Chase of San Diego have shown *T. angusticollis* to occur near sea level at San Diego, and collections by the Termite Investigations Committee show it to occur in the southern mountain ranges. With its northernmost limits in British Columbia, and its present known southern limit in San Diego, this species has a known north and south range of at least 1150 miles. Monterey was the southernmost collection point for *T. nevadensis* until this collection of Mr. Lamb's pushed its range limits 400 miles to the south, giving it a north and south range of about 1250 miles from Vancouver Island in the north to the San Pedro Martir Mountains of Lower California in the south.

KALOTERMES OCCIDENTIS Walker

*Kaloterme*s *occidentis* Walker is a remarkable species, much larger than any other species of the genus *Kaloterme*s, to which it has been reassigned by Banks (1920). The soldiers all have remarkably well-developed wing pads, and on this basis Holmgren (1911) placed it in a new genus *Pteroterme*s. The nymphs also differ in the possession of small but pigmented compound eyes from an early stage. Furthermore, unpublished studies by Mr. W. W. Lewis, made possible by material collected by Mr. Lamb, show that one of the Protozoa of its intestinal fauna belongs to a genus which has not yet been found in a species of *Kaloterme*s s. st., but is found in the species of the genus *Cryptoterme*s. For these reasons it seems possible that a careful study of its morphology may show it not to belong to *Kaloterme*s s. st.

This very interesting species was reported by Banks and Snyder (1920) from Sabino Canyon, the Coyote Mountains and the Baboquivari Mountains in Arizona, from Angel de la Guardia Island in the Gulf of California and from Cape San Lucas at the tip of Lower California. The records from Coyote Mountain and Baboquivari Mountains are not definite, however, since they are based on winged adults which from their size Banks believed to belong to this species, but which were taken flying and hence cannot be allocated to this species with certainty. Material collected from near Douglas, Arizona, by Professors A. A. Nichols and C. T. Vorhies of the University of Arizona, gives another locality for that state. Mr.

Lamb's two collections widen the known range in Lower California.

KALOTERMES MINOR Hagen

Kaloterme minor Hagen was reported by Banks and Snyder (1920) from Niles in Alameda County, from San José and from Monterey County, from Los Angeles and from Palm Springs, Riverside County, in California, and from southeastern Arizona (Pima County). Collections made by me in May 1925 and reported by Snyder (1926) add Copper Butte Canyon near Ray, Arizona, and Prescott, Arizona, as localities for this species, and more recent collections show it to be present in Ash Fork. The collections of the Termite Investigations Committee have shown this species to be common along the Pacific Coast as far north as Westport in Mendocino County. The northernmost known extension of its range is marked by a single collection (Harvey) from Redding, in Shasta County. It is not known to occur in the central San Joaquin Valley, but reappears again around Bakersfield and in the Tehachapi, the San Bernardino Mountains, and other southern mountains. In the Mohave Desert Barstow marks the eastern limit of its range, and in the Colorado Desert Garnet and Palm Springs. Its range is evidently continuous into Arizona, either south through Mexico or north through Nevada. The present collection extends the recorded range of this important economic species about 150 miles to the south, giving it a known north to south range of about 750 miles.

KALOTERMES HUBBARDI Banks

Kaloterme hubbardi was previously reported by Banks and Snyder (1920) from Cape San Lucas. A dealate pair of this species was taken by Mr. Lamb, crawling on his work desk at Todos Santos, on the west coast of Lower California. It has been reported in California (Banks and Snyder, 1920) from San Diego and as far north as San José. Careful search on the part of the Termite Investigations Committee has failed to show its presence in the state save at Blythe on the Colorado River. It is widespread throughout southern and central Arizona and presumably through much of Lower California and the western portion of Mexico proper.

NEOTERMES SIMPLICICORNIS Banks

Neotermes simplicicornis Banks (1920) was known from a single collection by Snyder made in southeastern Texas. No winged forms were taken and Banks placed the species in the genus *Kaloterмес*. This species was taken later in Sabino Canyon in southeastern Arizona, and in 1925 I took it at Ray, in Central Arizona (Snyder, 1926; Light, 1926, 1927). In 1927 the species was collected by the Southern Pacific Railway Company near Indio, Riverside County, California, and again in 1928, at the request of the Termite Investigations Committee, a considerable collection was brought in by Mr. R. M. Alpen from the same locality which contained two alates, not previously known. These showed it to belong to the genus *Neotermes*. Since that time it has been taken in connection with the field investigations of the Termite Investigations Committee (Light, Pickens, Harvey) from the Colorado and Mohave deserts and western Arizona. Its western limits in the deserts have been located at Barstow in the Mohave and Garnet and Palm Springs in the Colorado. In Arizona its known distribution is widened by my collections at Topac and Yucca and near Roosevelt Dam. Mr. Lamb's collection locates it on the western shore of Lower California, about 130 miles south of Mexicali, thus considerably extending the known southern limits of the range of this interesting and economically important species.

RETICULITERMES TIBIALIS

Reticulitermes tibialis was already known to range from Iowa to the Pacific Coast and from western Montana to central Riverside County in California. Its collection by Mr. Lamb at the tip of Lower California adds about 750 miles to its north-south range, bringing it to the amazing total of about 1650 miles. This would seem also to represent the most southerly record for the genus *Reticulitermes*, which is typically holarctic.

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A NEW OLIARUS

BY E. P. VAN DUZEE

Oliarus truncatus Van Duzee, n. sp.

Closely allied to *aridus* and *californicus* but with broader costal areole, the narrow vertex of *californicus* and different male genitalia. Length, 6-6.5 mm.

Male. Vertex slightly narrower and more parallel-sided than in *californicus*; costal areole one-half wider than the adjoining areole, in the allied species these areoles are subequal in width; stigma as in *aridus*, larger and darker than in *californicus*; elytral veins feebly punctate; front as in *aridus*, the pale lateral spots smaller; rostrum exceeding hind coxæ by two-thirds the length of its last segment. Male pygofers shaped as in *californicus* but shorter with the apical margins of the sides truncate, the median notch broad and shallow; plates exceeding the pygofers by half their length, their apical margin truncately rounded, their inner angle subacute; their apical member shaped much as in *aridus* but shorter and transverse, not as produced medially.

Described from the type and six male paratypes, three taken by the writer at La Jolla, California, January 27, 1913, and three taken by Mr. W. S. Wright at San Diego, California, August 21, 1913.

Holotype, male, No. 2622, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, July 4, 1913, at **Alpine, San Diego County, California.**

CONCERNING TWO OF GUÉRIN-MENEVILLE'S
TYPES IN THE NATIONAL MUSEUM OF
PARIS (HEMIPTERA: NOTONECTIDÆ
AND CORIXIDÆ)

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Dr. G. W. Kirkaldy and J. R. de la Torre-Bueno, in their "Catalogue of American Aquatic and Semi-aquatic Hemiptera," 1909, gave the following insufficient reference: "*Notonecta unifasciata* Guérin 1857, le Moniteur, p. (?)," and placed the species as a synonym of *Notonecta indica* L. They omitted *Corixa femorata* Guérin, which was described in the same paper with *Notonecta unifasciata* Guérin.

Champion placed *Corixa femorata* Guérin as a synonym of *Corixa abdominalis* Say, which is an entirely different species. Nevertheless it remained thus submerged until I chanced to find some specimens from Mexico which I thought must be Guérin-Meneville's unknown species and so described and figured them ("Bulletin of the Brooklyn Entomological Society," Vol. 20, No. 1, plate 1, February 1925).

The *Notonecta unifasciata* Guérin reference, as given in the catalogue, I was unable to complete until I found it in Paris upon my first visit to the entomological collections in the National Museum. I came across a box bearing the obscure label "Hautlé." In it was the display prepared by Guérin-Meneville dealing with the use of water bugs as food in Mexico and doubtless used by him in his report before the Academy of Sciences. The box contains the following:

1. Six pieces of reed covered with eggs, two of the pieces a foot or more in length.
2. A spoonful of eggs in a container devised by sealing together with red wax two watch glasses.
3. Two examples of "Calcaires oolithiques"—one from Mexico (gray in color) and one from France (chalk white).
4. Six pinned specimens of *Corixa femorata* Guér. (four males and two females) (two labeled types) and four or five more in glass vial.

5. Ten pinned specimens of *Corixa mercenaria* Say and a vial full besides.

6. Eight pinned *Notonecta unifasciata* Guér. (two marked "type") and a vial containing nineteen specimens (10 ♂ ♂, 6 ♀ ♀, 3 nymphs). The written labels pinned in the box are as follows:

1. "Mémoire sur trois espèces d'insectes hémiptères du groupe des punaises aquatiques, dont les Oeufs servant à faire une Sorte de Pain nommé Hautlé au Mexique. Par M. F. E. Guérin-Meneville."

2. "*Corixa femorata* Guér. *Corixa mercenaria* Say, dont les oeufs constituent une sorte de farine au Mexique."

3. "Ahautlé *Corixa femorata* Guérin-Meneville. Acad. du Sciences. Séance du 23 Nov.¹ 1857. Rev. et Mag. de Zool., 1857, p. 523. L'Illustration, 17 Juillet 1858, p. 47, avec figures dans le texte."

4. "Fragments de Jonce couverts du Oeufs des deux espèces de *Corixa* et de la *Notonecta*."

5. "Farine du Mexique—Oeufs de *Corixa*." (In the watch glass case.)

6. "Calcaires oolithiques. Le gris du Mexique. Le blanc de France."

Thus with the complete references mentioned I was able to examine the articles in the National Library at Paris. Since the publications are not accessible to most of us I am submitting some notes that give information concerning the insects and enable us to complete our bibliographical references.

This report concerning the use of the water bugs as food by the Mexicans must have been deemed a very important one, for it was published almost word for word in several periodicals.

I. "Le Moniteur Universel"—Journal officiel de l'Empire Français, Numéro 330, p. 1298, 26 Novembre 1857. This is the completed reference for the partial one given in Kirkaldy and Bueno's Catalogue relating to *Notonecta unifasciata* Guérin. "Le Moniteur Universel . . ." is a four-page news sheet about sixteen and one-half inches wide and twenty-five inches long, and set up in five rather large columns. The title of the paper in which we are interested is given "Entomologie appliquée Hautlé-Pain D'Insectes."

"Extrait d'un mémoire de M. Guérin-Meneville sur trois espèces d'insectes dont les oeufs servant à faire une sorte de pain nommé Hautlé au Mexique."

¹ Nov. (?) The writing of this abbreviation is difficult to decipher.

Then follows the article which is identical with that appearing in "Revue et Magasin de Zoologie," Tome IX, 1857.

II. "Revue et Magasin de Zoologie," 2nd ser., Tome IX, pp. 522-527, 1857, Paris.

"Séance de 23 Novembre 1847—M. Virlet d'Aoust lit une Note sur des oeufs d'Insectes servant à l'alimentation de l'homme et donnant lieu à la formation d'oolithes dans des calcaires lacustres du Mexique."

In this article is given a review of past literature, the story of the use of the insects and their eggs as food in Mexico, description of the eggs and of *Corixa femorata* and of *Notonecta unifasciata*. Concerning the eggs of the two Corixids, *C. femorata* and *C. mercenaria* Say, he says, "Ils sont de forme ovale, avec un petit bouton au bout et un pédicule à l'autre extrémité, au moyen duquel ils sont fixés sur un petit disque arrondi que la mère colle à la feuille. Parmi ces oeufs, qui sont très rapprochés et quelque-fois fixés l'un sur l'autre, comme on le voit dans une des figures de mes dessins, on en observe d'autres considérablement plus grands, allongés et de forme cylindrique, collés sur le flanc contre ces mêmes feuilles de joncs, et qu'appartiennent à un autre Insecte plus grand, à une véritable Notonecte très voisine des *Notonecta americana* et *variabilis* des auteurs." Then follows what we must accept as his description of *Notonecta unifasciata*: "Cependant, comme elle offre des caractères qui la distinguent de ces espèces, Je la décris et représente comme une espèce nouvelle que j'appellerai *Notonecta unifasciata*, à cause de la large bande transversale blanche du milieu de son corps en dessus."

It is fortunate that the types are preserved. His new *Corixa femorata* receives the following attention. I have not found a fuller description, but illustrations that are unmistakable appear elsewhere. "Les principaux fabricants de cette farine animale du Mexique sont deux espèces du genre *Corise* de Geoffroy, hemiptères de la tribu des Notonectides, dans la famille des Hydrocorises, ou Punaises d'eau, genre qui compte plus de soixante-dix espèces très difficiles à distinguer entre elles par des caractères extérieurs. La première forme une espèce nouvelle, bien distincte par les cuisses antérieures des males qui sont très épaisses, ainsi que par d'autres caractères mentionnés

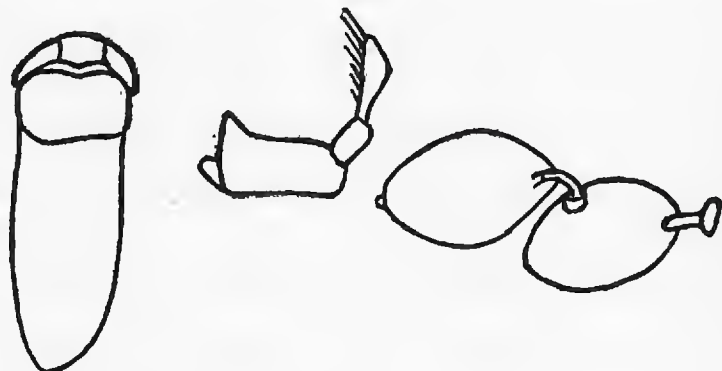
dans le description détaillée que j'en donne et dans les figures qui accompagnent mon Mémoire. Je lui ai donné le nom de *Corixa femorata*. La Seconde a été décrite d'après des individus achetés au marché de Mexico et publiée en 1831 par Thomas Say, entomologiste américain, sous le nom de *Corixa mercenaria*."

Even without the types the drawings given in the article below would suffice.

III. "L'Illustration," Tome XXXII, Juillet 17, 1858. In this illustrated magazine, on page 47 of the above number, is a small woodcut block of drawings illustrating a dorsal view of a male, front leg of the male, two eggs, one attached to the other, and a piece of *Juncus* with three *Notonecta* eggs and forty-eight *Corixid* eggs, the latter on stalks. These stalked eggs are interesting and correctly drawn, for I compared the drawings with the original material. The stalked eggs remind one of the eggs of *Cymatia*. (See "Bulletin Brooklyn Entomological Society," Vol. 18, No. 1, page 13, 1923.)

The drawings given here are tracings from those published in the above magazine. The article is almost word for word the same as appeared in the "Revue et Magasin de Zoologie."

The title under which the paper appears is "Pain d'Insectes, Nommé Ahautlé au Mexique." Fait avec une farine composé d'oeufs de punaises aquatiques. The



article is signed Guerin-Meneville at the end.

IV. "Annals and Magazine of Natural History," Ser. 3, Vol. 1, pp. 79-80, 1858. This is an English review that mentions the oölites in Mexico and the gathering of Hautlé by the Mexican Indians and is credited to Comptes Rendus, November 23, 1857, p. 865.

V. "Bulletin Soc. Zool. Acclim.," Vol. IV, p. 581, 1857. This is the reference given by Champion in his reference to *C. femorata* Guér., which he made a synonym of *C. abdominalis*

Say. The account is almost identical with the one in the "Revue et Magasin de Zoologie." It lacks, however, the first paragraph and adds two short ones at the end. In one of Doctor Kirkaldy's unpublished notes, which is bound in R 2 of his set of separates which we purchased some years ago, I find his notation: "The November number of the Rev. et Mag. did not appear before Dec. 6th (v. p. 529)." It was Doctor Kirkaldy's opinion that the "Moniteur," November 25, 1857, was the first one to appear.

VI. "Bulletin Soc. Ent. Fr." (3) V. p. CXLVIII-CLI. Here also is a repetition of the story that was certainly preceded by the "Moniteur."

A CATALOGUE OF THE MESOVELIIDÆ

Fascicle II of the General Catalogue of the Hemiptera, which has just come to hand, records the small family Mesoveliidæ. It has been prepared by our old friend Dr. Geza Horvath, who, since the death of Dr. Reuter, has been easily the leading hemipterist of the world. In this catalogue Dr. Horvath enumerates two genera and fourteen species now described. Three of these are Palæarctic, five Indo-Australian, and six American. Of the latter, three have been recorded from north of Mexico. It may be noted that *Mesovelia bisignata* Uhler has come back, and is now considered as distinct from *mulsanti* White.

In the preparation of my catalogue of the Hemiptera of America North of Mexico, I followed Dr. Reuter's classification of 1912 and placed this family just before the Nabidæ, but through the kindness of Dr. Bergroth was able, in a footnote, to indicate its true position in the superfamily Gerroidea, where Dr. Horvath had placed it *in lit.* In his present catalogue he gives it the same position.

Fascicle I of this great catalogue, the Membracidæ by Prof. Funkhauser, was noticed in THE PAN-PACIFIC ENTOMOLOGIST, Vol. IV, page 40, 1927. We understand the preparation of certain other families is well under way. They will be most welcome when they do appear.—E. P. Van Duzee.

THE COLEOPTERA OF UTAH—CICINDELIDÆ¹

BY VASCO M. TANNER

This paper is the first of a series in which the writer proposes to deal with the Coleoptera fauna of Utah and portions of the Great Basin. Many of our noted coleopterists have collected in various parts of this region, but very little has been published on their findings. It is the purpose of these papers to bring together what is known and make additions from my collection which has been obtained from all parts of the state.

I wish to thank Dr. Frank E. Blaisdell, Sr.; Mr. L. L. Buchanan, Mr. Warren Knaus, Dr. Walther Horn, and Professor H. E. Wickham for notes on Utah collections and expressions of opinion concerning certain species.

CICINDELIDÆ

1. *AMBLYCHEILA SCHWARZI* W. H.

Bellevue, Washington County, 1917 (Engelhardt and Doll).

In my correspondence with Mr. Warren Knaus he informs me that two specimens of this species were found dead in a pool in Ash Creek near Bellevue, Utah, by Mr. George P. Engelhardt and Mr. Jacob Doll in 1917. I have collected at various seasons of the year for several years in this region, but have not found this species. It seems to be very rare.

2. *CICINDELA PURPUREA* var. *AUDUBONI* Lec.

Great Salt Lake Valley, 1850 (Captain Howard Stansbury); City Creek Canyon near Salt Lake City, March and June (John Sugden and G. W. Browning).

The first insects taken in Utah for scientific purposes were collected by Captain Stansbury and his party during the years 1849-50. The poor means of caring for and transporting collections made it almost impossible to get large collections back to the eastern centers of study. Professor S. S. Haldeman, who studied the Stansbury collection, reported eleven species of insects from Utah, six of which were Coleoptera.

3. *CICINDELA PURPUREA* var. *GRAMINEA* Schp.

Provo, April, 1915, 1928, 1929; Indianola, May, 1927 (Vasco M. Tanner); Salt Lake City, June, 1915 (John Sugden); Lava Hot Springs, Idaho, May, 1928 (D. E. Beck).

¹ Contribution No. 19 from the Department of Zoölogy and Entomology, Brigham Young University, Provo, Utah.

4. *CICINDELA PURPUREA* var. *NIGERRIMA* Leng

City Creek Canyon, Salt Lake City, April and August (Browning and Sugden).

Professor H. E. Wickham informs me that he has specimens of this species which were taken by Mr. Browning in April.

5. *CICINDELA CIMARRONA* Lec.

Logan, April, 1915 (Harold Hagen and Herbert Pack); Wellsville, June, 1926 (Tanner).

6. *CICINDELA REPANDA* Dej.

Great Salt Lake Basin, 1871 (Hayden Survey); Douglass, Dinosaur Quarry, July, 1926 (Tanner); Duchesne, July, 1926 (Tanner and C. J. D. Brown); Green River, June, 1927 (Tanner and J. Kartchner); Moab, June, 1927 (Tanner and Anson Call, Jr.).

This species was reported from the Great Salt Lake Basin by Dr. George H. Horn in the United States Geological Survey of Montana and Adjacent Territory, 1871 (1872), pp. 382-392. Mr. Cyrus Thomas and other members of the Hayden party collected the beetles of this report between June 1 and July 6, 1891: "Starting from Ogden, Utah, through the Salt Lake Basin, by way of Brigham City, Boxelder Creek, Copenhagen, and Cache Valley; thence out of the Salt Lake Basin to Port Neuf River and Port Hall." Mr. E. T. Cresson, Jr., of the Academy of Natural Sciences of Philadelphia informs me that there is one specimen of *repanda* from Utah in the Horn collection.

Dr. Horn reports the following species as being widely distributed over the territory studied: *C. 12-guttata* Dej., *C. purpurea* Oliv., *C. punctulata* Fab. and *C. tranquebarica* Hbst. (*vulgaris* Say). There must be some mistake about *C. 12-guttata* Dej., as it was no doubt taken in the eastern part of the territory, probably Kansas.

Mr. J. D. Putnam (Davenport Acad. of Sci., Vol. 1, 1876, pp. 199-204), lists the Coleoptera collected in the vicinity of Spring Lake Villa, six miles south of Payson, Utah. The following Cicindelids were reported: *C. 12-guttata* Dej., *C. senilis* Horn, *C. tranquebarica* Herbst. and *C. near purpurea* Oliv. *Cicindela senilis* Horn may be confused with *C. echo* Csy.

The twenty-one Utah specimens of this species in my collection are all more coppery in luster and have broader macula-

tions than any of my eastern specimens. Dr. Blaisdell has a series of *repanda* which he collected at Baltimore, Maryland, which shows a wide variation with respect to the maculations; some of them are three times as wide as others.

7. *CICINDELA HIRTICOLLIS* Say

Moab, June, 1927 (Tanner and Irvin Rasmussen); St. George, March to November, 1917, 1921, 1922 (Tanner); Mesquite, Nevada, May, 1922 (Tanner).

This species is abundant on the muddy flood plains of the Virgin River and the Santa Clara Creek, near St. George.

8. *CICINDELA TRANQUEBARICA* Hbst.

St. George, June, 1919 (Knaus); April, 1922 (Tanner); Zion National Park, June, 1919 (Knaus); June, 1929 (Tanner).

9. *CICINDELA TRANQUEBARICA LASSENICA* Csy.

City Creek Canyon, near Salt Lake City, 1928 (G. Rasmussen).

This is a distinctive form and a new record for Utah.

10. *CICINDELA TRANQUEBARICA HORICONENSIS* Leng

St. George, April-May, 1917, 1921, 1922 (Tanner); June, 1919 (Knaus and Spalding); Zion National Park, 1919 (Knaus and Spalding); May, 1924 (Tanner); Shores of Great Salt Lake, June, 1915 (Sugden).

11. *CICINDELA TRANQUEBARICA KIRBYI* Lec.

Raft River Mountains, June, 1928 (Tanner); Logan, 1909 (E. G. Titus); Farr West, June, 1926 (Tanner); Bear Lake, near Lakota, June, 1926 (Tanner and Lynn, Hayward); Sheep Creek, Daggett County, June, 1926 (Tanner); Sinks and Dunes, South Lynndyl, September, 1926 (Tanner); Marysville, July, 1927 (Tanner); St. George, September, 1928 (Tanner); Bluff, July, 1927 (Tanner and Kartchner).

12. *CICINDELA TRANQUEBARICA ADMISCENS* Csy.

Price, June, 1927 (Tanner); Sheep Creek, June, 1926 (Lynn Hayward); Fort Bridger, Wyoming, June, 1926 (Tanner).

The nine specimens of this variety in my collection agree with the Casey specimens, but I question the advisability of separating these from the variety *kirbyi*. The color, pubescence, and elytral markings are variable in these two forms. I can find no distinctive morphological differences.

13. CICINDELA VIBEX var. INYO Fall

Zion National Park, September, 1916, June, 1917, August, 1920, August-September, 1922, August, 1925, 1926, 1927, 1928 (Tanner); June, 1919 (Knaus).

14. CICINDELA VIBEX var. OWENA Fall

Cicindela kirbyi var. *uintana* Csy. (type locality, Zion National Park)

Zion National Park, June, 1917 (Tanner); June and September, 1921, August, 1922, 1926, 1928 (Tanner); Iron Springs, Iron County, June, 1919 (Knaus).

I have had the opportunity of studying Colonel Casey's type of *uintana* and I am convinced that it is only a well-marked specimen of the variety *owena*. In the large series of *inyo* and *owena* of my collection from Zion Park there is a great deal of variation, depending upon the time of the year they are taken.

15. CICINDELA VIBEX var. MOAPANA Csy.

Provo, August 20 (Wickham).

Professor Wickham informs me that he collected this form of *vibex* at Provo, but I have never been able to distinguish this variety in specimens I have taken in Utah.

16. CICINDELA TENUICINCTA Schp.

East shore of Great Salt Lake, June 25, 1902 (Knaus); Saltair, June 21 (Wickham), September 26, 1925 (Tanner).

This species seems to be restricted in Utah to the shores of Great Salt Lake, where it is abundant.

17. CICINDELA LONGILABRIS Say

Emerald Lake, Mount Timpanogos, August, 1927 (Tanner).

This species is rarely found in Utah. I have never seen any of the green maculate specimens like the ones I have from Montana that have been taken in Utah. I doubt that *C. perviridis* has ever been taken in Utah and hence I am not including it in this list.

18. CICINDELA MONTANA Lec.

Cicindela montana var. *uteana* Csy. (type locality, Provo Canyon, Utah)

American Fork Canyon, 1876 (F. C. Bowditch); Aspen Grove, Mount Timpanogos, July and August, 1925, 1926, 1927 (Tanner); Deer Creek Canyon (Spalding); Greendale, Uinta Mountains, June, 1926 (Tanner); Uinta National Forest, August 3 (Silver); Park City,

August, 1927 (O. W. Olsen); Logan Canyon, June, 1926 (Tanner and C. Cottam); Deep Creek Mountains, June, 1928 (Tanner); Raft River Mountains, June, 1928 (D. E. Beck, Fred Richin and Tanner); Pine Valley Mountains, September, 1922 (Tanner); Paris Canyon, Idaho, July 2, 1920 (B. C. Cain); Lava Hot Springs, May, 1927 (Beck); Fort Bridger, Wyoming, June, 1926 (Tanner); Kaibab Forest, Arizona, July, 1927 (Tanner).

I agree with Professor Wickham that *montana* should be given specific rank. It is a distinctive species, though extremely variable, and is widely distributed throughout Utah. During the past summer (1928) I had the privilege of studying Colonel Casey's collection of Cicindelidæ, now in the National Museum. I have also recently submitted specimens of this group and other groups to Mr. L. L. Buchanan, who kindly studied them in connection with the Casey types. With this material before me I am convinced that most of the species and subspecies from Utah named by Casey in his last memoir (1924) should be placed in synonymy.

I have studied over a hundred specimens of *montana* and find some specimens with "subcupreous" heads and thorax and black elytra, while others have blackish heads and thorax and elytra that are subcupreous in color. The abdomens vary from dull greenish, blackish, bluish to blue-green. I have also taken the "subcupreous-brown" and black specimens in copula.

Mr. Knaus reports that he has specimens of *C. longilabris* var. *chamberlaini* Knaus and *C. longilabris* var. *vestalia* Leng, collected by Mr. Spalding in Provo Canyon. I have submitted specimens to Mr. Knaus, but he has not reported the results. I am unable to distinguish these varieties in my specimens; in fact since studying specimens of *vestalia* Leng I am inclined to believe that neither of these varieties are found in the Utah fauna.

19. CICINDELA LAURENTI Schp.

Parowan Canyon, July, 1921 (Knaus); Cedar Breaks, August, 1921 (B. C. Cain); La Sal Mountains, June, 1927 (Tanner, Call, Rasmussen, Kartchner).

A distinctive species. My nineteen specimens are uniform in color, markings and size.

20. *CICINDELA OREGONA* Lec.

Provo (common from May until October); Riverdale, Weber River, June, 1926 (Tanner, Hayward, Cottam); Wellsville, June, 1926 (Tanner); Farr West, June, 1926 (Tanner); Logan, August, 1924 (W. W. Henderson); Flaming Gorge, Green River, June, 1926 (Tanner); Douglass, Dinosaur Quarry, July, 1926 (Tanner); Aspen Grove, Mount Timpanogos, August, 1926-27 (Tanner); Thistle, Spanish Fork Canyon, July 22, 1922 (Tanner); Salt Creek Canyon, near Nephi, July 20, 1922 (Tanner); Sevier River at Lynndyl, July 26, 1922 (Tanner); Sinks and Dunes, South Lynndyl, September, 1927 (Tanner); Beaver, July, 1923 (Tanner); Callao, June, 1928 (Tanner); Mud Lake, Paris, Idaho, June, 1926 (Tanner, Hayward, Brown, Cottam); Mesa Verde National Park, Colorado, July, 1927 (Tanner and Call).

This species is common in the northern part of the state. Mr. Knaus reports that he has taken it at St. George and Zion Park, but I have never taken what I consider to be the true *oregona* in the Virgin River Valley.

21. *CICINDELA OREGONA GUTTIFERA* Lec.

Sheep Creek, Duchesne County, June, 1926 (Tanner); Aspen Grove, July and August, 1925, 1926, and 1927 (Tanner); Provo Canyon (Knaus); Utah Lake (Tanner); Woodside, June 1927 (Kartchner); Moab, May, 1928 (W. J. Gertsch); Mesa Verde National Park, Colorado, July, 1927 (Call, Kartchner, Tanner).

This form of *oregona* seems to be more in the Colorado River drainage area than in the Great Basin of Utah.

22. *CICINDELA OREGONA MARICOPA* Leng

Cicindela provensis Csy. (type locality, Provo Canyon).

Cicindela provensis mormonella Csy. (type locality, Utah).

Cicindela provensis nephiana Csy. (type locality, Parowan, Utah).

St. George, June to August, 1921, 1922, and 1925 (Tanner); Pine Valley, June, 1922, 1929 (Tanner, Doyle, Liddle, and Tony Bentley); Central, June, 1921, 1922, 1923, 1925 and 1929 (Tanner); Mountain Meadows, June, 1923 (Tanner); Toquerville, June 15, 1924 (Tanner); Cedar City, July, 1922 (Tanner); Beaver, July, 1924 (Henderson); Utah Lake, May, 1928 (Tanner); Aspen Grove, Mount Timpanogos, July, 1926 and 1927 (Tanner); Brighton, August, 1926 (Sugden); Vineyard, July (Spalding); Parowan Canyon, July (Spalding).

Last summer while I was at the National Museum I studied the Casey types of the above forms and made careful notes. Since then Mr. Buchanan has kindly compared a number of specimens with each type. With these and several hundred

specimens of the *oregona* group for study I am forced to the conclusion that *C. provensis*, *C. p. mormonella*, and *C. p. nephiana* are only color phases of *C. o. maricopa* Leng. I have relaxed and studied scores of specimens in this group, but I have failed to find any constant morphological differences. While collecting specimens of this group I have paid special attention to their association and have found greenish and deep-blue specimens on the same sandy river bottom. In Zion Park I collected specimens that are identical with Casey's *provensis* that were in copula with specimens that have been identified as *maricopa*. Several color phases may be taken throughout the season in the same locality which suggests that they may be physiological responses to an environmental complex. Some workers, past and present, seem to take a delight in gathering and naming the fortuitous variations of taxonomic units. Mr. Spalding picked out his most likely variations and sold them to Colonel Casey!

23. *CICINDELA OREGONA OREGONELLA* Csy.

(Type locality, Deer Creek, Provo Canyon, Utah)

Aspen Grove, Mount Timpanogos, July (Tanner); Deer Creek, Provo Canyon (Spalding); Logan, August, 1924 (Henderson); Sinks and Dunes, South Lynndyl, September, 1926 (Tanner); St. George, May, 1922 (Tanner); Zion Park, August 25, 1925 (Tanner).

The specimens listed here under *oregonella* run in Casey's key (1913, p. 29), to *sonoma*, but since I do not have material that has been compared with *sonoma* I am referring my specimens to a form I have studied, *oregonella*, which may prove to be a synonym. In my specimens the elytra lack the punctures and are "densely microgranulate" and the surface is opaque, but never metallic. They vary in color above from black to dirty brownish and dull greenish, beneath greenish to deep blue. Four specimens from near Lynndyl are black opaque above and dull greenish beneath. The head and thorax, except on the lateral part, are devoid of hairs. This form seems to be distinct enough to warrant separating it from the three *oregona* groups listed above.

24. *CICINDELA WILLISTONI* var. *ECHO* Csy.

(Type locality, shores of Great Salt Lake, Utah)

Great Salt Lake, 1904 (Wickham), June, 1926 (Tanner, Brown,

Cottam, and Hayward), 1921 (Knaus); Stansbury Island, Great Salt Lake, July, 1913 (Pack, Hagen, and Titus); Sevier Lake, 1904 (Wickham); Little Salt Lake, Parowan, July, 1921 (Knaus); June, 1928 and 1929 (Tanner, Bentley, and Liddle).

This species is common around the salty lakes of Utah.

25. *CICINDELA WILLISTONI SPALDINGI* Csy.

(Type locality, Callao, Utah)

Callao, June (Spalding).

I have seen but one specimen of this unique, the type, and it seems distinct enough to be separated from other varieties of this group. In many ways it is more closely related to the *fulgida* group than to the *willistoni* units.

26. *CICINDELA TANNERI* Knaus

(Type locality, Green River, Utah)

Green River, June, 1927 (Tanner and Kartchner); Duchesne, July, 1926 (C. J. D. Brown).

This species was rather common on the alkali flats near the river.

27. *CICINDELA PAROWANA* Wickh.

(Type locality, Salt Lake near Parowan, Utah)

Cicindela parowana var. *remittens* Csy. (type locality, Callao, Utah)

Little Salt Lake, near Parowan, August 11 (Wickham); July (Knaus); June (Tanner); Callao, June 5 (Spalding).

I have had an opportunity of studying all of Mr. Spalding's specimens of *parowana* and *remittens*, and after studying Colonel Casey's type there is no doubt but that *remittens* is a color phase and one that is extremely variable. The Callao specimens are reddish, greenish and bluish in color.

28. *CICINDELA NIGROCÆRULEA* Lec.

St. George, August, 1922 (Tanner).

I have only taken three specimens of this species in my many years of collecting.

29. *CICINDELA PUNCTULATA* Oliv.

St. George, August, 1923 (Tanner); Parowan, July (Knaus).

This species is not common in Utah and is usually associated with *chihuahuæ*.

30. *CICINDELA PUNCTULATA CHIHUAHUÆ* Bates

St. George, August, 1922 and September, 1927 (Tanner); July, 1921 (Knaus); Bellevue (Engelhardt); Zion Park, July, 1922 (Tanner); Parowan Canyon, July, 1921 (Knaus and Spalding).

This form seems to be confined to the southwestern part of the state.

31. *CICINDELA TENUISIGNATA* Lec.

Ash Creek near La Verkin, June, 1922 (Tanner).

The single specimen of this species taken at La Verkin is small with fine markings.

32. *CICINDELA LEMNISCATA* Lec.

St. George, August, 1922 (Tanner).

Three specimens came to the electric lights one warm, cloudy night. This seems to be a new record for Utah.

33. *CICINDELA CARTHAGENA* var. *HÆMORRHAGICA* Lec.

Saltair, July, 1921 (Knaus), August 29, (F. H. Shoemaker); June, 1926 (Tanner); Salt Lake Valley (Morrison); 1904 (Wickham); Farr West, June, 1926 (Brown); Parowan, July, 1921 (Knaus).

Mr. Leng reports *hentziana* from Utah and cites as his authority specimens in the Harris collection now in the Museum of Comparative Zoölogy at Harvard. Professor Nathan Banks has the following to say of this form in a letter under date of April 10, 1929: "In his (Harris's) collection I do not find any specimens under *hentzi*, but in his catalogue I find one sheet with these words, 'identical with, or very closely allied to the form on page 4052 (that is *hentzi*).' On this sheet there are records of specimens from St. George, Utah, July, H. F. Wickham, and 25 June, L. H. Joutel, and against the latter is the collector, 'Fuchs collection 772 and 773.' However, as I said, I did not find these specimens under *hentzi* in his collection, and he may have transferred them later elsewhere without changing the records."

I have never taken any specimens that agree with Leng's description of this variety.

34. *CICINDELA CARTHAGENA BISIGNATA* Dokh.

Saltair, June 26 (Wickham).

The only record of this species in Utah is one specimen in the Harris collection. I question the identification of the specimen.

35. *CICINDELA CARTHAGENA ARIZONÆ* Wickh.

St. George, 1917 to 1929 during the summer (Tanner); June, 1921 (Knaus); Zion Park, August, 1922 (Tanner).

This species seems to be confined to the Virgin River Valley. It is common throughout the summer.

36. *CICINDELA PUSILLA* var. *IMPERFECTA* Lec.

Provo, June (Wickham); Saltair, June (Wickham and Tanner); Farr West, June, 1926 (Tanner, Brown, and Hayward); Rosevere Creek, Raft River Mountains, June, 1928 (Tanner); Sevier River, near Lynndyl, June, 1922 (Tanner); Sevier Lake, June (Wickham); Parowan, June and July (Spalding, Knaus, and Tanner); Sheep Creek, Duchesne County, July, 1926 (Brown); Callao, June, 1928 (Tanner); Bear Lake, near Paris, Idaho, June, 1926 (Hayward and Tanner). Fort Bridger, Wyoming, June, 1926 (Tanner).

This species is extremely variable in color as well as markings.

37. *CICINDELA PUSILLA* var. *CINCTIPENNIS* Lec.

Miners Peak, July (Spalding); Sheep Creek, June (Brown and Hayward); Price, June, 1927 (Tanner); Douglass, Dinosaur Quarry, June (Brown and Hayward).

38. *CICINDELA CALIFORNICA* var. *PRÆTEXTATA* Lec.

St. George, August (Spalding, Wickham, Tanner).

This species has always been taken at night around the light.

39. *CICINDELA SPERATA* Lec.

Bluff, July, 1927 (Tanner and Kartchner).

This specimen was taken along the San Joaquin River. It is a new record for Utah.

40. *CICINDELA TOGATA* var. *GLOBICOLLIS* Csy.

Saltair, June 26 (Wickham).

Professor Banks writes the following concerning this variety: "Of *C. bisignata* and *C. globicollis* there are of each, one specimen from Saltair, 26 June, H. F. Wickham, collector."

SUMMARY

1. In this paper forty species are listed for Utah and ten forms are treated as doubtful or synonyms, thus bringing the list to fifty species that have been referred to the state.

2. Utah is the type locality for eleven of the fifty forms.

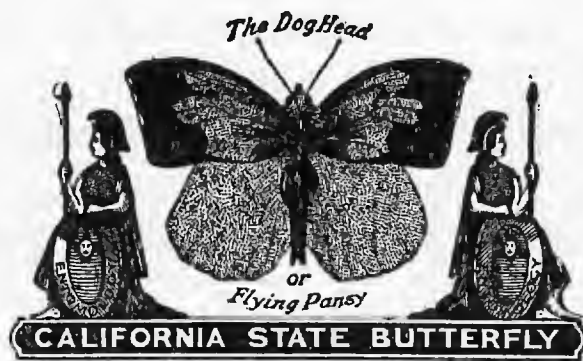
3. Specimens of forty-three of the fifty forms are in my collection of eight hundred and thirty specimens of Cicindelids.

A STATE BUTTERFLY FOR CALIFORNIA

BY J. D. GUNDER
Pasadena, California

Many states in the United States of America have officially designated or tentatively set aside what is popularly termed a "state flower." For example, California has long since chosen the poppy and Illinois the goldenrod. A number of states are going a step further and recognizing a state bird to represent their ornithological preference. The bird authorities of this commonwealth are still wrangling over the question of which species will be selected, but in all probability, according to latest reports, one of the California Quail family will be chosen.

During the last fifteen years, as everyone knows, there has been a marked advance in the science of entomology. The



The emblem

public at large is beginning to know what the term means and to recognize its importance. More interest is being shown by the press in the things that entomologists do. In other words, entomology is gradually becoming as significant to the public as ornithology and botany. Perhaps it will some day have more appeal. Its status in relation to man's existence is certainly closer in many respects. The more the attention of the general public can be focused on entomology the better. It was with these thoughts in mind that the Lorquin Entomological Society of Los Angeles has sought to establish a state insect for California and to have this state be the first in the entomological field to record a local symbol of its science.

At a society meeting during the fore part of this year it was decided that one of the diurnal lepidoptera would be the most

suitable and popular of all insects in general with the public. Butterflies have always held the imaginative fancy of the people; also there are perhaps more students interested in lepidoptera than in any other order. Three well-known butterflies occurring in California were selected on which a state-wide ballot was taken. The three were: *Heterochroa californica* Butl., the "California Sister"; *Zerene eurydice* Bdv., the "California Dog Head," or "Flying Pansy"; and *Basilarehia lorquini* Bdv., the "Lorquin's Admiral." Especially printed, return postcard ballots were sent to every known person really interested in entomology in the state. Names and addresses were obtained from the Natural History Society of San Diego, the Lorquin Society files, the Pacific Coast Entomological Society of San Francisco, the Government's State Economic List through the courtesy of Mr. Campbell of Alhambra, the University of California List (both at Davis and at Berkeley), and from other sources, including dealers' lists. Prof. L. J. Muchmore of the Entomological Department of the Los Angeles Museum attended to the receipt and count of the cards. Thus every entomologist who cared to vote on the subject had the chance to do so. The result of the ballot was as follows: seventy-seven cards were returned showing a preference for the "California Dog Head" butterfly and eleven showing a choice for the "California Sister." No cards were marked in favor of the "Lorquin's Admiral." Thus the active entomologists of the state chose the "California Dog Head," or better named, the "Flying Pansy" for their state butterfly. Practically everyone who received a ballot cast a vote which showed a genuine interest in the undertaking.

Zerene eurydice Bdv. is strictly a native California butterfly, its habitat being the lower mountains, from the Mexican border north to the San Francisco Bay region. It is particularly common in the San Bernardino mountains of southern California, where it flies mostly during June and July. The early stages were worked out years ago by W. H. Edwards, who illustrated the egg and larva in his "Butterflies of North America." For good illustrations of the typical species see Holland's, Wright's, or Comstock's books with their colored plates. *Eurydice* is a pretty butterfly, the male being orange

and black in color with a striking and easily remembered design, while the female is straight orange without pattern. Thousands of specimens are used each year in entomological art work for trays, bookends, plaques, etc., so the species is already fairly well known to the public.



The seal

To record and popularize California's new state butterfly, an emblem and a seal is needed to validate its announcement. The illustrations accompanying this article suggest designs for both. Either may be used at will by entomologists. The more often the better. The emblem makes a good letterhead embellishment, while the seal can be used by societies and state institutions when occasion demands. The original designs and the original zinc cuts are deposited with the Lorquin Society at the Los Angeles Museum and are available, upon demand, to responsible parties who may wish to borrow them.

The State of California and the entomologists of this state are to be congratulated upon being the first in the Union to select and symbolize a state insect, or rather, a state butterfly.

SOME HEMIPTERA TAKEN BY PROFESSOR
COCKERELL IN THE ORIENT

BY E. P. VAN DUZEE

Professor T. D. A. Cockerell has sent to me for study a small lot of Hemiptera representing a portion of his work in the Orient during 1928. He has very generously allowed me to retain the specimens for the collection of the California Academy of Sciences, which already has a very good representation of Oriental insects. It has seemed necessary for me to describe as new one genus and three species from this lot, and some of the others have proved interesting from the standpoint of geographical distribution.

SCUTELLERIDÆ

TECTOCORIS DIOPHTHALMUS Thunberg

Bourail, New Caledonia, May 22 (W. P. Cockerell). One larva, about half-grown. It is bronzed black with the head, pronotal callosities, apex of elytral pads, abdomen and legs deep steel blue, the coxæ tipped with ferruginous.

SCUTIPHORA PEDICELLATA Klug

Sydney, New South Wales. One fine large specimen taken in the Hotel Grosvenor.

PENTATOMIDÆ

SCOTINOPHARA OBSCURA Dallas

Chiengmai, Siam, April 6, 1928 (Dr. McKean), one example, certainly pertaining to Dallas' species and not to *lurida*.

Genus **Kyrtalus** Van Duzee, n. gen.

Allied to *Paramecocoris* Stål, 1861. Long, oval, depressed margins of head and thorax explanate. Head broad, flat semicircular in outline, narrower than base of scutellum, its length three-fourths that of pronotum on median line; cheeks contiguous before the small pointed tylus; ocelli a little more distant from one another than from the eyes; bucculæ low, feebly elevated anteriorly; rostrum not attaining intermediate coxæ; segment I reaching apex of bucculæ; II shorter than III and IV together; III longer than IV. Sides of pronotum broadly explanate, gently arcuate, entire; humeri and anterior angles rounded, anterior margin deeply excavated for reception of head, immarginate, hind margin scarcely arcuate before base of scutellum. Scutellum large, passing middle of abdomen, narrowed

at apex, frenum nearly attaining the apical fourth. Elytra narrower than abdomen, leaving connexivum exposed; costa expanded basally; membranal nervures becoming obsolete at base and apex. Osteolar canal long, curved, nearly attaining margin of the large oval, wrinkled opaque area; mesosternum broadly sulcate. Venter slightly convex, flattened along median line; base of segment II unarmed. All femora with a few small teeth below near apex; all tibiæ broadly sulcate. Antennæ five-segmented, I thickened, curved, scarcely passing the foliate margin of head; II and V subequal; IV longer than III but shorter than V; V fusiform. Surface above and sides beneath coarsely punctate.

Type of genus *Kyrtalus mackiei* Van D.

This insect runs in Stål's table to the African genus *Paramecocoris* Stål, 1861, (= *Delegorguella* Spinola), but the head is more expanded and regularly arcuate before, the tylus is smaller, the antennæ and rostrum are shorter, the osteolar canal is much longer and the upper surface is more coarsely punctured.

It should be noted that Stål established his genus *Paramecocoris* in 1853 as a substitute for the preoccupied name *Paramecus* Fieber, 1851; it must therefore take the same type species and must replace *Burma* of Kirkaldy. *Paramecocoris* of Stål, 1861 and 1864, seems to be quite a different genus and equivalent to *Delegorguella* Spin., 1850, as pointed out by Kirkaldy.

***Kyrtalus mackiei* Van Duzee, n. sp.**

Brownish testaceous, coarsely irregularly punctured with brown or black. Length, 10 mm.; width, 5 mm.

Head flat with coarse irregular punctures, leaving a smooth area between the ocelli and eyes that is crossed by an oblique line of contiguous punctures; apex of head entire, the cheeks meeting for one-third the length of the head; eyes brown, ocelli red; edge of head with a black line from eyes halfway to apex. Pronotum with an obsolete impressed transverse line terminating in a whitish callosed spot placed its own width within the margin; callosities a smooth annulus including an oval smooth area between them; punctures sparse on lateral margin anteriorly, finer and denser toward the humeri. Scutellum with a smooth spot within the basal angles, apex narrow, rounded, punctured to the tip. Elytra irregularly punctured, leaving a few scattering smooth spots, punctures coarser and blacker within the radial nervure; membrane moderately enfumed, nervures fuscous and distinct only along the median field; connexivum brown-punctate, with a large pale median area resting on

the margin of each segment. Antennæ with a fuscous annulus covering much of segment III; apex of rostrum and clavus black. Mesosoma and metapleuræ with a brown opaque area; lateral areas of pleuræ and venter brown-punctate; margin of venter smooth with a black spot at the incisures; hind edge of sixth segment with an obtusely angulate median tooth or rounded lobe, the disk with a brown mark either side at base. Described from the unique type.

Holotype, female, No. 2619, Mus. Calif. Acad. Sci., taken July 17, 1928, on **Mount Pah Meeung, Siam**, by Miss Alice Mackie, after whom the species is named.

STOLLIA LEREDDI Guillou

Thursday Island, March 15. A single specimen taken by Miss Alice Mackie. This agrees in every particular with Stål's description of his *Stollia fasciolata* which Schouteden places as a synonym of *lereddi*. It has been recorded from North Queensland and Papua between which Thursday Island lies.

CARBULA TRUX Breddin

Doi Sutep, Siam, February 8, one female taken by Alice Mackie. It agrees altogether with Breddin's description of his male specimen from Java ("Archiv. f. Naturges.," LXXVIII, Abt. A., p. 102, published in February, 1913).

Menida cockerelli Van Duzee, n. sp.

Size and form of *varipennis* Westw. Ochraceous more or less tinged with croceous, especially on the pronotum, coarsely punctured with black, beneath with a black median vitta, interrupted on the venter between the segments. Length, 6 mm.

Head with six lines of black punctures, the lateral following the margin, deflected about the eyes and ending in a black spot between the ocellus and eye; beneath with a polished black spot before the antennal base and a cluster of black punctures behind it. Pronotum with a submarginal row of black punctures and a row about the callosities, broken behind; posterior disk tinged with luteous, with scattering coarse black punctures. Scutellum coarsely, sparsely black-punctate, with a pale smooth spot within the basal angles and a blackish subapical spot on either side. Elytra coarsely fusco-punctate; membrane hyaline. Tergum black with a pale margin. Antennæ pale; segment II and base of III blackish above. Beneath pale testaceous yellow with a broad lateral area of scattering black punctures; stigmata black; median vitta on sternum and venter deep black, on the venter broken into segmental spots that on segment II extended anteriorly into a sutural vitta nearly attaining the con-

nexivum; on other segments this line is indicated. Legs and rostrum pale, the latter infuscated at tip which attains the hind coxæ; basal spine of abdomen reaching to between intermediate coxæ.

Holotype, female, No. 2620, Mus. Calif. Acad. Sci., taken by Professor T. D. A. Cockerell, December 27, 1928, at **Nan, Siam.**

This species approaches *pundaluoyæ* Distant from Ceylon, but seems to be sufficiently distinct.

Plascosternum tumidum Van Duzee, n. sp.

Closely allied to *taurus*, a little larger and darker, with the same form of humeral angles; cheeks tumidly elevated; apex of scutellum narrower and more produced, with a different form of genital plates in the female. Length, 24 mm.; width across humeri, 18 mm.

Cheeks tumidly elevated; basal angle of the notch on the bucculæ prominent and acute, as is the caudal angle of the bucculæ; these angles rounded in *taurus*. Segment II of antennæ distinctly shorter than III, scarcely shorter in *taurus* (possibly a variable character), III and IV equal. Mesosternal plate attaining middle of prosternum, reaching to its base only in *taurus*. Apex of scutellum narrower and more produced than in *taurus*, its length beyond apex of frenum one-fifth greater than its width there, in *taurus* these measurements are subequal. Venter with a shallow median groove. Basal genital plates quite strongly produced on their median angle, leaving the hind edge quite strongly sinuate, in *taurus* their hind edge is straight across, with no extension of their inner angles; all the plates more densely covered with pale hairs.

Color in the type darker than in *taurus* with a very slight pinkish tinge, especially on the inner apical field of the corium and base of the scutellum. Antennæ pale, impunctate, the most of segment I, II and III fuscous with pale incisures, IV and V black on apical half, in *taurus* the antennæ are coarsely punctate with brown and annulate with brown at apex.

Holotype, female, No. 2621, Mus. Calif. Acad. Sci., taken by Professor Cockerell, January 17, 1928, at **Pah Meeung, Siam.**

My material of *taurus* is from Java and is inadequate to show the extent of variation normal to the species, but the characters enumerated seem sufficient to give the present form specific standing. The Academy of Sciences has one male labeled "Batavia, Java," that has all the characters enumerated for this new form applicable to the male, but the cheeks are less strongly

tumid. In this male the genital segment is deeply roundedly excavated at apex. Length of this male, 17 mm.

MEGYMENUM INSULARE Westwood

Thursday Island, March 15, collected by Miss Alice Mackie and J. D. Foote. This species has the thoracic angles less prominent than in *subpurpurascens* and the surface is opaque black wanting the purple luster of that species.

COREIDÆ

PETILIA CALCAR (Dallas)

Lonquang, Siam, December 23, one specimen collected by Professor Cockerell.

PLINACTUS sp.

Thursday Island, March 15, 1928 (T. D. A. Cockerell), one example that is too mutilated for certain determination; the genus, even, is in some doubt.

LEPTOCORISA ACUTA Thunberg

Mount Pah Meeung, Siam, January 17, 1928 (T. D. A. Cockerell), one example.

REDUVIIDÆ

SPHEDANOLESTES TRICHROUS Stål

Doi Sutep, Siam, February 10, 1928 (Miss Alice Mackie). Stål described this beautiful red and black species from "India Orientalis." Distant did not know the species when he wrote the Hemiptera portion of the Fauna of British India, and on a cursory hunt I have not found it recorded elsewhere. The present record places it definitely in Indo-China.

DERBIDÆ

PARAPROUTISTA CERAMENSIS Muir

Mount Pah Meeung, Siam, January 18, 1928 (T. D. A. Cockerell), one example. Mr. Muir described the species from the island of Ceram and from British New Guinea. The present record extends its range to Indo-China.

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E. P. VAN DUZEE, Editor S. B. FREEBORN, Ph. D., Treasurer

EDITOR'S COMMENT

In *Science* for November 8, Professor G. F. Ferris raises the question, in his usual forceful way, whether the expenditure of so much money by the state and federal governments on insect quarantine and eradication really pays. This query naturally suggests a reply, and Professor Ferris' own state furnishes the best answer. Should the Mediterranean fruit fly become established in this state the financial loss to the fruit growers of the state, great as it would be, would not be all California would pay. The real price would be paid by each man, woman and child while picking the maggots out of the fruit they wished to eat. True, these maggots are not poisonous and may be eaten with impunity, but not being insectivorous birds we do not wish to eat them and the constant avoidance of them would soon become intolerable. California, on account of its climate and the extent of its fruit industries, is peculiarly susceptible to injury by the fruit fly and other insect pests against which this state is quarantined, and that they have been kept out for so long is due to the honest and efficient enforcement of the quarantine regulations established by our State Department of Agriculture. The least we can do is to uphold them and not hamper them by raising doubts in the minds of state officials whose training has been along other lines.

Fourteen butterfly enthusiasts met in the Board Room of the Mechanics' Institute in San Francisco on October 26 and organized a San Francisco Butterfly Club. Dr. L. I. Hewes was elected chairman. Mr. J. E. Cottle told of his early experiences in entomology, and the others present gave some account of their interest in butterfly collecting and what had aroused that interest. This was followed by an exhibition of interesting specimens. Further meetings will be at the call of the Chair.

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THE HEAD STRUCTURES OF THE ORTHOPTERON STENOPELMATUS—A CONTRIBUTION TO THE STUDY OF THE EXTERNAL ANATOMY OF STENOPELMATUS

BY G. C. CRAMPTON, PH.D.

Massachusetts Agricultural College, Amherst, Mass.

The main features of the head, thorax and abdomen of the "sand cricket" *Stenopelmatus* will be discussed in three papers dealing with the external anatomy of this extremely interesting, primitive and common insect, which is exceptionally suitable for anatomical study. The specimens used in this study were given to me by Dr. S. B. Freeborn, to whom I am deeply indebted for much valuable material.

Viewed from the front, the head capsule of *Stenopelmatus* (Fig. 5) is somewhat oval in outline, and is markedly rounded above. Its surface is quite hard and smooth, due, doubtless, to the fact that the insect uses its head and stout mandibles in digging. The huge muscle bundles inserted upon the inner surface of the skull show through the rather transparent head capsule in specimens preserved in alcohol and appear to divide the surface of the head into symmetrically arranged areas, but these have no especial value for the study of comparative morphology. The coronal suture *cs* of Fig. 5 (representing the stem of the Y-shaped epicranial suture) is rather faint, and the frontal sutures *fs* (representing the arms of the Y-shaped epicranial suture) are very indistinct; they extend just back of and above the raised area or frontal prominence above the letter *f* in Fig. 5.

The regions on each side of the coronal suture *cs* are the parietals *pa* (Fig. 5). The temples *te* or areas above and behind the eyes *e* are called the tempora. The cheeks, or regions below and behind the eyes *e* are called the genaë, *ge*. Below each gena *ge* is a sclerite *bm* variously termed the basimandibulare, mandibulare, and trochantin of the mandible. It

is demarked posteriorly by the basimandibular suture *es* which extends mesad toward its fellow on the opposite side of the head, but the two sutures do not meet in *Stenopelmatus*, as they do in some Orthoptera in which the complete suture extending across from one side to the other is called the epistomal suture. In such cases that portion of the epistomal suture between the frons *f* and the posterior clypeal region *pc* is called the frontoclypeal suture, while the lateral portions of the epistomal suture form the basimandibular sutures. In *Stenopelmatus*, the sutures, labeled *es* in Fig. 5, mark the location of the invaginations forming the anterior arms of the tentorium, labeled *pt* in Fig. 6, and since the sutures *es* correspond to the frontal pits of other insects (in which the frontal pits mark the location of the invaginations forming the anterior arms of the tentorium) they are also labeled *fp* to denote this fact. The frons, or front, labeled *f* in Fig. 5, is the area between the frontal sutures *fs* and the frontal pits *fp*. As was mentioned above, the frons is sometimes separated from the clypeus by a frontoclypeal suture (also called the clypeal suture). The clypeus is composed of two areas, the postclypeus, or epistoma *pc*, and the anteclypeus *ac*. The postclypeus *pc* is usually more darkly pigmented, and the anteclypeus *ac* is usually pale, resembling membrane in color. The suture between the clypeus and the labrum *l* is called the clypeolabral suture, or simply the labral suture. On the oral or pharyngeal surface (i. e., roof of the mouth cavity) the boundary between the labium and clypeus is marked by the tormæ described later.

The term "epicranium" is used very loosely even by recent entomologists. Thus Imms (1925) does not include the frons in the epicranial area, while Comstock (1924) states that "Under the term 'epicranium' are included all of the paired sclerites of the skull and sometimes also the front." Snodgrass (1928) includes not only the frons but also the clypeus, etc., in the designation epicranium, and there seems to be no uniformity in the application of the term. If it be employed at all, it is preferable to restrict the designation epicranium to the paired sclerites and frons, but not including the clypeus, etc. The designation vertex is also employed in various ways by different entomologists, but it is preferable to restrict its application to the upper portion of the head capsule, a vague area

on the top of the head, but not extending down the front of the face, as Yuasa (1920) and others maintain.

The faintly demarked ring about the base of the antenna (*an* of Figs. 5 and 11) is called the antennale. It bears an antennifer, *af* of Fig. 11, or projection near the base of the antenna, which is fairly large in some Orthopteroid insects, and serves as a pivotal structure for the antenna in these insects. The scape, *sc* of Fig. 11, is the large, broad, rather flat, basal segment of the antenna. The next segment or pedicel *pd* and the segment beyond it, or the postpedicel *ppd*, are subequal in size. The postpedicel *ppd* is usually regarded as the first segment of the flagellum, or that portion of the antenna distal to the pedicel *pd*. In the flagellum we may distinguish two main types of segments, the brachymeres or short segments, and the dolichomeres, or long segments. The brachymeres in turn consist of long brachymeres labeled *lb* in Fig. 11, and short brachymeres labeled *sb*, while the dolichomeres consist of broad dolichomeres *bd*, intermediate dolichomeres *id* and slender dolichomeres *sd* (at the tip of the antenna). The scape of the antenna is somewhat flattened to enable the antennæ to lie close to the head, when the antennæ are laid back along the head to get them out of the way during the digging operations of the insect, and the compound eyes, *e* of Fig. 5, project slightly in their dorso-mesal region so that the antennæ can be laid back above the eyes, and may be protected to some extent by the projecting eyes (the antennæ apparently have but little freedom of movement basally, since the scape seems to move backward and forward, but has not much lateral movement, so that the eyes doubtless prevent straining the antennæ basally by furnishing some support for the scape when the latter is pressed backward during the digging operations of the insect).

The compound eyes, *e* of Fig. 5, are situated rather far down the sides of the head, and they are not very large. Our eastern "cave cricket," *Ceuthophilus*, exhibits a similar tendency toward the reduction of the compound eyes, and even *Grylloblatta*, which is very like the ancestors of all of these forms, has very small eyes (see Crampton, 1926). The hiding habits of these insects doubtless put a premium upon relatively small eyes and correspondingly well developed antennæ, and in insects with hiding habits we frequently find the development of sen-

sitive antennæ correlated with a reduction of the eyes, enabling those forms which exhibit this tendency to establish themselves in caves and similar situations more readily than other types of insects. The reduction of the eyes is thus due not so much to "disuse," as it is to the fact that antennal development (useful in the dark) is correlated with eye reduction. The ocelli are vestigial or lacking (what appear to be very faint traces of them can be barely made out) and in this respect *Stenopelmatus* likewise resembles *Ceuthophilus* and *Grylloblatta*.

When the head is removed and is viewed from the rear, as in Figs. 13 and 6, one may readily observe a large posterior opening called the occipital foramen, or foramen magnum, *ocf*, through which the gullet, nerve cord, etc., pass backward from the head capsule into the neck and prothoracic region. On each side of the foramen is a lateral sclerite *po*, or parocciput, which is considered by Riley (1904) to be the pleural region of the labial segment. It is separated by a rather pronounced groove, the paroccipital groove, from the rest of the head capsule; and at the ventral end of the groove is located the gular pit, *gp* of Figs. 6 and 12, which is formed by an invagination or inpushing of the chitin to form a posterior arm of the tentorium presently to be described. Ventral to the gular pit, *gp* of Fig. 12, is a paragular process, *pap*, over which a basal projection of the maxillary cardo rides (i. e., the projection labeled *d* in Figs. 13, 10, etc.). The sclerite *po* bears an occipital condyle, *occ* of Figs. 13 and 6, for articulation with the anterior end of the lateral cervical or neck plate. The endocciput, *eo* of Fig. 13, is an internal ridge formed by an infolding of the integument between the sclerite *po* and the cranium proper. A dorsal paroccipital tendon *pat* is attached near its dorsal portion, and is a tendon of muscles extending to the thoracic region. The sclerite, *eoc* of Fig. 13, is a demarked median dorsal region called the euocciput or surocciput, and near its anterior margin (internally) is attached a median dorsal tendon *eot* of a muscle extending to the thoracic region. The sclerites *po* and *eoc* are parts of the occiput, or occipital region of the head.

Lateral to the parocciput, *po* of Figs. 13, 6, 12, etc., is the postgena *pge* which is separated from the gena *ge* by the postgenal suture *pgs*. Ventrally, there is demarked in the postgenal

region a marginal area, the parastome or hypostoma *pst*, extending along the ventral edge of the posterior region of the head capsule. This marginal area *pst* bordering the mouth region posterolaterally is rather illy defined in *Stenopelmatus*, but in certain beetles it forms an important sclerite. In this general region are the projections *pap* of Fig. 12, over which the process *d* of the cardo rides (Fig. 10), and the projection *pp* (Figs. 13 and 3), which bears a cup-like acetabulum *pga* (Fig. 3) for the posterior condyle of the mandible *h*.

The mandible has three principal surfaces best noted when the mandible is removed and viewed basally (i. e., looking down into its hollow interior), as in Fig. 2. The outer or lateral surface bears a lateral prominence *ep* to which is attached the extensor tendon *et* of the muscle opening the mandible, and the outer surface (in section) forms the base of a triangle at the apex of which is the mesally located structure *gn* of Fig. 2, bearing the flexor tendon *ft* of the muscles closing the mandible. The ginglymus *g* (Fig. 2) is an anterior projection presently to be described, and the condyle *h* is a posterior projection which will be discussed later. From *g* to *gn* in Fig. 2 is the anterior surface, and from *h* to *gn* is the posterior surface, and *gn* is located at the base of the median ridge of the mandible, best shown in Fig. 4. The endognath *eg* of Fig. 2 is a basal internal shelf projecting inward and extending around the basal portion of the mandible.

In Fig. 4 is shown a posterior view of the insect's left (sinistral) mandible; and seen in this view, the mandible appears to taper distally (ventrally) to form the gnathapex *ga*. Dorsal to this region, along the median ridge of the mandible, is the grinding area or mola *m* of Fig. 4; and dorsal to the mola is the brush or brustia *br*. At the base of the median ridge of the mandible is the gnathite *gn*, which bears the flexor (closing) tendon *ft* (compare *gn* and *ft* of Fig. 2). On the opposite or outer surface of the mandible is the projection *ep* bearing the extensor (opening) tendon *et*, behind which is the condyle *h* (compare also *ep* and *h* of Fig. 2). On the posterior surface of the mandible is the gnathal impress *gs* of Fig. 4, or depression marking the position of an internal projection for muscle attachment, etc.

If the basal region of the mandible shown in Fig. 2 is turned back up in the normal position, as shown in Fig. 3, it will be seen that the posterior condyle *h* fits into an acetabulum *pga* borne on the process labeled *pp* in Figs. 3, 1, and 13; and the anterior ginglymus *g* of Figs. 2, 3, etc., is received into a niche or incision in the lateral margin of the postclypeus *pc* as is shown in Figs. 3 and 1, where the incision is labeled *ct*. The ginglymus *g* of Figs. 2 and 3 is likewise grooved, and fits over a ridge (clypeothecal ridge) near the incision *ct* which receives the projecting ginglymus, *g*. The epignath, or lateral prominence *ep* of the mandible (see Fig. 2), dips beneath the basimandibular sclerite *bm* of Fig. 1, when the mandible is opened (see also Fig. 5) and its tendon *et* extends dorsad on the mesal side of the anterior arm of the tentorium labeled *pt* in Fig. 3. If a line is drawn between the points labeled *g* and *h* in Fig. 2, it will be seen that the point of attachment of the extensor tendon *et* borne on the prominence *ep*, lies outside of, or lateral to this line between *g* and *h* (compare Fig. 4), so that when the mandible rocks or pivots on the points *g* and *h*, a pull exerted at the point *ep* of Fig. 2 would open the mandible; and since the muscle opening the mandible need not be very powerful, the tendon attached at this point is a slender one. When the mandible pivots on the points *g* and *h* of Fig. 2, and a pull is exerted at the point *gn*, the mandible would be closed; and since the closing muscles must be very powerful for chewing food, etc., the flexor tendon *ft* exerting a pull at *gn* is a hugely developed tendon (see also Fig. 4). As is shown in Fig. 4, the flexor tendon *ft* is not attached directly to the mandible itself, but is borne on a sclerite-like structure, the gnathite *gn*, which is itself attached to the mandible by a membrane.

In describing the parts of the maxilla, I have employed the terminology used in a paper in which the maxillæ were compared throughout all of the orders of insects (Crampton, 1923); and I would again call attention to the homologies pointed out in this paper, since the facts brought out in the article in question are completely ignored by recent entomologists who misinterpret the basal region of the stipes for the entire stipes in the Coleoptera, and misidentify the parastipes of Orthopteroid insects with the so-called subgalea described by coleopterists who mistook the inflexed edges of underlying sclerites for

sutures in the plates situated above them in balsam mounts of maxillæ, and applied the designation subgalea to a supposed area situated below the galea (or in reality dorsal to the galea) wholly different from the parastipes here described. Since there is not space here for a full discussion of the parts in different insects, the reader is referred to the above-mentioned article for a comparison of the parts in different insects, and the reasons for the views concerning the homologies here accepted.

In Fig. 13 is shown a posterior view of the insect's right or dextral maxilla. The basimaxillary membrane, labeled *b*, connects the maxilla with the labium (and with the hypopharyngeal region). The basal segment or cardo is divided by the cardinal suture, *cds* of Figs. 10 and 13, into a basicardo *bc* and disticardo *dc*. An internal ridge or endocardo, *ec* of Fig. 8, corresponding to the external cardinal suture, extends along the inner face of the cardo and serves to strengthen the cardo and likewise offers a point of attachment to certain of the muscles inserted upon the inner surface of the cardo. The cardoprocess, *cp* of Figs. 8 and 10, is an inner process to which the cardo tendon *ctn* is attached. This tendon enables the extensor or opening muscles of the maxilla to exert a pull at the point *cp*, while the region under the process, labeled *d* in Fig. 10, serves as a fulcrum or pivotal point in opening the maxilla. The process, labeled *d* in Figs. 10 and 8, rides over the ridge *pap* of Fig. 12, while the process *cp* lies on the inner side of the ridge *pap*, so that the process *cp* of Fig. 10 is not visible from the exterior, while the process *d* of Fig. 10 is visible from the exterior, as is shown in Fig. 13.

The endostipes *est* of Fig. 8 is an internal ridge which serves to strengthen the walls of the stipes, and furnishes attachment for certain of the muscles which serve to close the maxilla, or to draw it toward the labium. The endostipes *est* of Fig. 8 corresponds to the external parastipital suture which demarks the parastipes *ps* of Fig. 13. The parastipes *ps* is not homologous with the so-called subgalea, although MacGillivray and others have mistakenly supposed that these two sclerites are the same. In many Coleoptera, Dermaptera, certain Gryllotalpids, etc., the stipes *s* of Fig. 13 is divided into a basal region and a distal region *ds*, but in *Stenopelmatus* the basal region is not demarked, although the distal region *ds* is faintly

demarked by a somewhat indistinct suture. The region *ds* is external to the point of attachment of the laciniatendon *lt* of Fig. 8, or the internal tendon attached to the base of the lacinia *la*. When this tendon exerts a pull upon the lacinia the lacinia apparently pivots upon the end of the endostipital ridge *est* of Fig. 8, although the lacinia does not seem to be very mobile. An anterior view of the lacinia is shown in Fig. 9, in which the tooth-like processes of the lacinia are labeled *ld*, the lacinia-mobilis-like process is labeled *lii*, and the lacinial fringe is labeled *gf*. The basigalea *bg* and distigalea *dg*, or basal and distal segments of the galea, are more clearly demarked in the anterior region shown in Fig. 9 than in the posterior region shown in Fig. 13. The palpifer *pf* of Fig. 13 is fairly clearly demarked, and the maxillary palpus *mp* which it bears is composed of the five segments typical of lower insects. The fifth segment bears a sensory area which is stippled in Fig. 13.

The labium is shown in Fig. 13. The glossæ *gl* are fairly well developed, and the glossæ with the paraglossæ *pgl* are borne on the glossigers *gg*, which in turn are borne at the distal ends of the sclerites *li*, which represent the labial stipites, while the glossæ and paraglossæ represent the lacinia and galæ of the labium. Basolaterad of the sclerites *li* are the palpigers *pg*, which correspond to the maxillary palpifers and bear the palpi *lp* which are reduced to three segments in the labium of Orthopteroid insects. The sclerites representing the maxillary cardines are vestigial, although some investigators maintain that the mentum *mn* represents the united cardines, while others think that the cardines are represented by the submental region. The mentum *mn* is distinct and quite well developed in *Stenopelmatus*, and is somewhat suggestive of the mentum of a cricket. The submentum *sm* and gula *gu*, though differing in color, are merely regions of a single plate in most Orthopteroid insects, and the gula *gu* is not united with the head capsule in *Stenopelmatus*, although the gular pits *gp* of Fig. 12 are situated near the gula *gu*. The gular pits *gp* are the mouths of the invaginations forming the posterior arms of the tentorium presently to be described. The postgular plate *pgu* of Fig. 13 is a ventral cervical plate, which will be described in discussing the neck region of *Stenopelmatus*.

In Fig. 6 the labium has been removed and the parts of the tentorium are shown as though cleared of the muscles and other concealing structures, which were removed by boiling in 10 per cent caustic potash. The gular pits, which were mentioned above, are labeled *gp* in Fig. 6. The invaginations from the gular pits form the posterior arms of the tentorium, which unite to form the eutentorium or body of the tentorium, labeled *eu* in Fig. 6, and they also form the posterior arch, labeled *p* in Fig. 6. Behind the arch *p* are the two posterior processes, labeled *pop*, which bear the posttentorial tendons, labeled *pot*. A deep emargination or incision, labeled *nf* in Fig. 6, forms the neural incision, which apparently corresponds to the neuroforamen of the roach, etc. (see description by Crampton, 1925). The anterior arms of the tentorium, labeled *pt* in Fig. 6, extend backward from the frontal pits, *fp* of Fig. 5, and give off the dorsal arms of the tentorium, labeled *st* in Fig. 6. At the distal ends of the structures, labeled *st*, are borne the delicate structures, labeled *dt* in Fig. 6, which are apparently distal portions of the dorsal arms of the tentorium.

The hypopharynx *hp* is shown in Fig. 15. The hypopharynx of *Stenopelmatus*, like that of the roach figured by Crampton (1925), is composed of a distal region *dl*, or distilingua, and a basal region *bl*, or basilingua. The salivary glands, which are not shown in Fig. 15, open in the ventrobasal region of the basilingua, *bl*. The slender sclerite, labeled *ll* in Fig. 15, apparently corresponds to the sclerite called the lingualora in the roach, and the sclerite, labeled *pl*, corresponds to that called the linguatendon in the roach. Since the sclerite *pl* is not exactly a tendon, it is preferable to refer to it as the postlingua in *Stenopelmatus*. The dorsal portion of the base of the hypopharynx, labeled *sl* in Fig. 15, lies below the posterior epipharyngeal region, labeled *poe* in Fig. 15.

The regions labeled *poe* and *pre* in Fig. 15 are the posterior and anterior regions of the epipharynx or portion of the roof of the mouth. The posterior region *poe* is situated in the clypeal area, while the anterior region *pre* is situated in the labral area. In Fig. 7 these areas of the epipharynx are shown in an inner or buccal (pharyngeal) view of the labrum and clypeal region. The tormæ *to* of Fig. 7 demark the labrum from the

clypeus in this view. A narrow transverse sclerite *it* extends between the tormæ *to* and serves to demark the anterior epipharyngeal region *pre* from the posterior epipharyngeal region *poe*.

In discussing the relation of the maxilla to the underlip, it should have been mentioned that the distal margin of the maxillary membrane *b* merges into the distal margin of the submentum *sm*, as shown in Fig. 13. The attachment of the basimaxillary membrane *b* may therefore be taken as a landmark for demarking the distal limits of the submentum in *Stenopelmatus* and certain other insects. In higher insects, however, this criterion for determining the distal limits of the submental region does not hold good, so that this feature is not of universal application (see discussion by Crampton, 1928).

The external anatomy of the thoracic and abdominal regions will be discussed in another paper, since it is possible to devote more space to the description of the parts, and more plates to illustrating the anatomical details of the various regions, if these are treated in a series of papers, instead of trying to include the descriptions of all of the main external features of *Stenopelmatus* in a single paper.

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ABBREVIATIONS

- | | |
|-----------------------------------|--------------------------------------|
| ac. Anteclypeus | ec. Endocardo |
| af. Antennifer | eg. Endognath |
| an. Antennale | eo. Endoccipt |
| ant. Antenna | eoc. Euoccipt or surocciput |
| b. Basimaxillary membrane | eot. Euoccipital tendon |
| bc. Basicardo | ep. Epignath or extensor prominence |
| bd. Broad dolichomeres of antenna | es. Epistomal suture |
| bg. Basigalea | esp. Endostipital process |
| bgl. Basiglossa | est. Endostipes |
| bl. Basilingua | et. Extensor tendon |
| bm. Basimandibulare | eu. Eutentorium or body of tentorium |
| bmm. Basimandibular membrane | f. Frons or front |
| br. Brustia | fp. Frontal pits or clefts |
| bs. Basiscape | fs. Frontal sutures |
| c. Clypeus. | ft. Flexor tendon |
| cds. Cardosuture | g. Ginglymus |
| cp. Cardoprocess | ga. Gnathapex |
| cs. Coronal suture | ge. Gena |
| ct. Clypeotheca | gf. Laciniafimbrium |
| ctn. Cardotendon | gg. Glossiger (basiglossa) |
| d. Epicardo | gl. Glossa |
| dc. Disticardo | gn. Gnathite |
| dg. Distigalea | gp. Gular pits. |
| dl. Distilingua | gs. Gnathal suture or impress |
| ds. Dististipes | gu. Gula |
| dt. Distitentorium | h. Gnathocondyle or hypocondyle |
| e. Compound eye | |

hp. Hypopharynx	pf. Palpifer
id. Intermediate dolichomeres of antenna	pg. Palpiger
it. Intertorma	pga. Postgenal acetabulum
l. Labrum	pge. Postgenæ
la. Lacinia	pgl. Paraglossæ
lb. Long brachymeres of antenna	pgs. Postgenal suture
ld. Laciniadentes	pgt. Paraglossal tendon
li. Labiites or labial stipites	pgu. Postgulare
lii. Lacinula	pl. Postlingua or "linguatendon"
li. Lingualora	po. Parocciput
lp. Labial palpus	poe. Postepipharynx
lt. Laciniatendon	pop. Posttentorial process
m. Mola	pot. Posttentorial tendon
md. Mandible	pp. Postgenal process
mn. Mentum	ppd. Postpedicel
mp. Maxillary palpus	pre. Preepipharynx
nf. Neuroforamen or neural incision	ps. Parastipes
occ. Occipital condyles	pss. Parastipital suture
ocf. Occipital foramen or foramen magnum	pst. Parastomium
p. Tentorial arch or trabecula	pt. Pretentorium
pa. Parietalia	s. Stipes.
pap. Paragular or paroccipital process	sb. Short brachymeres of antenna
pat. Paroccipital tendons	sc. Scape
pc. Postclypeus or epistoma	sd. Slender dolichomeres of antenna
pd. Pedicel	sl. Dorsolingua (surlingua)
	st. Supratentorium
	te. Tempora
	to. Tormæ

EXPLANATION OF PLATES

Fig. 1—Lateral view of sinistral mandible, clypeus and labrum; Fig. 2—Dorsal view of base of sinistral mandible; Fig. 3—Lateral view of base of mandible and neighboring parts; Fig. 4—Posterior view of sinistral mandible; Fig. 5—Frontal view of head; Fig. 6—Posterior view of tentorium and neighboring parts; Fig. 7—Inner or buccal view of labrum and clypeus; Fig. 8—Inner surface of cardo and stipes; Fig. 9—Anterior view of lacinia and galea; Fig. 10—Basal portion of dextral maxilla (posterior view); Fig. 11—Parts of antenna; Fig. 12—Posterior view of region at base of gular plate; Fig. 13—Posterior view of back of head; Fig. 14—Anterior view of glossæ and paraglossæ; Fig. 15—Lateral view of hypopharynx and upper and lower lip, with most of the head capsule removed.

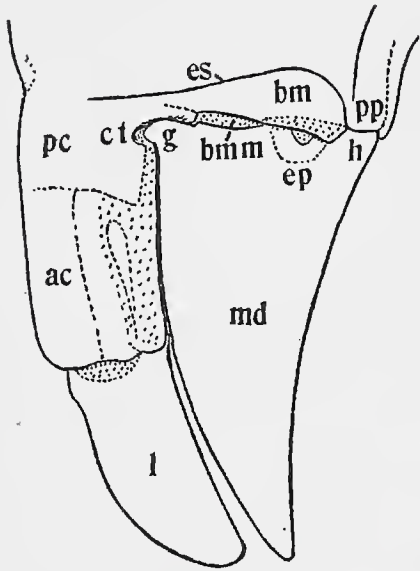


Fig. 1

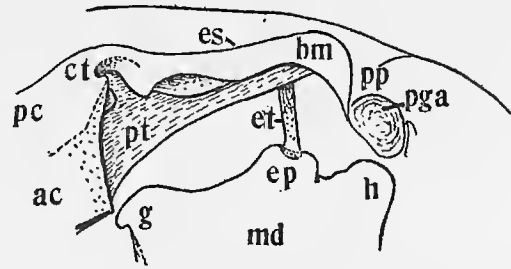


Fig. 3

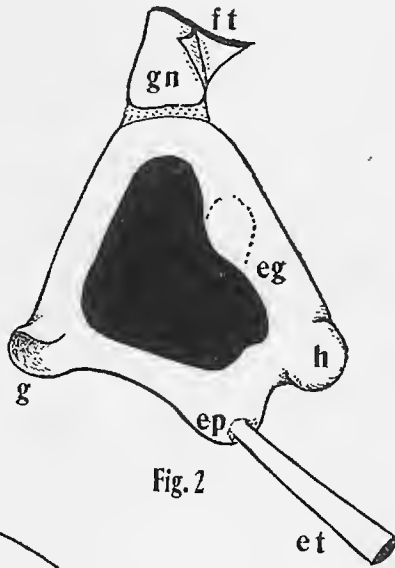


Fig. 2

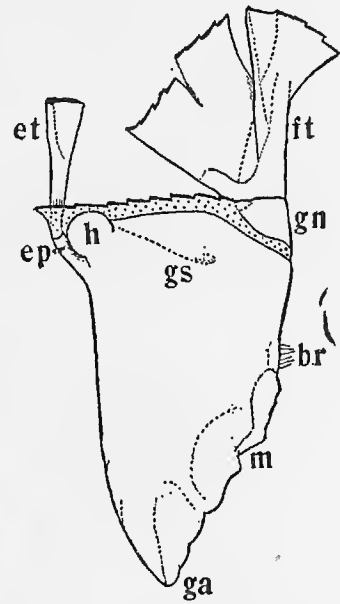


Fig. 4

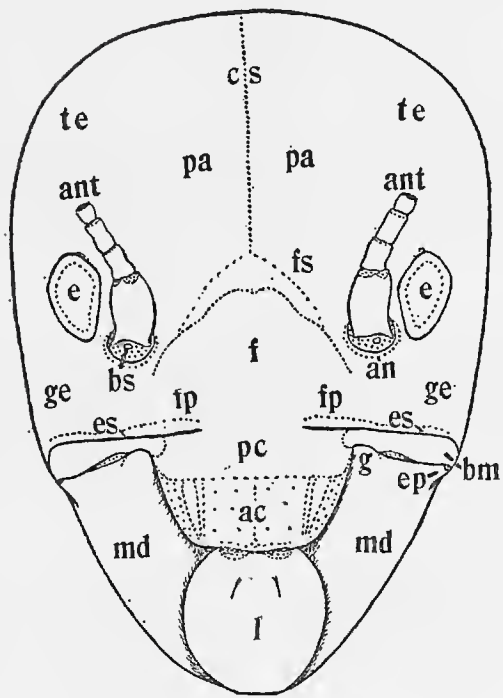


Fig. 5

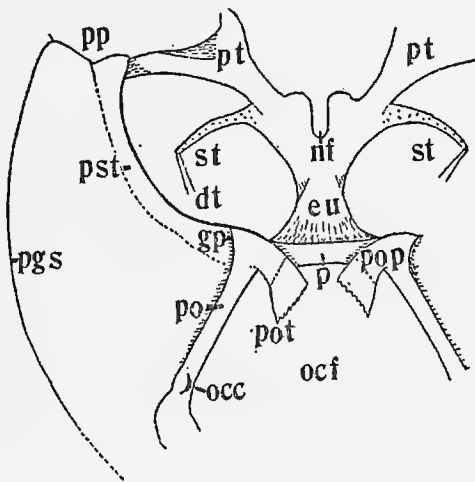
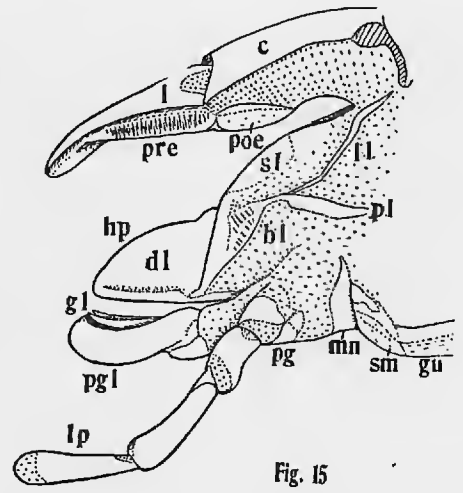
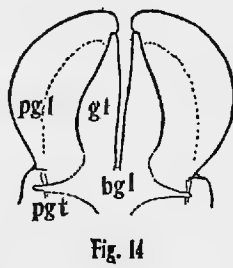
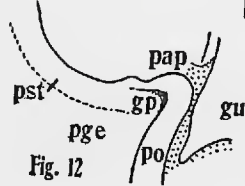
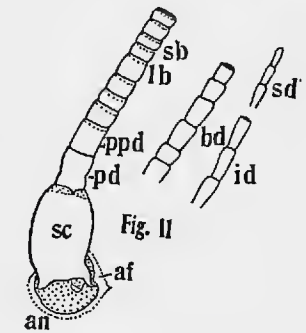
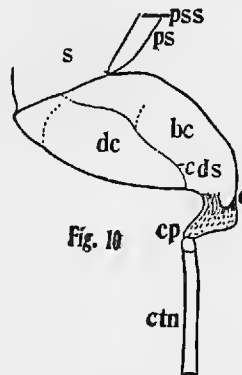
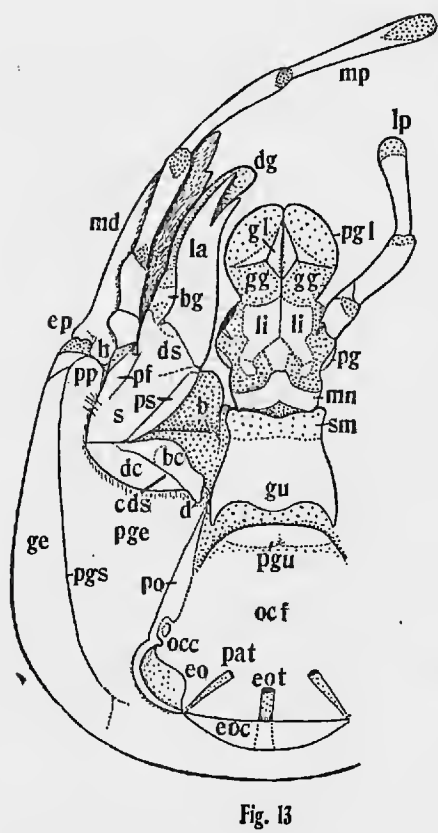
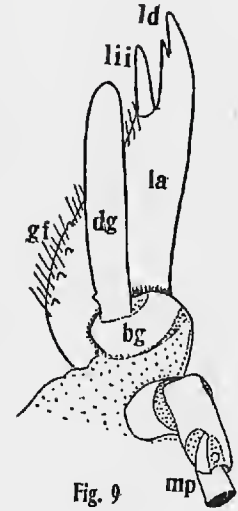
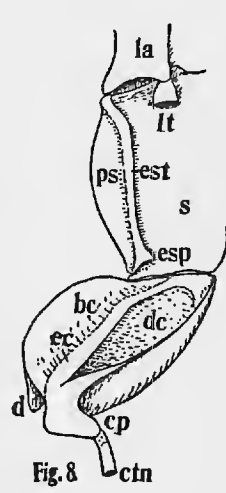
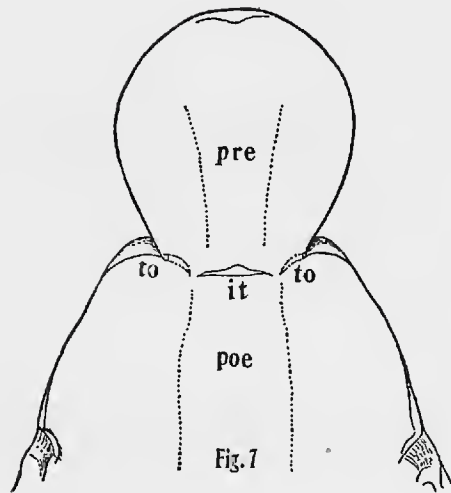


Fig. 6

Crampton. Head structures of *Stenopelmatus*. For explanation see page 108.



Crampton. Head structures of *Stenopelmatus*. For explanation see page 108.

ON SOME CENTIPEDS AND MILLIPEDS FROM
UTAH AND ARIZONA

BY RALPH V. CHAMBERLIN

University of Utah

These notes are based chiefly upon material collected in the course of a field trip from the Department of Zoölogy of the University of Utah to the western side of the Henry Mountains during September, 1929. Collections were made *en route* at several points, such as at Fish Lake, in Sevier County, and at the Neff ranch in Horse Valley, Wayne County. A few forms from other localities, such as Flagstaff and the Kaibab Forest, Arizona, and St. George, Utah, are also included.

CHILOPODA

LAMYCTES FULVICORNIS Meinert

Utah: Capitol Wash, Wayne County. One specimen 9 mm. long was taken by W. Gertsch on September 12.

The specimen lacks the anal legs, but agrees so closely in other features that little doubt can exist as to its identity.

OABIUS PIUTUS Chamberlin

Utah: Horse Valley, Wayne County. One male.

This species was taken originally at Parowan in Iron County.

POKABIUS UTAHENSIS (Chamberlin)

Utah: Fish Lake, Sevier County (September 4 and 5); Butterfield Canyon, Salt Lake County (May, 1929).

This species is abundant at both these places under fallen leaves, etc., along the stream courses. It is one of the commonest chilopods in the state.

Pokabius pedus Chamberlin, new species

A species of *Pokabius* sens. str. which resembles *P. utahensis* in having only the last pair of coxæ laterally armed. It is a larger form most readily distinguished in the male by the form of the anal legs. In these the fourth joint is widely longitudinally furrowed above with the mesal side of this furrow limited by a ridge which at its proximal end is produced dorsomesad into a process much as in *P. gilæ*, but the process is longer and distally narrower. Unlike *P. utahensis* and *P. gilæ* the third joint is not produced at its distal end opposite to or continuously with the process of the fourth joint. Anal legs with dorsal spines 1, 0, 3, 1, 0; ventral spines,

0, 1, 3, 2, 0; coxa also laterally armed. Penult legs with dorsal spines 1, 0, 2, 1, 1; ventral spines, 0, 1, 3, 3, 2, with three claws. Coxal pores, 2, 2, 2, 2. Ocelli few, in two series; e. g., 1 + 4, 3, the single ocellus close to the others.

Color of dorsum light brown, the last tergite and the frontal region of head lighter; legs and antennæ yellow.

Length, 11.5 mm. (male holotype).

Utah: St. George, Washington County. One male taken April 3, 1929, by Lowell Woodbury.

LOPHOBIUS FRANCISCÆ Chamberlin

Utah: Fish Lake and Burrville, Sevier County (September 5 and 6); Panguich, Garfield County (A. M. Myers collection); Henry Mountains, Wayne and Garfield counties.

This species seems to be abundant at all these places. In the specimens from Fish Lake it was noted that the ventral spines of the anal legs are either 0, 1, 3, 2, 1 or 0, 1, 3, 2, 0, the latter formula being more frequent than in the type specimens from Cedar City. It is plentiful in the Henry Mountains, above King's ranch, at the level of the yellow pines (e. g., at Pine Springs).

LOPHOBIUS COLLIUM Chamberlin

Utah: Fish Lake (September 5), and Fruita (September 14), Wayne County; Horse Valley and near Loa (September 6), Wayne County; Henry Mountains, especially at level of the quaking aspens (September 10 and 11), Garfield County. Abundant at all these places.

This species is common from Salt Lake County southward as far as Bluff, San Juan County, especially under stones over the open foothills and other nonwooded places.

ANOBIUS CENTURIO (Chamberlin)

Utah: Henry Mountains, at King's ranch, base of mountains. Common. Previously reported from San Juan County, Utah, and New Mexico (type locality).

BOTHROPOLYS PERMUNDUS Chamberlin

Utah: Butterfield Canyon, Salt Lake County. Found common in May, 1929.

Common in canyons of the Wasatch Mountains, especially in the northern part of the state. It seems to be replaced

farther south, as in Wayne County, by the next species, *Archethopolys parowanus*.

ARCHETHOPOLYS PAROWANUS Chamberlin

Utah: Fish Lake, Sevier County; Henry Mountains, at several localities (e. g., Pine Springs, Willow Springs, and other points above King's ranch).

Apparently common in favorable places in Wayne and Garfield counties, where it is undoubtedly the prevalent large lithobioid.

Archethopolys kaibabus Chamberlin, new species

A species closely related to *A. gosobius* occurring in San Juan County, but much smaller in size and typically with only a single prosternal tooth ectad of the diastemal seta instead of three or four, the dental formula in the holotype being 1-6 + 6-1. In thus having but a single tooth ectad of the diastema the species agrees with *A. parowanus*, but the latter species has the claw of the genital forceps of the female entire, whereas in the present species the claw is tripartite, with the basal spines 3 + 3. Last two pairs of coxæ armed ventrally and laterally. Ventral spines of anal legs, 1, 1, 3, 3, 2, the claw armed with two straight spines at base. Ocelli in a narrowly elongate patch, arranged in three series; thus, 1 + 6, 5, 2. Antennæ consisting of twenty articles, moderate in length, reaching upon the sixth dorsal plate.

Length, 18 mm., or a little less.

Arizona: Kaibab Forest, not far from the Utah border. One female (holotype) and a male lacking anal legs, collected by Lowell Woodbury on July 7, 1929.

The species of this group (*Archethopolys*) now known from Utah and the adjacent parts of Arizona may be separated by means of the following key.

- a. Normally with two or more teeth ectad of diastemal bristle on the prosternal margin.
 - b. Ventral spines of anal legs, 1, 1, 3, 2, 1; ectal teeth of prosternum on each side, normally, two.....
.....*A. bipunctatus* (Wood)
 - bb. Ventral spines of anal legs, 1, 1, 3, 2, 0; ectal teeth on each side of prosternum, normally, three or four.....
.....*A. gosobius* Chamberlin
- aa. Normally with only one tooth ectad of diastemal bristle on each side of prosternum.
 - b. Claw of genital forceps of female entire, acute; length, 21 mm. and above.....*A. parowanus* Chamberlin
 - bb. Claw of genital forceps of female more blunt, tripartite; length, 18 mm.....*A. kaibabus*, new species

LINOETÆNIA CHIONOPHILA (Wood)

Mill Creek Canyon, Salt Lake County (August, 1929); Butterfield Canyon, Salt Lake County (May, 1929); Fruita, Wayne County; Henry Mountains, Garfield County (e. g., at Willow Springs and Pine Springs, September 10 and 11, 1929).

This species, common in Canada, Alaska, etc., is distributed throughout Utah in the mountains, especially at middle and upper elevations.

GEOPHILUS GLYPTUS Chamberlin

Utah: Butterfield Canyon, Oquirrh Mountains, Salt Lake County (May, 1929).

This species was described originally from the Wasatch Mountains, Salt Lake County, and is also known from the State of Washington.

Geophilus pedus Chamberlin, new species

A species resembling *G. rubens* Say in having the frontal plate discrete, the prebasal plate exposed, the last ventral plate very wide, with two pits on each anal coxa covered by the last ventral plate. It differs from that species, among other points, in having the spiracles, excepting the last few, elliptic in shape instead of circular, with the first two on each side much larger than the third, the second not being much smaller than the first; in having the ventral pores in a band along caudal border of plate strongly developed, this band extending forward angularly at middle line; and in having the number of pairs of legs much greater, seventy-nine in the holotype. Dorsum lacking the geminate dark band showing typically in *G. rubens*.

Length, 75 mm.

Utah: **St. George.** One male taken by Lowell Woodbury, April 3, 1929.

GEOPHILUS FRUITANUS Chamberlin

Utah: Horse Valley, Wayne County. One female.

Like the holotype, which was taken at Fruita, Wayne County, in May, 1928, the present specimen has fifty-seven pairs of legs.

GNATHOMERIUM XENOPORUS (Chamberlin)

Utah: Butterfield Canyon (May, 1929), and Mill Creek Canyon (August, 1929), Salt Lake County; Fish Lake and Burrville (September 4 and 6), Sevier County; Horse Valley (September), and Fruita, Wayne County; Panguich (A. M. Myers) and Henry Mountains (Willow Springs, Pine Springs

and at level of quaking aspens, September 10 and 11), Garfield County.

This species in Salt Lake County and other northern sections of the state on the average has fewer pairs of legs (forty-five to forty-nine) than those represented by the present collection from more southern localities. In the latter the pairs of legs range from forty-nine to fifty-three.

Navajona Chamberlin, new genus

Frontal suture absent. Prebasal plate covered. Dorsal plates bisulcate. Antennæ short and filiform. A single clypeal area present, this small and finely areolated. Labrum free, with the lateral pieces meeting at the middle line, fringed throughout with long spinescent processes. Outer branch of first maxillæ distinctly biarticulate, each bearing two membranous lappets of which the distal one, in the holotype, is the larger. Inner branch undivided, set off by a suture which may be in part indistinct. Coxæ completely fused. Coxæ of the second maxillæ weakly united at middle by a more membranous isthmus; pleurosternal sutures strongly developed; the pore opening mesad of anterior end of suture through edge of sclerite; palpus triarticulate, terminating in a simple claw, none of the joints with processes.

Prehensors large, exposed at sides and projecting beyond front margin of the head. Claw armed at base; femuroid armed distally and the intermediate joints armed with weaker teeth or bosses. Prosternum without chitinous lines; anterior margin unarmed. Ventral pores absent. Anterior spiracles elliptic. Last ventral plate wide. Coxopleuræ but little inflated. Pores small and few in number. Anal pores well developed. Anal legs clawless, consisting of only five joints distad of coxæ.

Genotype. *Navajona miuropus*, new species.

This genus differs from all other chilenophiloid genera in having only five articles in the anal legs distad of the coxæ. It may be placed with reference to the other known North American genera of the group by means of the following key.

Key to North American Genera of the Chilenophilidæ

- a. Anal legs with an additional article replacing the claw.
 - b. Coxæ of second maxillæ broadly and completely fused
.....*Telocricus* Chamberlin
 - bb. Coxæ of second maxillæ separated or at most weakly
united by a membranous isthmus.....
.....*Watophilus* Chamberlin
- aa. Anal legs without such additional article, having only five or
six articles beyond coxopleuræ; either with or without
claws.

- b. Lateral pieces of labrum overlapping the median piece and meeting at middle line.
- c. Anal legs with six articles beyond coxopleuræ and bearing claws.
 - d. No clypeal area present.....*Gnathomerium* Ribaut
 - dd. A clypeal area present.....*Cryophilus* Chamberlin
- cc. Anal legs with only five articles beyond coxopleura, clawless.....*Navajona*, new genus
- bb. Lateral pieces of labrum not in contact at median line, more or less widely separated by middle piece.
 - c. No ventral pores present.....*Taiyuna* Chamberlin
 - cc. Ventral pores in four areas.....*Nesidiphilus* Chamberlin

***Navajona miuropus* Chamberlin new species**

Body yellowish. Cephalic plate longer than wide nearly in ratio 3:2, a little wider anteriorly than posteriorly; lateral margins at middle nearly straight, but the corners well rounded (see figure); anterior margin somewhat arcuate; caudal margin nearly straight or very slightly convex. Basal plate a little overlapped anteriorly by the cephalic, its exposed area wider than long in the ratio 2.25:1.

Claws of prehensors when closed attaining anterior end of first antennal article. Claw armed at base with a tooth of moderate size. Femuroid armed near distal end with a rounded, somewhat distally directed, tooth. The intermediate joints each with a small, rounded nodular tooth or boss. Anterior margin of prosternum unarmed, mesally emarginate. Prosternum nearly equal in length and breadth. Median length 1.7 times greater than length of femuroid on its ectal side. Paired sulci of tergites deeply impressed. Anterior ventral plates with a deeply impressed median longitudinal sulcus, this becoming shallower toward posterior region and finally disappearing. No ventral pores detected. Anterior spiracles vertically elliptic, the first abruptly much larger than the second; those of middle and posterior regions circular. First legs much smaller than the second. Last ventral plate broad, narrowed caudad (trapeziform); the caudal margin shallowly incurved mesally; sides convex, converging more strongly over posterior part of length than over anterior. Pores of coxæ simple, small, few in number, six or seven arranged in a circular line with mesal two or three covered by last ventral plate. Anal legs somewhat crassate, thickest near middle of length, the last article distally rounded, wholly lacking any trace of claw. Anal pores conspicuous. Pairs of legs in holotype, fifty-one. Length, 30 mm.

Arizona: Flagstaff. One male taken in May, 1929.

SCOLOPENDRA POLYMORPHA Wood

Utah: Fruita and Horse Valley, Wayne County; Henry Mountains, at and near King's ranch. Common.

This species is distributed throughout Utah as far north as Salt Lake County. The specimens from the northern part of

the state are smaller and less brightly colored than those from the south. The Wayne, Garfield County, specimens are large and have the tergites conspicuously banded across the posterior borders as in typical Arizona and California specimens.

DIPLOPODA

PARAJULUS TIGANUS Chamberlin

Utah: Mill Creek and Butterfield canyons, Salt Lake County (August and May, 1929); Fish Lake, Sevier County (September 4 and 6).

Undoubtedly the most abundant member of the genus in the state.

PARAJULUS PAIUTUS Chamberlin

Utah: Fish Lake, Sevier County; Weber Canyon, Summit County, where it occurs along with the commoner *P. tiganus*.

Previously known from Parowan and Cedar City, Iron County, and Zion National Park, Washington County.

PARAJULUS sp.

Utah: Henry Mountains, Garfield County.

Specimens of a species of *Parajulus* were collected in the Henry Mountains at Willow Springs and other points, but the vials containing them have been misplaced or lost. Only one specimen, a not fully mature male is available at this time.

Piedolus Chamberlin, new genus

Related to *Atopetholus* and allied spiroboloid genera of the southeastern United States. It is like *Atopetholus* in having the first three pairs of legs crassate in the male; but the claws are not disproportionately enlarged or hypertrophied, being obviously shorter than the last tarsal joint, the next three pairs of legs less crassate, and all others normal. Unlike *Atopetholus*, it has the coxæ of the third legs with processes much more developed than in the following legs, these processes being chitinous, smooth falcate or subuncate blades. Coxæ of fourth, fifth and sixth legs compressed in the caudo-cephalic direction, and projecting ventrad at ends but little. Collum with lateral ends acute, and with anterior margin incurved on each side opposite level of eye. Anal valves with mesal margins meeting in a groove, not compressed or elevated.

Telopodite of anterior gonopods exceeding the coxal plate, a little produced at mesodistal angle. Posterior gonopods with telopodite furcate or biramous, the branch carrying the duct slender, the other laminate.

Genotype. *Piedolus utus* Chamberlin.

***Piedolus utus* Chamberlin, new species**

Color in general deep brown or almost black, the segments lighter beneath; head and anal segments uniform in color except for a median pale line above clypeal incision; legs and antennæ concolorous with body.

Clypeal foveolæ 5 + 5. Median sulcus extending across vertex and down to level of antennæ where it is furcate, the divergent branches only obscurely impressed. Lower angle of collum on each side a little rounded; anterior border margined from the angle up to level opposite the eye.

Segments transversely constricted or furrowed in front of level of spiracles; smooth, scarcely at all sculptured, the surface caudad of constriction obscurely and very finely punctate. Anal valves inflated, not at all compressed, equaling the last dorsal plate. Last dorsal plate caudally widely rounded; transversely depressed near middle of length.

In the male the slender coxal processes of the third legs curve caudad to or just beyond the coxæ of the fifth legs. Gonopods as represented in the accompanying figure. Number of segments, 44. Length, about 30 mm.; diameter, 3 mm.

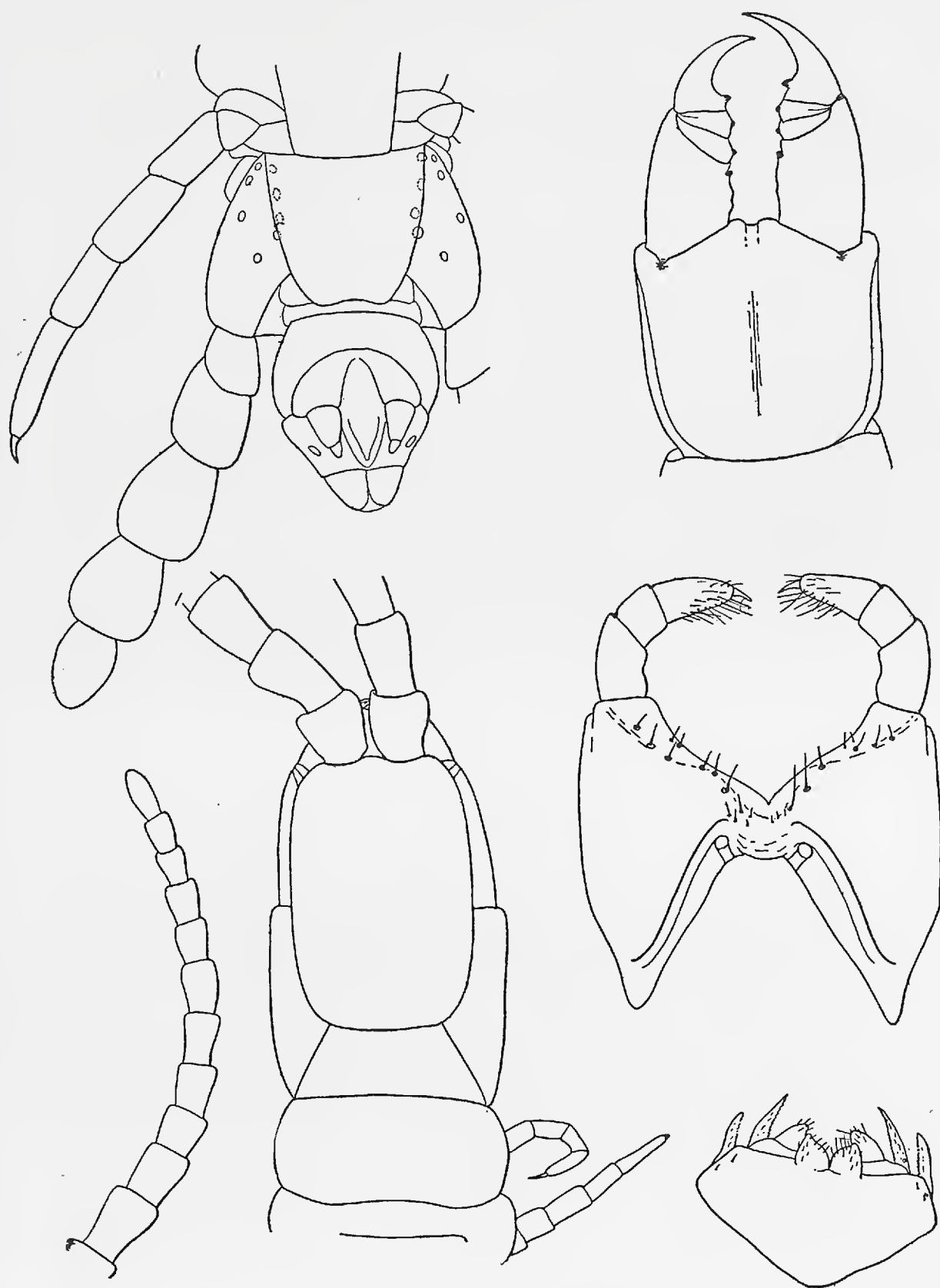
Utah: St. George. One male taken April 3, 1929, by Lowell Woodbury.

***Brachydesmus henriensis* Chamberlin, new species**

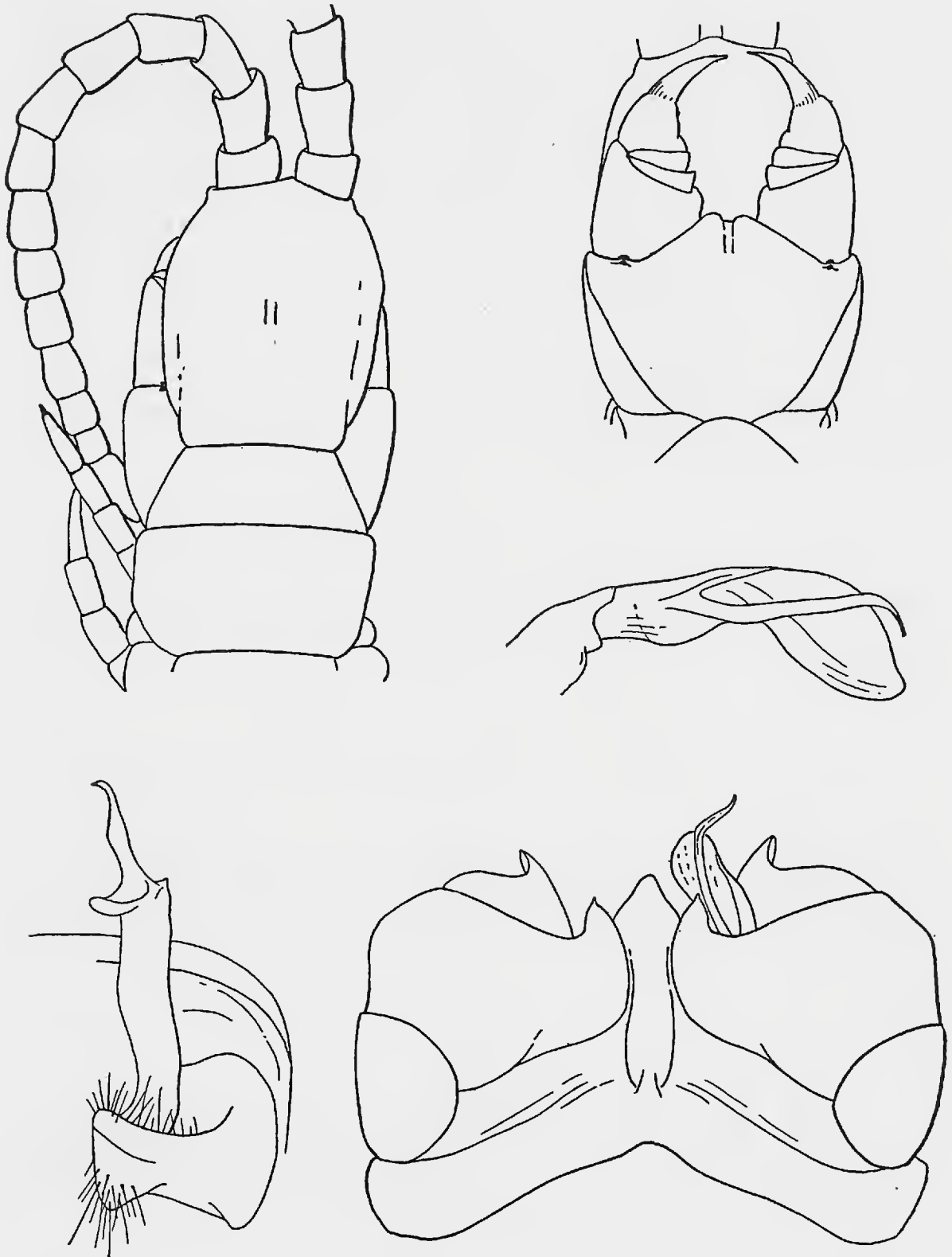
Typically the body is light brown above and over the sides; the venter, including basal joints of legs, lighter, yellowish or sometimes whitish. The head brown above, but in clypeal region and up to or a little above level of antennæ paler, yellowish. Legs light brown, the antennæ, except proximally, darker, the joints sometimes pale at distal ends.

Collum not quite as wide as head inclusive of cardines, and decidedly narrower than the second tergite; lateral and anterior margins together forming an even, subsemicircular curve, this margin with typically eighteen distinct, setigerous teeth.

In the other tergites the keels are nearly horizontal, the lateral ends of the most posterior ones a little upturned. Second tergite obviously wider than the head; keels bent forward; anterior margin of keel smooth; lateral margin with two large, setigerous teeth between a small one at anterior corner and a larger one at posterior corner; caudal margin of keel with two teeth. Keels of subsequent tergites more nearly transverse, those of middle and posterior regions entirely so; all with marginal teeth arranged as in the second. Anterior margins of keels from fourth to seventh with one or two minute serrations proximad of corner tooth. Keels of seventeenth and eighteenth tergites shortened and with caudal angles produced



Navajona miuropus, new species. Top figures: left, caudal end, ventral view (x 62); right, prehensors, ventral view (x 27). Middle figure: second maxillæ (x 62). Bottom figures: right, second maxillæ (x 62); middle, anterior end, dorsal view (x 27); left, last eleven articles of left antenna (x 27).



Top figures: Dorsal view of anterior end and ventral view of prehensors of *Geophilus fruitanus* Chamberlin (x 39). Middle figure: Telopodite of left posterior gonopod (x 40) of *Piedolus utus*, new species. Right figure at bottom, gonopods, anterior view (x 32). Left figure at bottom, left gonopod of male, subventral view, of *Brachydesmus henriensis*, new species (x 40).

moderately caudad of caudal margin of tergite. Tubercles of the three transverse rows well developed, all setigerous.

Gonopods of male conspicuously exposed. The telopodite bent forward in the excavation and then ventrocephalad between bases of legs of the preceding body segment. Basal segment of each gonopod swollen into a thick, rounded rampart ectad of excavation in which telopodite arises. Telopodite ending distally in a long, slightly sinuous or sigmoidal process which is acute distally, this terminal process with a minute tooth at base on subectal side and with a thin, rounded lamina on mesal side as shown in the accompanying figure.

Length, 12 mm.; width, 1.5 mm. (male holotype).

Utah: Henry Mountains, above King's ranch. Taken among rocks at level of the quaking aspens on slopes of Mount Ellen. Many specimens.

SPIROSTREPHON UTORUM Chamberlin

Utah: **St. George, Washington County**, one female taken April 3, 1929, by Lowell Woodbury.

Previously known from Emery, Wayne, and San Juan counties.

UNDERWOODIA TIDA Chamberlin

Utah: Butterfield Canyon, Oquirrh Mountains, Salt Lake County (May, 1929).

Many specimens, of which all but one are females. A similar disproportion of the sexes has been noted in other species of this genus. Described originally from Loga, Cache County.

TWO CORRECTIONS

On page 15 of this volume the name *Diceratothrips brevitubus* Moulton, n. sp., should read **Trybomia brevitubus** Moulton, n. sp.

On page 57 of this volume the Miscellaneous Studies in the Coleoptera, by Dr. Blaisdell, should have been Number Four instead of Number Three.

THE CORRECT NAMES OF CERTAIN SPECIES OF NORTH
AMERICAN MELOE (MELOIDÆ, COLEOPTERA)

Soon after the appearance of my paper,¹ dealing with the species of *Meloe* in this country, Mr. K. G. Blair of the British Museum informed me that we in America had apparently never properly understood certain of the species described by Leach and Kirby in spite of the fact that supposedly both LeConte and Horn had examined the types which are now in the British Museum. Mr. Blair very kindly sent me typical specimens compared with these types as well as carefully compared some of my specimens with the same. As a result of these careful comparisons we are forced to make the following changes in regard to the species listed in my work:

Meloe americanus Leach. (not *americanus* of American authors) = *Meloe moerens* LeConte, the latter an absolute synonym of the former.

Meloe impressus Kirby = *Meloe americanus* of my work and of American authors generally. The type of *impressus* is somewhat abnormal, having a very short prothorax; but it otherwise agrees. Inasmuch as this species is a very variable one, particularly as regards the proportions of the prothorax, both Mr. Blair and I agree that it is better to retain the name *impressus* for all of the variable forms of the more Eastern species rather than to limit the name to an abnormal form and coin a new subspecific name for the usual forms with the prothorax more elongate. My subspecies *occidentalis* will, therefore, rank as a subspecies of *impressus* Kirby.

Meloe niger Kirby = *Meloe impressus* of my work and of American authors generally. Mr. Blair found that the *niger* and *impressus* of Kirby were as indicated above, two very distinct species, not mere phases of one species as we have believed in this country.—Edwin V. Van Dyke.

¹ A reclassification of the genera of North American Meloidal (Coleoptera) and a revision of the genera and species placed in the tribe Meloini found in America north of Mexico, together with descriptions of new species. Univ. Calif. Publ. Entom., Vol. IV, No. 12, pp. 395-474, pl. 15-19 (1928).

THREE NEW DOLICHOPOIDS FROM CALIFORNIA
AND COLORADO (DIPTERA)

BY M. C. VAN DUZEE

*Buffalo, New York**Pelastoneurus latifacies* Van Duzee, new species

Male. Length, 5 mm. Face very wide, silvery white, the suture near the middle, upper part concave, lower part quite bulging and cut off straight at lower edge; palpi black, covered with white pollen; front velvety black along the orbits, opaque reddish brown in middle, which color extends to the orbits at vertex; antennæ and orbital cilia wholly black, arista feathered with rather stout, short hairs, which are about as long as longest hairs on second antennal joint.

Thorax and abdomen black, latter with coppery reflections and spots of white pollen on sides of segments, last segment wholly white pollinose; thorax with large triangles of white pollen at the sutures, but this pollen is not silvery; hypopygium large, black, its lamellæ black, somewhat oval, fringed with long hairs, the lowest of the inner appendages are a pair of rather slender, black, somewhat clavate organs with several long, stiff hairs at tip.

Coxæ, femora and tibiæ black, knees narrowly yellow; fore and middle femora with a row of black hairs below, those on anterior pair half, on middle ones one-fourth as long as width of femora; fore tarsi black above with white hairs, below yellow for half or more of their thickness; middle and hind tarsi wholly black; fore tibiæ and tarsi of equal length, joints of fore tarsi as 25, 16, 14, 12, 9; first two joints of hind tarsi as 43, 52. Calypters and halteres yellow, cilia of former black.

Wings almost hyaline, cross-vein and last section of fourth vein a little clouded with brown, the latter bent at or a little beyond basal third; apical part straight; third vein a very little bent back at tip; costa not enlarged.

Female. Face very wide, opaque golden brown, lower part narrowly white pollinose along the orbits, suture above the middle; front metallic, partly shining; thorax black with slight purple reflections; abdomen shining green with coppery reflections on posterior part of segments; all coxæ black; femora yellow, more or less blackened at extreme base, middle ones

with a row of black hairs below; middle and hind tibiæ sharply black at base; fore tarsi colored, as in the male; wings about as in the male but the brown cloud on fourth vein forms a small, indistinct spot at the bend; last section of fifth vein one and a half times as long as cross-vein.

Described from one pair, taken by the author, in 1926, holotype, male, at Lower Lake near Clear Lake, California, May 11; allotype, female, at Konocti Bay, Clear Lake, May 10.

Types in the author's collection.

Dolichopus subcostatus Van Duzee, new species

Male. Length, 5.5 mm. Face wide, white, very slightly yellowish, especially above; front shining blue green; antennæ yellow, third joint about as long as wide, largely blackish, obtusely pointed; lower orbital cilia yellowish, the black cilia descending, almost one-third of the eye height.

Dorsum of thorax green with blue reflections and with a median coppery vitta, also a little coppery along the sides. Abdomen coppery with green reflections on the sides; hypopygium black, its lamellæ rather large, somewhat oval, white with apical margin narrowly black, jagged and bristly.

Fore coxæ, femora and tibiæ wholly yellow; middle and hind coxæ yellow, blackened on outer surface; hind femora ciliated on middle half of lower posterior edge with yellow hairs, which are longer than width of femora; fore tarsi yellow, black from middle of third joint, third and fourth joints fringed above with long black hairs; middle and hind tarsi black from tip of first joint, middle basitarsi with a large bristle above at apical third. Calypters and halteres yellow, cilia of former black.

Wings grayish; costa deep black, distinctly thickened from just before the tip of first vein, gradually tapering to normal size, but rather strong to its tip; last section of fourth vein bent before its middle at a right angle, with a stump vein at the bend; upper bend also a right angle and scarcely at all rounded, third vein considerably bent back at tip, so as to approach fourth; last section of fifth vein a little longer than the cross-vein; anal angle of wing prominent.

Described from one male, taken by E. P. Van Duzee, June 17, 1929, at Big Pine, Inyo County, California. Holotype No. 2622, California Academy of Sciences.

This species belongs to the closely related group which includes *longipennis* Loew, *sarotes* Loew, *cuprinus* Wiederman, and *absonus* Van Duzee, Cole and Aldrich, all of which have the fore tarsi formed nearly alike, the last two also have the venation almost like this form; the fore tarsi are formed almost as in *cuprinus*. It differs from all these species in having the costa gradually tapering from the thickest part which is at tip of first vein, and, although the costa is fully as much thickened as in any of the other forms, it leaves the front line of costa straight; in the others where the costa is thickened it is a little bulged outward at the thickened part.

***Dolichopus nigroapicalis* Van Duzee, new species**

Male. Length, 4 mm. Face rather narrow, its sides parallel, face and palpi covered with yellow pollen, which is rather pale; front shining green with bronze reflections; antennæ yellow, rather long, third joint a little blackened above (the tip broken off in type); arista dorsal, black; lower orbital cilia yellow, the bristles blunt at tip.

Dorsum of thorax dark green, almost blackish, with coppery reflections, shining, a little dull when viewed obliquely. Abdomen shining, coppery, hairs black, sides with very little pollen; hypopygium black, of normal size, lamellæ oval, about as long as wide, with a short petiole at base; white with a black border; bristly and jagged at outer corner.

Fore coxæ wholly yellow with small black hairs; middle and hind coxæ black with narrow yellow tips; femora and tibiæ yellow, posterior tibiæ very narrowly but quite sharply black at tip; middle tibiæ very slender, base normal, upper surface with silvery pollen and with a narrow black line which does not reach the base and is wholly concealed by the silvery pollen when viewed obliquely (tip of the only middle tibia left on type is broken off); one bristle on upper anterior surface near base; fore tibiæ with one bristle on lower posterior surface near basal third and two large ones on upper anterior surface of basal third; hind tibiæ narrowly black at extreme tip, the black quite sharply defined, with one bristle at apical fourth of lower anterior surface; fore tarsi black from tip of first joint, hind ones wholly black; joints of fore tarsi as 37, 18, 14, 8, 7; first four joints of hind tarsi as 47, 40, 28, 18. Calypters yellow,

their cilia mostly black, but many of the hairs yellow; halteres yellow.

Wings grayish; veins dark brown, yellow at root of wing; third vein a little bent back at tip; last section of fourth vein bent quite sharply before its middle; last section of fifth vein twice as long as cross-vein.

Female. Face wide, gray pollinose; palpi yellow with black hair and one black bristle; antennæ yellow, third joint mostly blackish, about as long as wide, obtusely pointed; anterior and posterior tibiæ about as in the male; middle tibiæ normal, their tips slightly brownish, a large bristle near apical fourth of lower anterior surface and several bristles above; middle tarsi wholly black; venation of wings and body color about as in the male.

Described from one pair, taken by E. C. Van Dyke, July 13 and 14, 1926, at Longs Peak Inn, Colorado, 9000 feet elevation. Holotype, male, No. 2623, allotype, female, No. 2624, California Academy of Sciences.

DOCTOR HERBERT J. PACK

In the death of Doctor Herbert J. Pack, which occurred at Logan, Utah, January 5, 1930, the biologists of the State of Utah lost an energetic fellow worker and a genial friend. Born in 1893, he received his bachelor's degree at the Utah State Agricultural College in 1912, and his master's degree from the same institution in 1923. Following this, he attended Cornell University for two years, receiving the degree of Doctor of Philosophy in 1925. He returned to the Utah Agricultural Experiment Station as associate entomologist, and in 1926 was appointed station entomologist. For many years his principal interest was herpetology, in which field he published a number of papers. At the time of his death he was endeavoring to complete the work on several problems, the material for which was almost ready for publication, and plans are being made for the work to be finished and published at a later date. Doctor Pack was a member of the American Association of Economic Entomologists, Entomological Society of America, American Academy of Sciences, and the Utah Academy of Sciences.

OCCURRENCE OF THE WEEVIL PHYRDENUS
MURICEUS (GERM.) IN ARIZONA

BY HAROLD R. BRISLEY

Judging from the results of an infestation of this weevil in a field of eggplants (*Solanum melongena* L.) during the summer of 1929, I am confident that, should the species become established here, its ravages would prevent the growing of eggplant on a commercial scale, unless adequate control measures could be devised.

Specimens which I collected were sent to Dr. E. C. Van Dyke and Dr. H. C. Fall for identification. Through their efforts it was determined as the species mentioned above. Furthermore Dr. Van Dyke advises that this is the first report of the occurrence of the species in Arizona since Casey described it in 1892, under the name *Phyrdenus bullatus*. Later this was placed by Champion as a synonym of *Phyrdenus muriceus* (Germ.). Probably the only other specimens now in collections in this country are the Casey types. A somewhat extended description of the habits and results produced by the species should be of value in enabling other entomologists and field men to recognize this species when encountered.

The field in which I discovered the infestation is located on the banks of Oak Creek, a well-known trout stream in central Arizona, near the Page Fish Hatchery. About a dozen rows of eggplants were growing in a truck garden area. Adjacent to the eggplants were growing tomatoes, peppers, turnips, and several other varieties of truck crops. A close search revealed that none of the other varieties were infested, nor was the weed thorn apple (*Datura meteloides*), which is a close botanical relative of the eggplant and harbors many of the common eggplant insects.

August 2 was the first time that I saw the plot in question. The owner advised that the plants had been growing in a perfectly normal manner until about ten days prior to my visit. This statement was borne out by the size and general thrift of the planting. On this day about 25 per cent of the plants showed definite wilting and, after a month had elapsed, 75 per cent of the planting had been rendered worthless. On August 2 all stages of the insect transformation were present. The eggs

were found in the soil near the underground stem and close to the ground line. The white grubs were feeding on the roots to a depth of three inches, and many were partly buried in the tissue of the underground stems. The pupæ were in small earthen cells which would readily break open when the plant was uprooted. The adults are hard to find but were finally discovered at the base of the plants, feeding on the stems at the ground line. Their color is so like that of the earth that I passed over many of them without notice until I discovered that the small pebbles I was looking at were in reality the adult insects. The adults do not feed on the leaves, fruit, or stems above ground, as is usually the case with weevils whose young are root feeders, but limit their activities to the stem at the ground line. Their feeding punctures are relatively small and would probably cause little injury if not accompanied by the much more severe injury caused by the young. The effect on the plant is much more severe than in the case of the Jimson weed borer (*Trichobaris compacta* Casey), which is often found boring in the stems of eggplant in this locality. In the case of *Phyrdenus* the plants have more the appearance of gopher injury. It takes only about a week from the time that wilting is first apparent for the top to become dead and dry.

Observations would indicate that so far the infestation is very limited in extent. About one hundred yards distant was a field of about an acre of eggplants. I watched this area closely throughout the season and found no *Phyrdenus* infestation, though later in the year many plants were rendered worthless by the borings of *Trichobaris compacta*.

Phyrdenus appears to have only one brood each year, for on September 14 all larvæ, pupæ and live adults, had disappeared. The few adults found at the base of the plants were dead. No live adults were in evidence during the remainder of the season.

NOTES ON THE GENUS DIODYRHYNCHUS SCH.
WITH A DESCRIPTION OF A NEW SPECIES
(COLEOPTERA)

BY J. O. MARTIN

Berkeley, California

The genus *Diodyrhynchus* of Schœnherr¹ has remained since 1880² with but a single North American species (*byturoides* Lec.) which was described from the Sierra Nevada of California. From an examination of a series of nine males and eleven females of *byturoides*, all taken in the Sierras, and in the collection of the California Academy of Sciences, I record the following observations on the sexual characters in the above species. In the males the prothorax is noticeably narrower than the base of the elytra, while in the females it is fully as wide. The beak of the female is more curved and stouter than that of the male. The male thorax is widest at about the middle, while that of the female is widest at about the basal third and not at base as stated by Dr. Le Conte. The underside of the body of the females is piceous with the exception of the anal segment, while all of the males are testaceous above and below. In some instances the females are, with the exception of the prothorax, entirely black, but I have seen no males thus colored. The most important sexual difference is to be noted on the third and fourth abdominal segments on each of which are two large, shallow punctures or pits, one on each side of the median line, and from which extends a pointed brush of white hairs.

This genus may at once be separated from *Rhynomacer* by the way the beak joins the front. In *Rhynomacer* the front rises from the beak at a much greater angle. In *Diodyrhynchus* the front is in almost the same plane and only a slight sinuation marks the separation.

In the L. S. Slevin collection, recently presented to the Academy, I find a series of twenty-four specimens evidently belonging to this genus and representing an undescribed species. Mr. Slevin informs me that they were taken on the beach at Carmel, California, where they were washed up by the waves in company with numerous specimens of a species of *Rhyno-*

¹ Gen. Sp. Curc., 1833, Tome I, p. 240.

² Trans. Am. Ent. Soc., VII, 1880, p. 215.

macer. A majority of the specimens were taken in February, which is about the normal season for the Monterey pines to be in blossom, and I suspect that this species, like *Rhynomacer*, is a pine-blossom feeder and in flight falls into the water.

***Diodyrhynchus slevini* Martin, sp. nov.**

Elongate oblong-oval, convex, testaceous throughout except that in the female the thoracic and abdominal segments are piceous. Head obscurely, coarsely punctate with rather coarse long, white decumbent hairs on the front between the eyes which grow shorter, finer and more scattered toward the vertex; the punctuation of the beak is more definite, hairy on the sides but not on the upper surface which is flat and without grooves or carina, the beak is more quadrate in cross section than in *byturoides* and, like that species, the female beak is more curved. Eyes black, prominent, finely faceted. Prothorax rather coarsely and moderately punctate, less so on the disk, with long decumbent white hairs on the sides, becoming finer and more scattered toward the base; narrower than base of elytra in the male but fully as wide in the female, widest just before the middle in the male and at basal third in female, in which sex there is a slight longitudinal depression above the median line. On the female prothorax behind the eyes is an elevated area which extends downward along the border with blunt tooth-like granulations which vary considerably in size and shape in different specimens, the toothed portion being immediately behind the eyes. Elytra more densely punctate than the prothorax with long, white decumbent hairs on the sides becoming shorter and finer toward the suture; in the female there is a shallow, curved, oblique depression starting near the humeral angle and extending beyond basal third to the suture where it is broadest and deepest; this depression is present but less pronounced in the males. Sternum, abdomen and legs with sparse white decumbent hairs.

On the fourth abdominal segment of the male on the median line is a single large shallow pit or puncture with a pointed brush of white hairs, which is entirely lacking in the female. Length, 3 to 4 mm.

Type: Male, No. 2625, and allotype, female, No. 2626, in the collection of the California Academy of Sciences.

Diodyrhynchus slevini differs from *byturiodes* Lec. by its smaller size, its longer, coarser and more irregular hairs, as well as by the single abdominal brush in the male, and the roughened prothoracic area behind the eyes in the female which are not present in *byturoides*.

I take pleasure in dedicating this species to Mr. L. S. Slevin, whose careful collecting has done so much to make known the interesting insect fauna of the Monterey peninsula.

TWO NEW SPECIES OF VANDUZEEINA FROM
CALIFORNIA (SCUTELLERIDÆ, HEMIPT.)

BY R. L. USINGER

Oakland, California

The material used in the preparation of this paper was kindly loaned to me by Mr. E. P. Van Duzee from the collection of the California Academy of Sciences except for two specimens which were submitted to me for determination by Mr. A. T. McClay. Mr. Van Duzee has very kindly read the manuscript and made several valuable suggestions.

Vanduzeeina ænescens Usinger, n. sp.

Near *balli* Van D., but covered with a long brown pubescence; head distinctly bronzed; pronotum narrower with the sides more nearly parallel and rectilinear. Length, 5 to 6 mm.

Head more narrowed anteriorly than in *balli*; tylus tumid, surpassing the juga, which are broad at apex. Pronotum transverse; the ratio of the length to the width three to five; one-half as long as wide in *balli*; margins more nearly parallel; anterior margin rectilinear; sides depressed with the margins sharply carinate and rectilinear; the anterior angles forming almost a right angle; transverse impression deep, slightly behind the middle. Scutellum with the apex regularly rounded, marked with a more or less distinct sub-apical triangular fuscopunctate pale spot, its sides margined with black; a more or less distinct, slightly oblique, vitta either side of the disk bisecting a fuscopunctate paler area. Connexivum black with a linear pale spot behind each incisure. Vestiture of long brown hairs and a sparse shorter cinereous pubescence, becoming shorter on the venter. Dorsum evenly and closely punctate; a median pale carinate line on the scutellum, more or less distinct, which becomes concolorous anteriorly. Femora slightly thicker than in *balli* and covered with brown pubescence. Rostrum almost attaining hind margin of second ventral segment; apical two joints thickened and darker as in *balli*. Antennæ with the apical two joints thicker in the male than in *balli*.

Color æneous-black, more bronzed on the head, with lighter markings on the scutellum. Venter black; coxæ, apices of the tibiæ, and the tarsi fuscotestaceous. Described from one male and three females.

Holotype, male, No. 2627, Mus. Calif. Acad. Sciences, collected by Dr. E. C. Van Dyke, June 20, 1929, at Potwisha,

Sequoia National Park, California, and allotype, female, No. 2628, Mus. Calif. Acad. Sciences, collected by E. C. Van Dyke, June 13, 1929, in Sequoia National Park. Paratypes, two females, taken by Mr. A. T. McClay in Sequoia National Park, June 13 and 18, 1929, in the collection of the author.

Vanduzeeina slevini Usinger, n. sp.

Nearer *ænescens* Usinger than *balli* Van D. The vestiture long, fuscotestaceous, as in *ænescens*; pronotum broad with the margins broadly flattened as in *balli*, but narrower behind with the margins more nearly rectilinear. Length, 6.5 mm.

Female. Head more narrowed apically than in *balli*; tylus scarcely surpassing juga; eyes vertical, narrowed. Pronotum transverse, narrower behind than in *balli*; margins but feebly arcuated. Legs thicker than in *ænescens*. Rostrum reaching the posterior coxæ with the apical two joints thickened. Penultimate segment of antennæ slightly widened apically; subfusiform in *balli*; third and fourth segments subequal, fourth longer than third in *balli*.

Described from one female specimen taken by Mr. L. S. Slevin of Carmel, California, after whom the species is named.

Holotype, female, No. 2629, Mus. Calif. Acad. Sciences, collected by L. S. Slevin at Carmel, Monterey County, California, April 30, 1916.

Dr. E. C. Van Dyke took a specimen, which may be the male of this species, at Carmel, California, on May 21, 1911. In most characters it agrees with the female of *slevini* but has the tylus more distinctly surpassing the juga; eyes wider than in the female *slevini* but narrower than in the male of *balli*; legs thicker and with longer pubescence than in *balli*; color lighter on the dorsum; head and anterior portion of pronotum black; posterior portion of pronotum becoming light brown medianly; scutellum light brown with a triangular spot at base and area near the basal angles black.

Key to the Species of *Vanduzeeina* Schout.

- Larger, more than 6 mm. Vestiture very short. Head longer, slightly oblique, with the sides more parallel..... 1
 Smaller, 6 mm. or less. Vestiture longer. Head short, vertical, narrowed apically..... 2
 1. Smaller, 6-7 mm. The transverse median pronotal impression distinct. Apex of scutellum, in female, with a large oblong pale spot margined with black.....*californica* Van D.

- . Larger, 7.5-8 mm. The transverse median pronotal impression very feeble. Apex of scutellum, in female, with a smaller and less distinct pale spot not outlined with black.....
.....*borealis* Van D.
2. Pronotum narrow; sides depressed with the margins sharply carinate and rectilinear. Head produced, bronzed. Scutellum with a more or less distinct, slightly oblique black vitta either side of the disk.....*anesceus* n. sp.
- . Pronotum with margins broadly flattened. Head shorter and broader at base with the apex broadly rounded..... 3
3. Vestiture short. Connexivum alternated with black and pale. Pronotum broad behind; margins arcuate.....*balli* Van D.
- . Vestiture long. Connexivum very feebly marked with lighter color behind each incisure. Margins of pronotum more nearly parallel; rectilinear, or very slightly arcuated.....
.....*slevini* n. sp.

RECORD OF AN INSECT MIGRATION IN THE ARKANSAS VALLEY, COLORADO

BY WALTER CARTER

United States Bureau of Entomology

During a visit to Rocky Ford, Colorado, on the twenty-first day of September, 1927, the attention of the writer was directed to the fact that the sidewalks and curbings along the street were covered with a layer of dead insects. Inquiry elicited the information that on the night of the 17th the insects had flown to the lights of the town in such numbers as to cause the closing of business houses and even interference with automobile travel.

In order to obtain data on the species represented in the flight, a large cigar box full of the insects was collected from the curbing. Some idea of the numbers of insects present can be obtained from the fact that the collection was made by simply picking up a page of a magazine which happened to be lying on the curb and sliding the insects on it into the box.

A sample for determination was obtained from the collection in the following manner: The insects were spread thinly over a rectangular sheet of paper. A straight edge was then placed diagonally across the rectangle and half the layer swept off. This was repeated twice and the portion remaining was taken

as the sample, and the species contained therein were identified by W. L. McAtee, United States Biological Survey (Hemiptera), and E. A. Chapin, United States Bureau of Entomology (Coleoptera), as given in the list which follows. C. T. Greene of the United States Bureau of Entomology reported on the Diptera.

List of species found in sample, with number of specimens of each.

COLEOPTERA

Carabidæ, *Stenolophus conjunctus* Say (1); Hydrophilidæ, *Tropisternus* sp. (1); Phalacridæ, *Phalacrus seriatus* Lec. (2); Chrysomelidæ, *Haltica foliacea* Lec. (2); Curculionidæ, *Anthonomus squamosus* Lec. (2).

DIPTERA

Specimens too badly damaged for determination (17).

HEMIPTERA

Pentatomidæ, *Thyanta custator* Fabr. (1); Coreidæ, *Harmostes reflexulus* Say (27), *Corizus viridicatus* Uhl. (1), *Corisus lateralis* Say (2); Lygæidæ, *Lygæus lateralis* Dall. (8), *Nysius californicus* Stål (503), *Geocoris bullatus* Say (13); Nabidæ, *Nabis fesus* Linn. (9); Miridæ, *Lygus elisus* Van D. (2), *Orthotylus* sp. (3); Cicadellidæ, *Xerophlæa viridis* Fabr. (2271), *Euscelis exitiosus* Uhl. (682), *Eugnathodus abdominalis* Van D. (141); Fulgoridæ, *Liburnia* sp. (3).

The one species *Xerophlæa viridis* Fab. predominates over all other species combined, but two other leafhoppers, *Euscelis exitiosus* Uhl. and *Eugnathodus abdominalis* Van D., contributed large numbers to the sample.

The method of taking the sample undoubtedly eliminated some species which occurred only in very small numbers. The data suggest, however, that the flight was principally by the Hemiptera, and of the 3666 specimens in that group, 3094 were Cicadellidæ.

On the day of the flight an unusual and sudden drop in temperature of between 20 and 30 degrees Fahrenheit was experienced.

THREE NEW LEAFHOPPERS FROM THE SOUTH-
WEST (HOMOPTERA, CICADELLIDÆ)

BY PAUL B. LAWSON

*Lawrence, Kansas*¹***Eupteryx huachucae* Lawson, n. sp.**

(Figs. 2-2b)

A pale yellow species strongly marked with red. Length, 2.75-3 mm.

Form: Vertex slightly wider than long, about twice as long at middle as next the eye, quite acutely pointed in female. Pronotum one-third longer than vertex, scarcely twice as wide as long, distinctly widened posteriorly, posterior margin somewhat sinuately concave. Scutellum large, nearly as long as pronotum and nearly twice as wide as long. Elytra very long and parallel margined, greatly exceeding the abdomen; first cross-vein directed somewhat cephalad, apical veins arising from a short common stalk from which the third apical vein soon separates; first and second apical veins having a long common stalk. Venation of hind wing characteristic of the genus.

Genitalia: Last ventral segment of female very long, posterior margin strongly produced to a pointed apex. Last ventral segment of male long, with broadly concave posterior margin; valve hidden; plates long, with slender upturned apices.

Color: Vertex pale yellow with dark narrow marginal band which widens out into a diffused dark area near each eye. Pronotum pale yellow, lateral margins broadly and irregularly brown. Scutellum pale yellow, lateral angles darker. Anterior half of elytra pale yellow marked with red as follows: Irregular spot at base of clavus, smaller irregular spot midway on clavus, a few dots beyond this on clavus and a large spot on band between claval suture and costal plaque which breaks up into smaller spots or dots posteriorly. Posterior half of elytra distinctly fumose, veins for the most part distinctly margined with dark brown or black; tips of sectors and area caudad of dark border of costal plaque, red. Underside practically pale yellow except for two dark dashes on front running mesad from each eye, the dark tips of beak, hind tibiae, ovipositor, and the dark tarsal claws.

Described from a female and a male, holotype and allotype, respectively, and eight paratypes, all taken by Dr. R. H. Beamer in the **Huachuca Mountains, Arizona**, August 1, 1927.

Types deposited in the Snow entomological collection.

¹ Contribution from the Department of Entomology, University of Kansas.

The male genitalia are not figured because in each of the three males at hand the tip of the abdomen is somewhat distorted.

Joruma minuta Lawson, sp. n.

(Figs. 1-1f)

A very small old-gold species allied to *J. subaurata* but smaller and with distinct genitalia. Length, 2 mm.

Form: Head as wide as pronotum. Vertex one-fourth longer than wide, one-third longer at middle than next the eye, anterior margin broadly rounded, median longitudinal line extending to ocelli, which are large and distinct. Pronotum shorter than vertex, over twice as wide as long, anterior and posterior margins nearly parallel. Scutellum large. Elytra greatly exceeding abdomen; first apical cell apparently small, its basal vein indistinct, other apical cells much larger, slightly increasing in size from the second to the fourth; elytra nearly opaque to tip of clavus beyond which three clear areas appear cephalad of the second to fourth apical cells. Hind wing peculiar in having row of small but stout spines along costal margin, while posterior margin is distinctly serrate, the teeth larger near the base.

Genitalia: Last ventral segment of female with large and deep median incision which bears a small basal lobe; ovipositor distinctly exceeding pygofer. Last ventral segment of male with posterior margin strongly and widely concave; valve hidden; plates quite long, tapering gradually to just past middle, then more suddenly constricted and produced to slender apices which about equal the pygofer.

Color: Old gold, tinged on vertex and pronotum with brownish; elytra golden yellow for over half their length, then smoky hyaline in apical cells and in three cell-like areas cephalad of second to fourth apical cells. Front golden brown, rest of underside more yellowish. Dorsum of abdomen dark brown.

Described from a male and a female, holotype and allotype, respectively, and two female paratypes, taken by Dr. R. H. Beamer, August 3, 1928, in **Cameron County, Texas**.

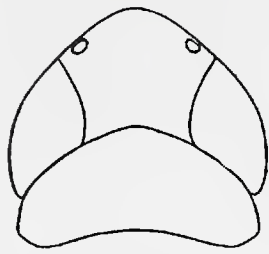
Types deposited in Snow entomological collection.

Figure 1e shows the nature of the serrated posterior margin of the hind wing under high power, and figure 1f shows the spines on the costal margin highly magnified.

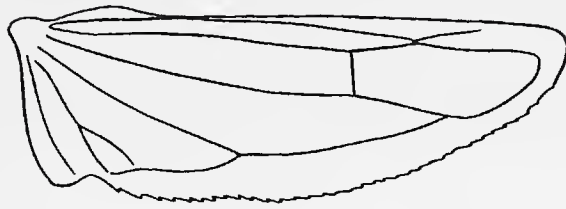
Acinopterus spatiosus Lawson, sp. n.

(Figs. 3-3b)

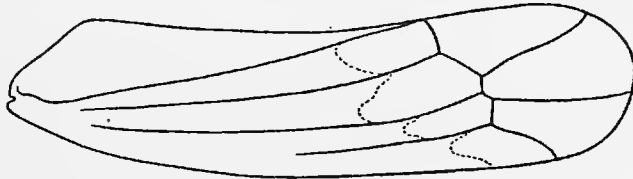
A yellowish-brown robust species allied to *A. angulatus* but more robust and lighter. Length, 5 to 6 mm.



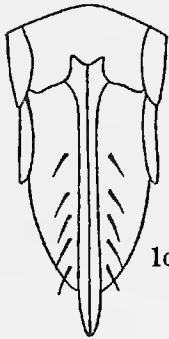
1 *J. minuta*



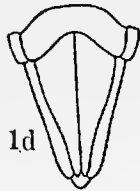
1b



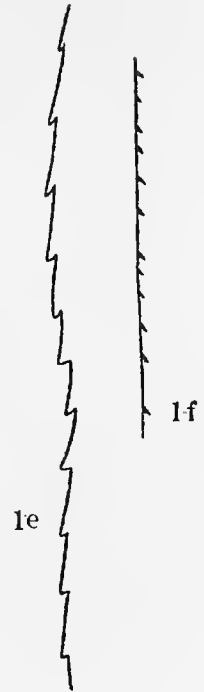
1a



1c

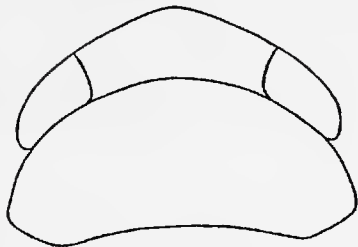


1d

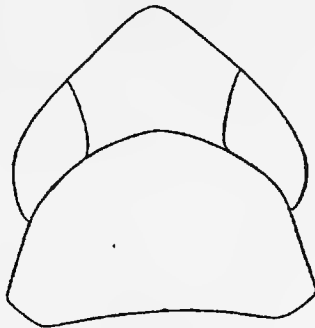


1e

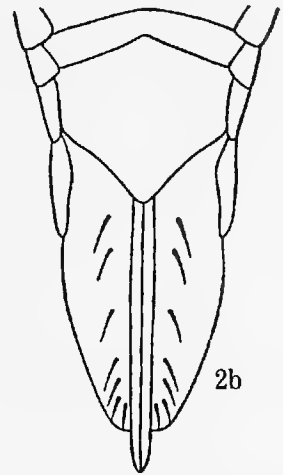
1f



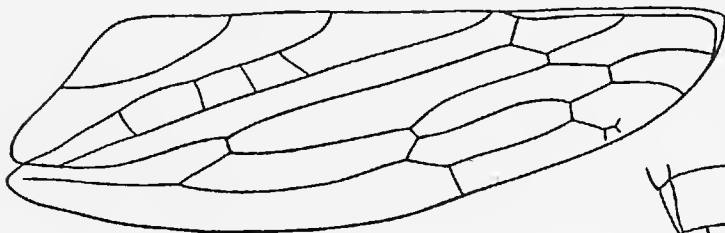
3 *A. spatiosus*



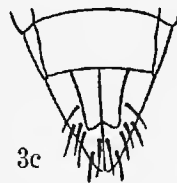
2 *E. huachucae*



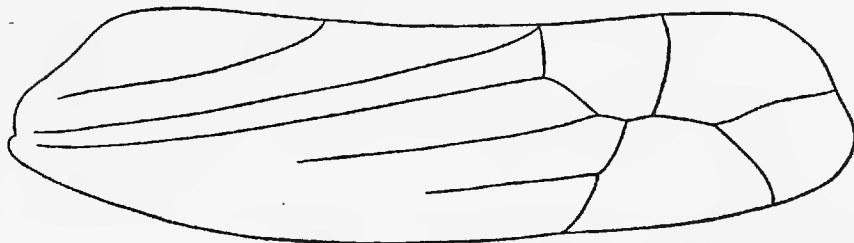
2b



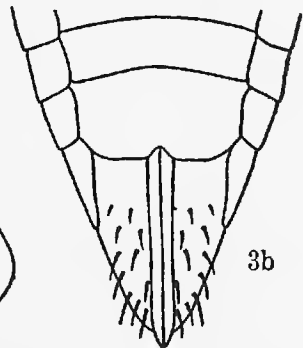
3a



3c



2a



3b

Form: Head slightly narrower than pronotum. Vertex two and one-half times as wide as long, one-third longer at middle than next the eye, anterior margin broadly rounded. Pronotum a little over twice as long as vertex, a little over twice as wide as long, anterior and posterior margins nearly parallel, humeral margins slightly longer than lateral, disk and posterior third transversely wrinkled. Scutellum small. Elytra with costal margin straight clear to tip forming sharply acute apices which are usually flaring; several cross-veins between first and second anal veins.

Genitalia: Last ventral segment of female much as in *A. angulatus* but with lateral angles not as prominent; posterior margin nearly truncate, with definite median notch and with definite lateral angles which are, however, broadly rounded. Last ventral segment of male half longer than preceding; valve hidden; plates longer than in *A. angulatus* and more rounded apically.

Color: Light or yellowish brown; impressed line of scutellum dark; veins of elytra, especially apical ones, with smoky margins, veins on clavus light, claval suture darker, apical cell dark. Eyes dark brown. Underside yellowish brown; a brown dash on either side of median notch of last ventral segment of female. Dorsum of abdomen frequently dark and legs sometimes spotted with brown.

Described from a male and a female, holotype and allotype, respectively, and a series of female paratypes, all from **Brazoria County, Texas**. Taken August 10, 1928 by Dr. R. H. Beamer.

Types deposited in Snow entomological collection.

A BUPRESTID NEW TO THE YOSEMITE

One of the most characteristic trees on the floor of the Yosemite Valley is the black cottonwood, *Populus trichocarpa* Hook. Common in the ridges of the bark on the trunks of many of these trees are the oval emergence holes of a moderately large flathead borer. In the bark beneath each hole is a dark winding mine made by the larva. The mine winds through the outer bark and down to the cambium, but does not appear to cause any particular damage to the tree. Most of the trees appear perfectly healthy, although the work in the bark indicates that generations of the insects have developed in it. The species is *Poecilonota montanus* Chamberlin, named from specimens collected near Missoula, Montana, by Mr. J. Brunner. Dead beetles were collected from the bark in the Yosemite on July 6, 1927, and live adults crawling on the bark on August 16 of the same year. The live beetles dropped to the ground when touched and were caught without much difficulty.—H. E. Burke.

THE LARVA OF EUBRIANAX EDWARDSI (LEC.)
(COLEOPTERA: PSEPHENIDÆ)

BY RICHARD E. BLACKWELDER

Stanford University, California

The larva of *Eubrianax edwardsi* (Le Conte) has been known for a good many years, but all that has been known of it is that it lives in streams and resembles the larvæ of the Parnidæ (Dryopidæ). Le Conte, who received his specimens and his information from Crotch, said: "The larva is sub-aquatic and resembles in appearance those of Psephenus and Helichus."¹ In his "Insects of Western North America" (1926, p. 404), Essig figures the pupa and adult, and states that the larva lives on rocks in small, fresh running streams, and that pupation takes place in the old larval skin in the water. Böving in April 1929² figures the larva and discusses its relation and similarity to the larva of Psephenus. This seems to be the extent of the literature on this very curious larva.

There are certain additional points of interest which are recorded here in company with a detailed drawing of the larva and of some of the unusual structures found upon it. The material for this study was collected by Mr. David Shepherd in Waddell Creek, Santa Cruz County. It was Professor G. F. Ferris who first interested me in this larva, and he has given many suggestions on the study of the material and the preparation of this paper.

The larva is found rather abundantly on the undersurface of stones in places where the water is running fairly rapidly. It is most abundant in the summer.

The larva is flat with the dorsal surface slightly convex. The tergites are rather small, but the pleurites are very much enlarged, extending to the margin from the edge of the pleurites above and back underneath to join the sternites at a point about one-third the distance from the margin to the longitudinal axis. This line between the pleurites and the sternites is rather obscure, and is indicated only by slight folds along the sutures. The pleurites of the prothorax are extended around over the head so that they meet in front and completely cover the head

¹ Trans. Amer. Ent. Soc., Vol. V, 1874, p. 58.

² Bull. Brooklyn Ent. Soc., Vol. XXIV, 1929, p. 59; pl. V, figs. A-F.

above. At the posterior end the pleurites of the ninth abdominal segment meet around the end, covering the retracted tenth segment. It is not quite certain that this designation of the sclerites is correct, there being a possibility that the tergites extend around the margin, and that the pleurites are absent as in many larvæ, but the evident separation of the sclerites along the dorsum, the position of the spiracles (Fig. 1, *A*), and a comparison with other fringed larvæ of this type indicate that the pleurites are enlarged and include the margin. Along the angle of the margin, and therefore on the pleurites, there is a fringe which completely surrounds the larva (Fig. 1, *A*). The fringe is composed of a row of long narrow pedicels, edged with spines; each pedicel bearing a long seta on its distal end (Figs. 1, *H, I*).

The head is small and completely hidden from above. It bears a pair of two-segmented antennæ (Fig. 1, *A*), the labium with its pair of nodule-like palpi, the maxillæ with the two-jointed maxillary palpi (Fig. 2, *B*), and the mandibles (Fig. 2, *C*). The mandibles of some individuals examined were shorter than the one shown and were truncate in front, as if they had been worn down. Böving figures mandibles of this type.

The legs are short and four- or possibly five-segmented, with the coxa, trochanter, femur, and tibia present, and a single terminal claw (Fig. 1, *J*). This may be a true claw or it may possibly be a modified tarsus, which otherwise is entirely absent.

There are only two pairs of spiracles. The anterior ones (Fig. 1, *B*), situated on the proximal anterior corner of the mesopleura, are the mesothoracic spiracles, and the other pair, representing the eighth abdominal spiracles, are on the proximal portion of the eighth abdominal pleurite. On each of the second, third, fourth, and fifth abdominal sternites there is situated a pair of gill groups (Fig. 2, *D*), which are composed of long membranous filaments that become so fine at their extremities as to be invisible. These are evidently functional gills, while it is rather doubtful if the spiracles are used at all.

On the ventral surface are quite a number of setæ of various sizes and shapes (Figs. 1, *C, D*). On the dorsal surface there are some very peculiar scale-like markings (Figs. 1, *E, F, G*),

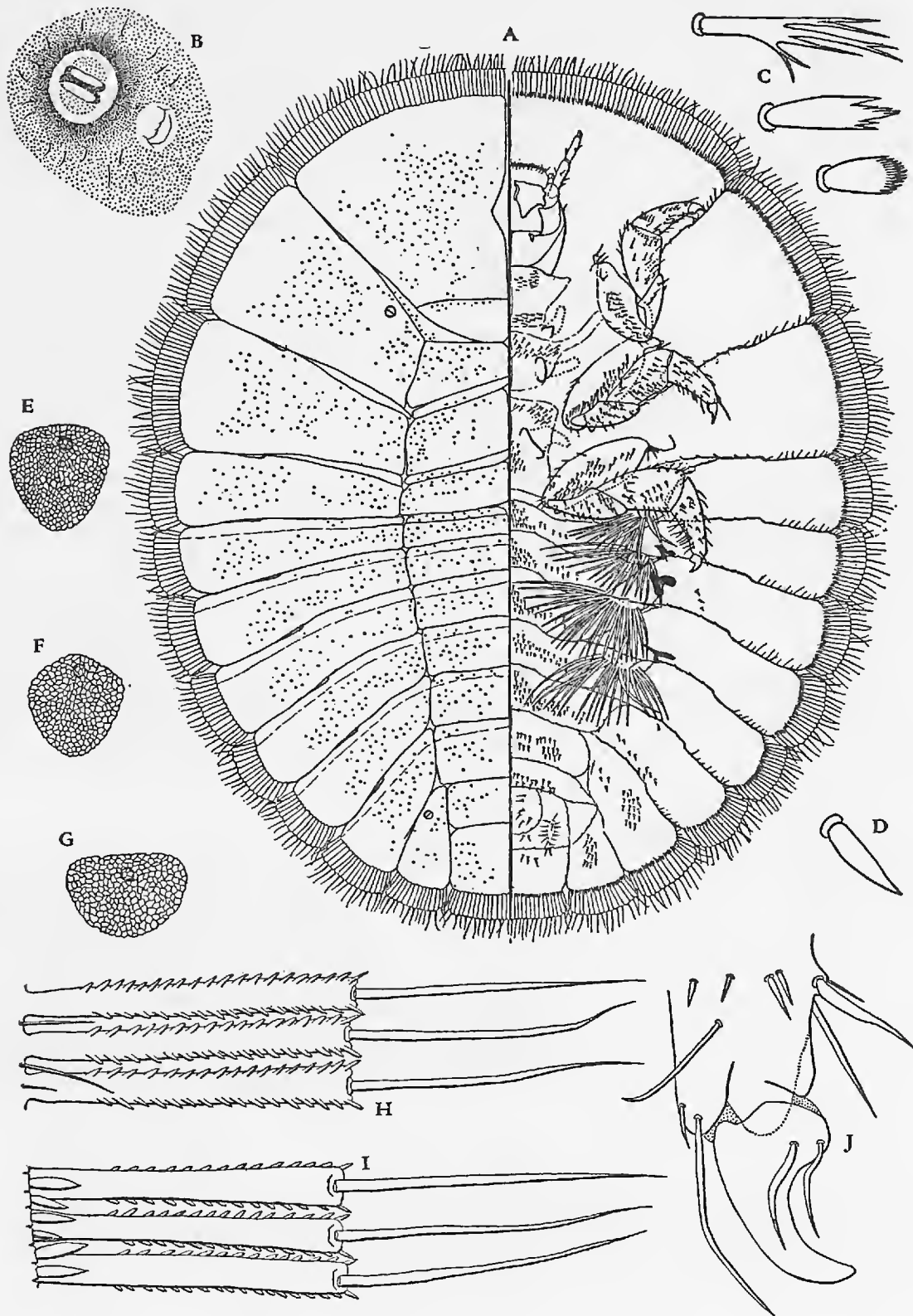


Fig. 1. *Eubrianax edwardsi* (Le Conte), larva: A, dorsal and ventral aspects; B, thoracic spiracle and surrounding region; C, D, types of setæ from ventral side of body; E, F, G, scale-like markings of dorsum; H, I, portions of marginal fringe from dorsal and ventral aspects respectively; J, claw.

which are microscopic in size but which do not appear to be separate scales.

Pupation occurs in the larval skin, except that a portion of the posterior region of the larval skin—probably segments seven, eight, nine, and ten (Fig. 2, *E*)—is replaced by a somewhat similar structure, belonging to the pupa, which corresponds with it, and which bears a different type of marginal fringe (Fig. 2, *F*). The pupal skin itself is membranous, except for this section at the posterior end. Essig's figure of the larva is evidently really only a dorsal view of the pupa, as the fringe in the larva, unlike that in the pupa, extends around the posterior end in an unbroken line.

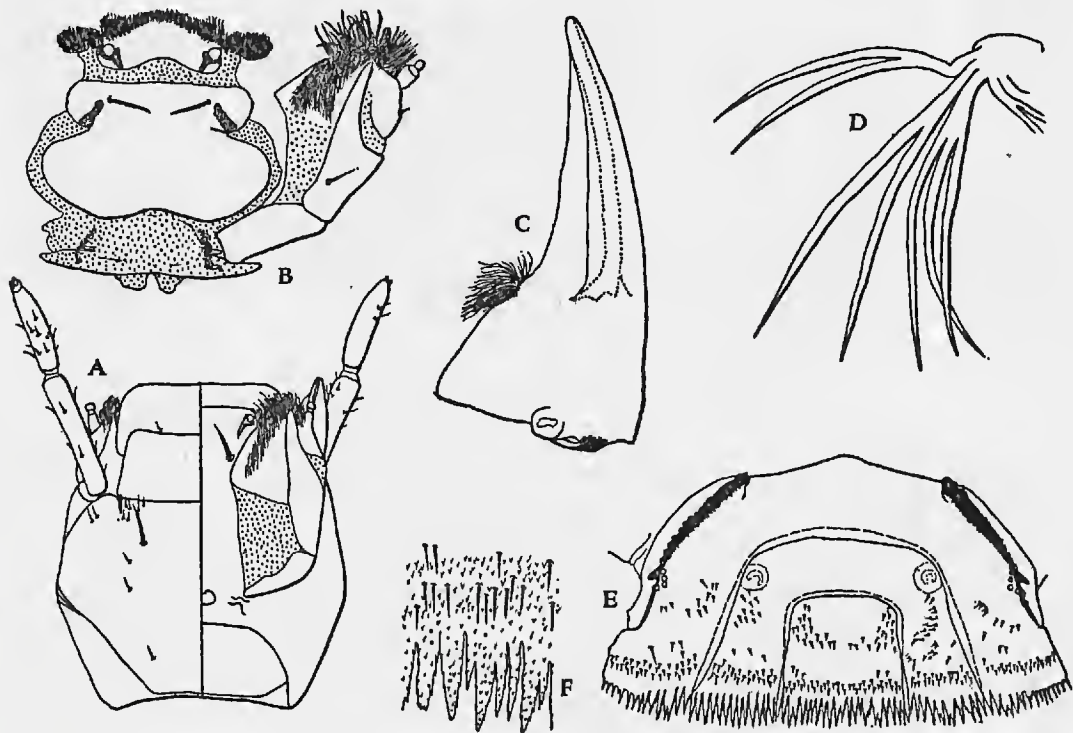


Fig. 2. *Eubrianax edwardsi* (Le Conte): *A*, dorsal and ventral aspects of head of larva; *B*, labium and maxilla of larva; *C*, mandible of larva; *D*, portion of gill of larva; *E*, posterior sclerotic region of pupa; *F*, portion of fringe from this region.

OMISSION FROM OCTOBER NUMBER

(Text to figure on page 66)

"Coffee-pot maker" *Lagoa crispata* Packard. 1. Side view of larva. 2. Dorsal view of larva. 3. Larva drawn up in defensive attitude when disturbed. 4. Cocoon in process of construction viewed from front. 5. Side view of same almost completed. 6. Completed cocoon from which winds and rains remove loose webs shown at the ends. 7. Outline figure of adult showing location of the crinkled tufts on the wings.

A NEW ABERRATION OF EUCHLOE AUSONIDES

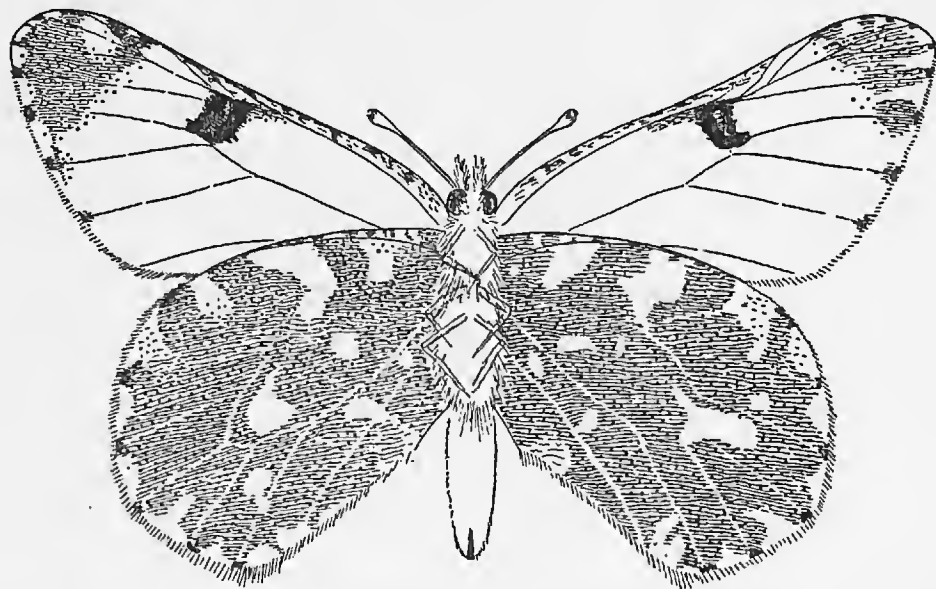
BY M. DOUDOROFF

*San Francisco, California**Euchloe ausonides boharti* Doudoroff, n. ab.

Differs from *ausonides* in its smaller size, slightly narrower wings, greater heaviness of the dark markings on the superior surface, and the peculiar pattern on the underside of the secondaries.

Primaries: The black bar at the arc is broader, both above and below, than in *ausonides* and the green on the underside at the apices is deeper. Secondaries: The greenish gray markings on the underside of the secondaries are greatly enlarged at the expense of the white background, forming a pattern well illustrated by G. F. Ferris in the figure. The veins are bordered with yellow. Expanse: 40 mm.

Holotype, male, in collection of R. M. Bohart, taken at Berkeley, California, April 16, 1929. Named after Mr. R. M. Bohart of Berkeley, California, who has kindly loaned it to me for description.



Euchloe ausonides boharti, male, underside, x 2.

THE PAN-PACIFIC ENTOMOLOGIST

Published quarterly by the Pacific Coast Entomological Society
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E. P. VAN DUZEE, Editor S. B. FREEBORN, Ph. D., Treasurer

EDITORIAL COMMENT

We have just received a copy of Mr. W. S. Wright's list of the butterflies of San Diego County, California.¹ This most excellent list records 148 forms with distributional and other data for each, and at the end lists twenty other forms that are likely to occur in that county. Local lists, especially when gotten out by a competent authority as is this, are most valuable and interesting. The San Francisco Bay region needs a similar list and we hope some day we may record its publication.

Fascicle III of a General Catalogue of the Hemiptera,² received recently, enumerates the Pyrrhocoridae of the world. It was compiled by Dr. R. F. Hussey with a bibliography by Elizabeth Sherman and is an excellent piece of work. It has the defect, common to all this series of catalogues, of an alphabetical arrangement of the species, giving no hint as to the relationship of the species. The type used for the various categories could hardly be improved, except, perhaps, that the genus names at the head of the pages might be made a little larger. Why could not the name of each species be followed by a number, in square brackets, indicating the systematic arrangement of the species? The addition of such a number would combine in one list the advantages of both the systematic and alphabetical arrangement of the species. Here for the first time Stål's error in the identification of *Dysdercus mimus* Say is corrected and a new name, *mimulus*, is given the form heretofore known as *mimus*.

Dr. Ralph V. Chamberlin of the University of Utah, Salt Lake City, was a welcome visitor at the Academy recently.

¹ Trans. San Diego Society of Natural History, Vol. VI, No. 1, pp. 1-40, February 28, 1930.

² General Catalogue of the Hemiptera. Fasc. III. Smith College, Northampton, Massachusetts, 1929.

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San Francisco, California

1930

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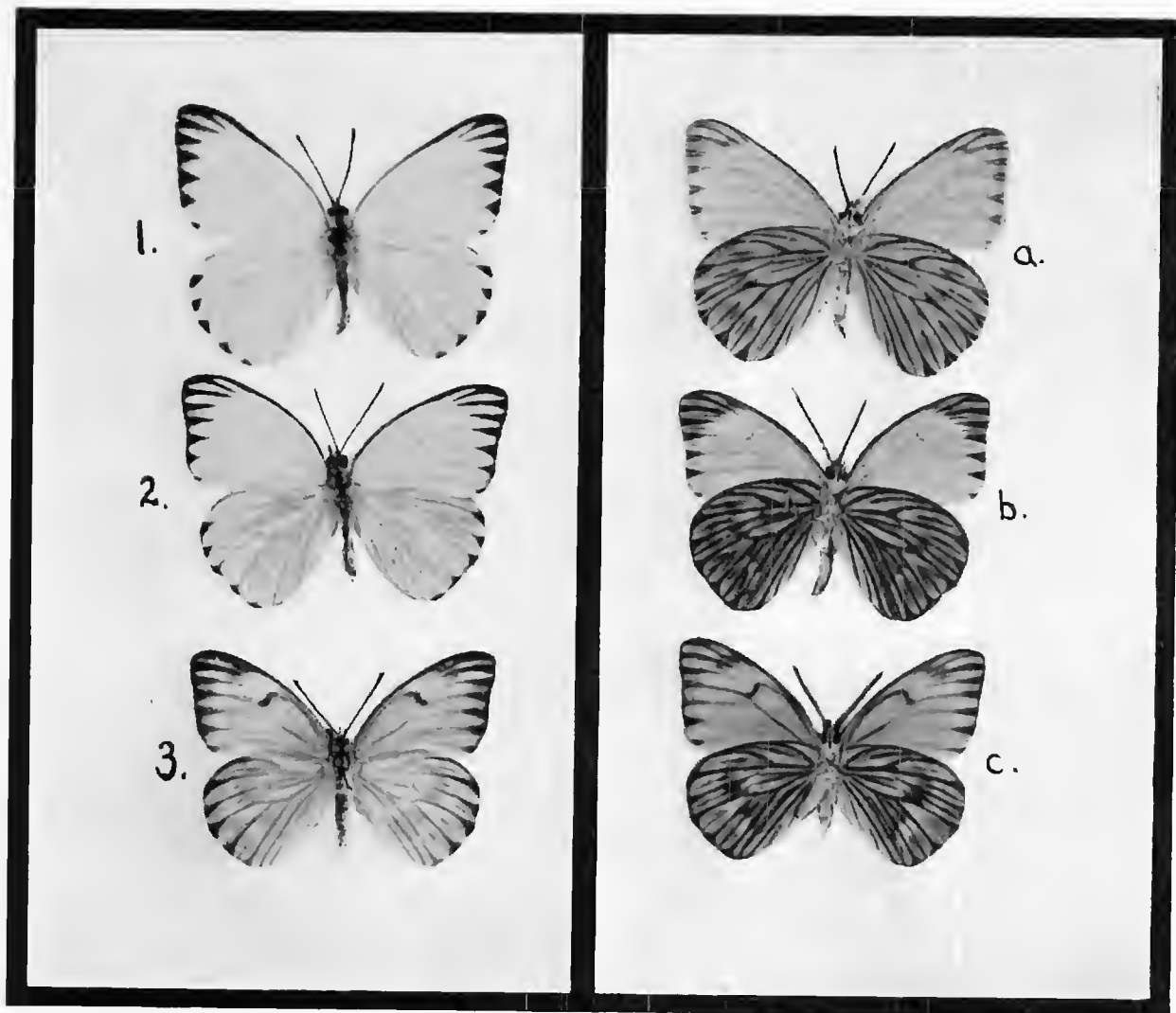
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Ascia monuste raza Klots

The Pan-Pacific Entomologist

Vol. VI, No. 4.

April, 1930

A NEW SUBSPECIES OF ASCIA MONUSTE (L.) FROM LOWER CALIFORNIA (LEPIDOPTERA, PIERIDÆ)

BY ALEXANDER B. KLOTS

Cornell University, Ithaca, New York

Through the kindness of Mr. E. P. Van Duzee of the California Academy of Natural Sciences the author has had the opportunity of studying a series of specimens of *Ascia monuste* (L.) from Lower California which represent a very distinct and apparently undescribed geographic race, characterized as follows:

Ascia monuste raza Klots, new subspecies (See Plate)

Differs from all other *monuste* forms in the following particulars:

Males:

1. Fuscous markings at tips of veins of primaries above uniformly well defined, as shown in figures, never confluent except at extreme margin of wing. Markings at tips of veins of secondaries above more variable, being sometimes nearly absent.

2. Markings at tips of veins of primaries beneath uniformly present and distinct, as shown in figures, of a lighter shade than the corresponding markings above. Spaces between these markings at apex, and often along outer margin, light yellowish white to ochre yellow.

3. Dark markings on secondaries beneath, as shown in figures, uniformly present and distinct, fuscous to brownish fuscous. Ground color of secondaries beneath ranging from a light yellowish white to a deep ochre yellow.

Females:

1. Entire ground color of wings above suffused with light drab gray. Markings, as shown in figure, fuscous, uniformly present.

2. Wings beneath with ground color as above. Dark markings concolorous with those of upper side, less diffuse, uniformly present. A yellow marginal suffusion present between dark markings of apex of primary and along outer margin of secondary as far as anal angle.

The uniformly present and very conspicuous pattern on the underside of the wings, especially of the secondaries, and the drab-gray ground color and heavy pattern above of the females, serve to distinguish this race from all other *monuste* forms. Occasional specimens of *monuste* from mainland Mexico (Mazatlan, Manzanillo) show something of an approach to *raza* in the above-mentioned characters, occupying an intermediate position between *raza* and the form from central Mexico. This is just as would be expected from the geographical relationship of these localities. None of the mainland Mexico specimens show the above combination of characters with any uniformity, nor are any of the characters developed to the extent that they are in *raza*.

One of the specimens of *raza* (see paratype 8 below) in the Grundel collection bore the label "*Pieris erebus*." The author has been unable to find any record of the publication of this name, and concludes that it must have been, at most, in manuscript.

Holotype, male (No. 2630, Mus. Calif. Acad. Sci.), Isla Raza, Gulf of California, April 21, 1921; collector, E. P. Van Duzee. Allotype, female (No. 2631, Mus. Calif. Acad. Sci.), Smith's Island, Angeles Bay, Gulf of California, June 27, 1921; collector, Virgil Owen. Paratypes No. 1, 2, 3, 4, all males, Isla Raza, Gulf of California, April 21, 1921; collector, E. P. Van Duzee. Paratype 5, male, Salinas Bay, Carmen Island, Gulf of California, June 16, 1921; collector, E. P. Van Duzee. Paratype 6, male, Abreojos Point, Lower California, July 31, 1922; collectors, G. D. Hanna and J. R. Slevin. Paratype 7, male, Magdalena Bay, Lower California, May 29, 1925; collector, H. H. Keifer. Paratype 8, male, Lower California; presented by J. G. Grundel; labeled "*Pieris erebus*." Paratype 9, female, Santa Margarita Island, Baja California, July 29, 1922; collectors, G. D. Hanna and J. R. Slevin. Paratype 10, female, Magdalena Bay, Lower California, July 26, 1922; collectors, G. D. Hanna and J. R. Slevin. Paratypes 11-16, all males, Isla Raza, Gulf of California, April 21, 1921; collector, E. P. Van Duzee. Paratypes 17-18, both males, Salinas Bay, Carmen Island, Gulf of California, June 16, 1921; collector, E. P. Van Duzee. Paratype 19, female, Pond Island Bay, Angel de la Guardia Island, Gulf of California, June 30, 1921, collector, E. P. Van Duzee.

Holotype, allotype, and paratypes 1 to 10 are in the California Academy of Sciences. The other paratypes have been deposited as follows: Paratypes 11 and 19 in the American

Museum of Natural History; paratype 12 in United States National Museum; paratype 13 in Carnegie Museum; paratype 14 in Cornell University collection; paratypes 15 and 16 in author's collection; paratype 17 in British Museum; paratype 18, in Hill Museum, Witley, Surrey, England.

EXPLANATION OF PLATE

Approximately X 3/5

1. Upper and undersides of holotype ♂, *Ascia monuste raza* Klots.
2. Upper and undersides of paratype 6, ♂, *A. monuste raza* Klots.
3. Upper and undersides of allotype ♀, *A. monuste raza* Klots.

MONTEREY PINE MIDGE PUPATES AT BASES OF NEEDLES

During the past ten years several published references to the Monterey pine midge, *Thecodiplosis piniradiatæ* (Snow and Mills) have said that pupation takes place in the soil, and that cultivation will control the pest. A careful investigation of the species this season indicates that these references are erroneous, and that Snow and Mills were right when they said that the species pupates at the bases of the needles. In all cases studied, pupation took place in hollowed-out cells at the bases of the needles, usually beneath the scales which form the sheath. Sometimes a few pupæ would be found between the sheaths. The larva forms a papery cocoon and pupates in that.—H. E. Burke.

A NEW EMPOASCA

BY E. P. VAN DUZEE

The following species has been in my collection for a number of years under a manuscript name. It now proves to be of some economic interest, so the description is published to make it available for use in case it is needed.

Empoasca denaria Van Duzee, new species

Allied to *alboscripta* Van Duzee, but smaller with a more pointed head, different arrangement of pale markings and distinct male genitalia. Length, 3.5 mm.

Vertex a third longer than one-half its basal width, distinctly more produced than in *alboscripta*, two-thirds the length of the pronotum; front narrower and flatter than in the related species, its sides almost parallel.

Color yellowish green, becoming almost fulvous in mature dried specimens; vertex with the median line, a spot against each eye and an oblique spot on the front edge either side the apex, white, the latter spots including the distinct ocelli; pronotum with a broad whitish median vitta edged with dusky; a spot behind each eye and one at the middle ivory white; anterior field of scutellum with a pale median line, posterior field with a pale spot on each basal angle; elytral nervures obscure at base; clavus with two pale spots, one sub-basal the other at apical one-third and lying against the suture; disk of corium with two pale areas alternating with those on the clavus; costal area subhyaline, apical third of elytra slightly infuscated, with its nervures conspicuously pale, this infuscated portion preceded by a whitish arc, the elytra thus showing ten pale spots, more or less distinct; beneath pale, front ochraceous with a pale median line and subbasal spot either side; tarsi and tip of clypeus touched with bluish green.

The external genital pieces do not differ materially from those of *alboscripta*, but when dissected the styles are found to be much shorter, linear, and curved upward; in *alboscripta* they are longer, almost fusiform, with their apex produced in a spinose tip a third as long as the style, and pale in color, dotted with black. Described from sixteen examples.

Holotype, male No. 2651, and allotype, female No. 2652, Mus. Calif. Acad. Sci., taken by Dr. J. C. Bradley at Leona Heights, near Mills College, Oakland, California, in August, in my collection. Paratypes, six males and five females, same data, and three females taken on artichoke at San Jose, California, in March, received from Dr. H. H. Severin.

NEW RHYNCHOPHORA (COLEOPTERA) FROM
WESTERN NORTH AMERICA

BY EDWIN C. VAN DYKE

University of California, Berkeley, California

Tribe Alophini

Genus *Lepidophorus* Kirby

Synoptic Key

1. Scales on pronotum densely and uniformly arranged; setæ of upper surface conspicuously suberect on elytral declivity only 2
 Pronotal scales arranged in a median and lateral stripes, the intervening area quite bare of scales; setæ of pronotum, as well as of entire elytra, conspicuous and more or less semi-erect throughout 3
2. Elytral intervals entirely flat, setæ equally evident on all intervals; abdomen densely clothed with scales and sparsely pilose, the last ventral more finely and densely pilose and with a shallow impression at most. Alaska.....
*lineaticollis* Kirby
 Elytral intervals slightly convex apically. Setæ distinct only on alternate intervals; abdomen clothed with scales and with scattered, prostrate setæ, the last ventral of males with a deep fovea at apex. Mount Rainier, Washington
*rainieri* n. sp.
3. Elytra with intervals all more or less flattened, the setæ present on all intervals anteriorly but only distinct on alternate ones posteriorly; abdomen sparsely setose, the last ventral broadly and shallowly impressed. New York, Maryland, West Pennsylvania, and Virginia.....*setiger* Ham.
 Elytra with intervals alternately elevated, the setæ present on all intervals anteriorly but absent on alternate ones on elytral declivity. Abdomen moderately scaly and setose. Coastal area of Washington and Oregon.....*alternatus* n. sp.

***Lepidophorus rainieri* Van Dyke, new species**

Oval, convex, piceous, antennæ and legs reddish brown; densely clothed above with small, round brown or white scales, the latter forming median and lateral stripes on the pronotum and a more or less nebulous marking along the sides of the elytra, as well as being more or less scattered over the disk; setæ short, semi-erect on the head, scattered and prostrate over the pronotum, and in rows on the alternate intervals of the elytra, quite prostrate in front and semi-erect on the declivity. Beak dilated apically, somewhat flat-

tened above and rugosely punctured. Prothorax as broad or broader than long, convex; sides narrowed at base, somewhat parallel at middle and narrowed and constricted at apex; disk rather densely and coarsely punctured, the punctures in fresh specimens concealed by the scales. Elytra not quite twice as wide as prothorax; striæ broad and flat in front and faintly convex toward apex, these striæ well impressed and rather closely punctured with somewhat elongate punctures, each of which bears a small scale. Beneath rather densely clothed with silvery scales and short, recumbent and scattered setæ; last ventral segment deeply impressed near apex in males and more shallowly in the females. Length, 5 mm.; breadth, 2.25 mm.

Holotype, allotype (Nos. 2632, 2633, Mus. Calif. Acad. Sci.), and several designated paratypes from a series of eighteen specimens collected by myself from beneath stones, July 14-31, 1905, at about 6000 feet altitude, on the slopes of Paradise Valley, Mount Rainier, Washington, in my collection.

This species rather closely resembles the well-known *lineaticollis*, the type of the genus, but is in general less robust, has the elytral setæ only on the alternate elytral intervals, the ventral setæ less hairlike and in the female less dense, and the last ventral segment deeply impressed in the male.

Lepidophorus alternatus Van Dyke, new species

Oval, convex; brown, legs and antennæ somewhat rufous; head and elytra rather densely clothed above with small, round brown or yellowish white scales, the scales of the pronotum light and mostly condensed into a median and lateral stripes, the lighter scales also more evident along the sides of the elytra and in irregular transverse patches near the center of the disk; setæ rather conspicuous, slightly elevated, scattered over the head and pronotum, more evidently elevated and arranged in rows on the alternate elytral intervals, with a few scattering ones on the even intervals anteriorly. Beak dilated apically, somewhat flattened above, with, at times, an indistinct median crista, and rugosely punctured. Prothorax slightly longer than broad, convex; sides evenly arcuate, narrower in front than at base but not constricted; disk densely, coarsely, somewhat cribrately punctured. Elytra less than twice as wide as prothorax, the alternate intervals somewhat elevated and convex throughout, the even intervals flattened in front and slightly convex behind; striæ evidently impressed and rather closely punctured with deep, round punctures, from each of which projects a short setiferous scale. Beneath moderately densely clothed with whitish scales and recumbent, scattered yellow setæ, the last ventral segment but shallowly impressed near the apex even in the male. Length, 5 mm.; breadth, 2.5 mm.

Holotype (No. 2634, Mus. Calif. Acad. Sci.), and numerous designated paratypes from a series of forty-four specimens collected by myself at Forks, Clallam County, Washington, July 2 and 5, 1920, in my collection. These were beaten from low herbage on the margins of a boggy clearing in the forest. I have also another specimen which I collected at Cannon Beach, Oregon, June 9, 1926, and in the California Academy collection there is another series of specimens taken by Mr. E. P. Van Duzee at Forks, Washington, on the same date that I collected my specimens.

This species rather closely resembles *setiger*, with a specimen of which, kindly presented by Dr. H. C. Fall, it has been carefully compared. It differs by being much larger and more robust, with the alternate elytral intervals more or less distinctly elevated, the setæ coarser and more clubbed, and the funicle of the antennæ longer, the first and second segments distinctly longer than in the other, and the outer segments less transverse. The closely related *setiger* and *alternatus* are probably species of the dense forests while the equally closely related *lineaticollis* and *rainieri* are restricted to the more open country.

Tribe Myrmecini (Otidoccephalini)

Myrmex (*Otidoccephalus*) *ventralis* Van Dyke new species

Narrow and elongate, black, moderately clothed above with soft white pile, erect and directed forward on the pronotum and loosely appressed on the elytra, and with rows of short, erect, and sparsely placed black setæ also on the elytra. Head moderately coarsely, densely punctured; eyes of moderate size and slightly convex; beak short, robust, bistriate laterally, the median carina extending from between the eyes almost to the apex; antennæ piceous, the club elongate and robust. Prothorax nearly one-fourth longer than broad, convex; sides moderately arcuate at center; disk coarsely, densely, somewhat cribrately punctured, a well-defined median crista extending from base almost to apex. Elytra somewhat more than twice as long as prothorax, about one-fourth broader at base than prothorax, with sides almost straight or just perceptibly arcuate and diverging to posterior third from whence they are gradually rounded to apex; disk moderately finely, closely, and irregularly punctured. Beneath rather densely punctured and densely clothed with sub-recumbent, radiate-pectinate, white hairs; each femora with distinct

tooth, and the front tibiæ slightly sinuate within. Length (without beak), 6 mm.; breadth, 2.5 mm.

Holotype (No. 2635, Mus. Calif. Acad. Sci.), a unique, collected in the Chisos Mountains, Brewster County, Texas, July 18, 1921, by Mr. C. D. Duncan.

This species approaches quite closely to *M. estriatus* (Casey), but it differs by being black, not rufous or rufopiceous, more elongate and narrower, with less globular afterbody, the white pile finer and denser above, the elytral setæ shorter and more numerous, the pronotal punctures more uniformly disposed, the elytral punctuation finer and the underside densely clothed throughout with short, radiate-pectinate hairs, whereas in the other the pile is sparse and similar to that of the upper surface except for an occasional pectinate-radiate hair forward and at sides.

***Myrmex dimidiatus* Van Dyke, new species**

Narrow and elongate, the elytra and ventral surface of abdomen black, the remaining portion of body rufous, tibiæ somewhat darkened; body rather sparsely clothed with long, erect black hair, on the elytra arranged in rows on the intervals, the hair of the middle and hind legs mostly white, and the scutellum, meso- and metapleuræ densely clothed with recumbent radiate-pectinate white hairs. Head rather sparsely punctured; eyes moderately convex and well separated; beak short, robust, bistrate laterally and sparsely punctured basally, the median carina well marked at base only; antennæ rufous, club elliptical. Prothorax one-third longer than broad, convex; sides moderately arcuate at center; disk sparsely, rather finely punctured, more closely at base and apex. Elytra twice as long as prothorax, slightly broader at base than prothorax though one-fourth broader at middle; sides sinuate and diverging behind humeri, arcuate at center and converging to apex; disk with striæ faintly impressed and with rows of well-marked, elongate, rather closely placed punctures, the intervals flat, with rows of finer and more sparsely placed punctures. Beneath rather finely, sparsely punctured and shining. Length, 4.75 mm.; breadth, 2 mm.

Holotype (No. 2636, Mus. Calif. Acad. Sci.), a unique from the Davis Mountains, Texas, collected May 14, 1927, by Mr. J. O. Martin.

This bicolored species could only be confused with others of like coloration; *dichrous* (Lec.) from Florida has the base of the elytra also rufous, the punctures of prothorax and elytra denser and coarser and with no erect pile; *basalis* (Schæf.)

from Arizona, has the red color limited to the base of elytra, and is stouter and clothed with a double type of pile above; while *diversicolor* (Champ.), from Central America, also has the red color more limited, and differs otherwise.

MYRMEX OCTOLINEATUS (Champ.)

A number of specimens of this Mexican species are in the collection of the California Academy of Sciences, taken at the following localities in Arizona: fourteen miles east of Oracle, July 27, 1924, by Mr. E. P. Van Duzee; and Texas Cañon, Chiricahua Mountains, September 8, 1927, by Mr. J. A. Kusche. This species is not included in the Leng catalogue.

MYRMEX ESTRIATUS (Casey)

The California Academy of Sciences has specimens of this species from southwestern Texas, southwestern Colorado, the Chiricahua Mountains of Arizona, as well as from New Mexico. Specimens collected near Los Vegas Hot Springs, New Mexico, by Mr. Weld were bred from woody stem galls on oak.

MYRMEX ARIZONICUS (Schaefer.)

A series of this species was taken near Camp Potwisha, Sequoia National Park, California, during May 1929. It was first beaten from mistletoe. *Phoradendron villosum* Nutt., on white oak, *Quercus lobata* Nee, by Mr. Walter Lammerts, and later was dug out from its pupal chambers in the stems of the mistletoe.

Tribe Zygotini

Cylindrocopturus vanduzeei Van Dyke, new species

Moderately elongate, the entire underside including the feet and most of the dorsal surface clothed with large, chalky white scales, opalescent in strong light; the remaining surface ornamented with ochraceous scales which are condensed near the anterior margin of the prothorax at the angles, and on either side of the median line of the disk, more broadly near the base; they form an irregular band extending from the base of the elytra at the outer side of the humeri in the form of a lunule directed toward the middle of the suture, thence zigzagging backward almost to the apex, leaving white areas in the form of a broad triangle at the base, a band three intervals wide on either side of the suture, and a small triangular spot at the sides posteriorly. Head with eyes well separated, the interocular area narrowest at middle, the beak robust, rather coarsely punctured

at the sides from base to apex, the second funicular segment just perceptibly shorter than the first and the antennal club moderately wide. Prothorax as long at sides as broad, the sides slightly narrowing forward and sinuate. Elytra gradually arcuately narrowed posteriorly, suddenly depressed before the apex, with apical margin slightly elevated. Hind margin of second ventral segment faintly bituberculate near the middle. Length, 4 mm.; breadth, 1.75 mm.

Holotype (No. 2637, Mus. Calif. Acad. Sci.), and one paratype belonging to the California Academy of Sciences, collected by Mr. E. P. Van Duzee at Independence, Inyo County, California, June 15, 1929.

This very pretty little species should perhaps follow *princeps* Fall, according to his key.¹ It is also closely related to the recently described *mediatus* Carr, but is smaller, with wider interocular area, and larger scales.

Cylindrocopturus crassus Van Dyke, new species

Robust, subelliptical; black, the underside clothed with slaty gray scales of various shades, the upper with dark slaty colored scales except for a few white scales forming a line along the lateral margin of the pronotum, and on the elytra a spot at the humeri, short lines near the scutellum on the second and third intervals, a short transverse bar at the posterior third from the first to the third or fourth interval, a small spot on the eighth slightly in advance of the preceding, and a series of slaty gray scales extending obliquely outward and backward from just back of the scutellar white scales. Head with eyes well separated, the interocular space narrowest at center and rapidly widening both above and below; beak robust, rather coarsely punctured at the sides from base to apex, second funicular segment slightly shorter than first, and antennal club robust and fusiform. Prothorax slightly broader than long, sides somewhat arcuate posteriorly, narrowed and constricted in front. Elytra rather broadly arcuate at sides, faintly sinuate posteriorly, the disk distinctly convex, compressed before the apex, and the apices slightly divergent. Hind margin of second ventral segment faintly bituberculate at center, each tubercle with a tuft of erect scales. Length, 3.5 mm.; breadth, 1.75 mm.

Holotype (No. 2638, Mus. Calif. Acad. Sci.), and five paratypes from a series of eight specimens, two injured, under No. 29,441, submitted to me by the California State Department of Agriculture through Mr. Hartford Keifer. They were

¹ New species of American Coleoptera of the Tribe Zygopini, by Henry C. Fall, Trans. Am. Entom. Soc., Vol. XXXII, pp. 53-61, 1906.

reared from chrysanthemum in San Mateo County, California, November 18, 1929.

This robust and elliptical species may follow the preceding, but it has a facies all its own. The markings of the elytra are variable, the white scales often being more numerous than in the type and the slaty gray scales sometimes covering most of the disk.

***Cylindrocopturus hemizoniæ* Van Dyke, new species**

Moderately elongate, black, the underside clothed with grayish and grayish brown scales; upper side clothed with brown scales of several shades except for a series of white scales on the occiput, at times forming a stripe down the middle and along the sides of the pronotum, a spot at the humeri, one on the third and fourth intervals behind the middle and one on the eighth interval slightly in advance of the preceding, the sutural intervals also often of a light shade. Head with eyes well separated, the interocular space gradually narrowed to the center, the beak robust, coarsely and closely punctured on sides toward base, more finely apically, the second segment of funicle almost as long as the first, the antennal club robust. Prothorax as long as broad, sides subparallel behind, slightly sinuate and narrowed or slightly constricted in front. Elytra with the sides moderately arcuate, somewhat sinuate before the middle, the disk flattened, and the apical area depressed. Hind margin of second ventral segment nontuberculate. Tarsi with but a few gray scales on second segment. Length, 4.25 mm.; breadth, 1.75 mm.

Holotype (No. 2639, Mus. Calif. Acad. Sci.), and several designated paratypes from a series of thirty-two specimens reared at San Jose, California, April 15 and May 1, 1928, by Mr. L. M. Smith. This species lives in the stems of one of our native tarweeds, *Hemizonia congesta* DC.

This species is, of course, variable as to size, most specimens being somewhat smaller than the type, but it is also variable as to color, the gray or lighter brown scales often replacing most of the dark brown of the elytral disk. A superficially close resemblance in size and shape is shown to *C. longulus* Lec., but it differs by having a shorter, more robust and heavily punctured beak, more widely separated eyes, the elytral intervals flat, never convex, and the darker scales dull, never coppery as they are in *longulus* and its varieties.

***Cylindrocopturus cretaceus* Van Dyke, new species**

Small, elongate, clothed with large chalky white scales over the

undersurface and much of the upper, the disk of pronotum with two broad bands of somewhat brownish scales, the propleuræ and disk of elytra also often similarly clothed to a great extent as in the type, though sometimes with but a minimum of brown scales. Head with eyes fairly well separated, the interocular space narrowest at middle; beak stout, slightly cristate and rather coarsely, closely punctured from base to apex; second funicular segment subequal to first, the antennal club well formed. Prothorax as long as broad; sides slightly sinuate and subparallel, constricted near apex. Elytra with sides somewhat arcuate, gradually narrowing posteriorly, the disk flattened and the apex rather suddenly depressed. Hind margin of second ventral segment nontuberculate. Length, 3 mm.; breadth, 1.25 mm.

Holotype (No. 2640, Mus. Calif. Acad. Sci.), collected fourteen miles east of Oracle, Arizona, July 27, 1924, by Mr. E. P. Van Duzee, and two paratypes, one collected at the same locality as above by Mr. J. O. Martin, the other at Nogales, Arizona, August 27, 1906, by Mr. F. W. Nunenmacher, all in the collection of the California Academy of Sciences.

This small elongate species belongs near *longulus*, but it is not only generally smaller but is without bronzed scales, with the white scales more densely, uniformly placed and larger, the interocular area broader and with its lateral boundaries more arcuate, the beak stouter and more curved, and the entire disk in general flatter. There is, as usual, some variation, the paratypes being smaller than the type and more uniformly white in color.

Cylindrocopturus unicolor Van Dyke, new species

Elongate, subparallel, clothed above as well as beneath with scales of a uniform white color. Head with eyes rather widely separated, the interocular space two-thirds the width of an eye, depressed so as to form a shallow sulcus between the eyes, with a minute longitudinal crista above and as usual narrowest in the middle; beak stout, distinctly arched and rather coarsely punctured from base to apex; second funicular segment just perceptibly shorter than the first, the antennal club well formed. Prothorax slightly broader than long, with sides almost parallel for basal two-thirds and faintly sinuate as well, narrowed and constricted at apex, the disk barely convex and cribrately punctured, the punctures in most cases concealed by the scales. Elytra with sides almost parallel at basal half, thence gradually arcuately narrowed posteriorly and sinuate slightly in advance of apex, the disk flattened and gradually declivous near

apex. Hind margin of second ventral segment nontuberculate. Length, 4 mm.; breadth, 1.5 mm.

Holotype in my collection (No. 2641, Mus. Calif. Acad. Sci.), taken by myself at San Francisco, California, and paratype, somewhat smaller, collected by Dr. F. E. Blaisdell at Del Monte, Monterey County, California, July 25, 1924, in his collection.

This species simulates *cretaceus* in general shape and appearance except that it is proportionally longer, with the scales smaller, of a more uniform color, more pearly and less of a chalky white, the interocular space broader, the beak more robust and arched, the elytra gradually declivous to apex and the ventral segments likewise more gradually narrowed. Its more parallel shape, more flattened dorsum, lack of color pattern, broad interocular space, and more robust and arched beak will also readily separate it from any of the phases of *longulus*.

CYLINDROCOPTURUS LONGULUS (Lec.)

After examining a large series of specimens from many places in the western part of our country, and with a knowledge of their food trees furnished by Dr. H. E. Burke and others, I am forced to conclude that this species is not only of wide distribution but very variable as to color pattern and quite catholic as regards its food plants. I thoroughly agree with Fall² in placing *nubilatus* (Casey), *subcupreus* (Casey), *obscurellus* (Casey), *mucidus* (Casey), and *dispersus* (Casey) with *longulus* (Lec.) as mere color phases and would even go further and include *lunatus* (Lec.). All of these breed in coniferous trees. Typical *longulus* breeds in Douglas fir, *Pseudotsuga taxifolia* Britt, the lodgepole pine, *Pinus murrayana* Balf., and the true fir, *Abies*. Specimens answering perfectly to the original description have been bred from grand fir, *Abies grandis* Lindl., on Vancouver Island, by Mr. A. N. Chells, and from lodgepole pine in the Yellowstone Park by Dr. H. E. Burke. Typical *nubilatus*, which differ only in having the white scales more diffused, have been taken along with *longulus* from the Monterey pine, *Pinus radiata* Don., at Carmel, California, close to the type locality for the former. Other specimens

² Trans. Amer. Ent. Soc., Vol. XXXII, p. 54, 1905.

some of which agree with the description of *mucidus*, have been taken on Mount Hood, Oregon, at various places in northern California, as well as at Idlewild on Mount San Jacinto in southern California, from the western yellow pine, *Pinus ponderosa* Dougl. Dr. Burke has also submitted two specimens which belong with these, one taken from sugar pine, *Pinus lambertiana* Dougl., the other from the lodgepole pine. A beautiful little variety, entirely bronzed above except for a short white bar back of the middle of the elytra, has been bred at Palo Alto, California, by Dr. Burke from both the Douglas and the white fir, *Abies concolor* Lindl. and Gord., and I have seen specimens of the same from Marin County, California, as well as from Corvallis, Oregon, where presumably it lives on the Douglas fir. Specimens which tally exactly with the description of *lunatus* (Lec.) have also been taken in Marin County as well as elsewhere. This species, judging from the material before me, appears thus to vary from specimens almost entirely clothed above with white scales to those almost entirely bare of white scales, with the true *longulus* as the intermediate color phase.

Tribe Cryptorhynchini

Conotrachelus cinereus Van Dyke, new species

Robust, piceous, the elytra moderately densely clothed with small, narrow, light brown and broader white scales, the latter assembled to form more or less transverse spots here and there over the surface, each elytral interval also with a row of sparsely placed, minute, erect white setæ, the rest of the surface more sparsely clothed, the prothorax also ornamented with two white spots and the femora banded with white at the middle. Head moderately coarsely, densely punctured; a well-defined fovea between the eyes; the beak long and slender, slightly less than one-half the length of the body, distinctly striate at base and rather finely punctured; the antennæ inserted at middle of beak, first funicular segment but four-fifths the length of the greatly elongated second segment, the third and fourth together about equal in length to the second, the third a bit longer than the fourth. Prothorax slightly wider than long, the sides broadly arcuate to anterior third, then suddenly constricted and sinuate to lobed apex; the disk with a well-defined, complete median longitudinal carina, and the surface rather coarsely, closely and somewhat cribrately punctured. Elytra about one-third broader than prothorax and two and a quarter times as long, the humeri prominent but rounded, sides arcuate, and the posterior two-thirds gradually nar-

rowed to rounded apex; disk with third, fifth, seventh, and ninth intervals elevated and cristate almost to apex, the even intervals flat, and the striæ faintly impressed, with rather large and closely placed punctures. Beneath coarsely, closely punctured, a deep triangular impression on last ventral. Mesosternum protuberant in front. Front and middle femora slightly prominent where tooth should be, and hind femora with a distinct but not prominent tooth. Claws divergent and toothed. Length, 6.5 mm.; breadth, 3.25 mm.

Holotype (No. 2642, Mus. Calif. Acad. Sci.), a unique specimen collected at Austin, Texas, December 7, 1928, by Mr. J. O. Martin.

This rather large and robust species belongs in the *cratægi* group of the genus and is perhaps nearest to *adpersus* Lec. and *invadens* Fall, but differs from both by the shape of the prothorax, somewhat cordate elytra, and coloration, as well as by the distinctly cristate alternate elytral intervals and broad, flattened, even intervals. The distinctly striate beak and different lengths to the funicular segments also differentiates it. It is strange that such a conspicuous species from eastern Texas should have remained so long unknown.

Conotrachelus asperatus Van Dyke, new species

Short, robust, dark brown, sparsely clothed above with brown and yellowish white scalelike hair, the latter more or less arranged in transverse bars across the elytra, and with short erect setæ, the shorter inclined forward on the pronotum, and the longer inclined backward and arranged in rows on the intervals. Head moderately closely, coarsely punctured, a yellowish squamous hair arising from each puncture; beak robust, slightly arcuate, as long as head and prothorax, carinate above, tricarinate laterally, moderately punctured and with short semi-erect setiferous hairs; antennæ inserted at outer third of beak, second funicular segment slightly longer than first, third and fourth short, together but little longer than second. Prothorax about as wide as long, sides almost straight or faintly arcuate at basal two-thirds and suddenly constricted near apex; disk coarsely punctured, cribrate and without carina. Elytra two-fifths wider than prothorax and over twice as long, cordiform, humeri prominent but rounded, sides arcuate and gradually narrowed from base to apex; disk with alternate intervals slightly elevated and carinate, the even intervals flat, with a row of coarse, well-separated punctures on either side, the basal margins of each puncture elevated so as to form short, transverse, smooth rugæ or asperities. Beneath very coarsely, closely punctured, a short hair arising from each puncture. Mesosternum prominent but not protuberant. All femora with a

single large tooth, tarsal claws divergent and toothed. Length, 5 mm.; breadth, 2.5 mm.

Holotype (No. 2643, Mus. Calif. Acad. Sci.), a unique collected at an altitude of 9000 feet, in Bear Foot Park, Chiricahua Mountains, Arizona, July 29, 1927, by Mr. J. A. Kusche, in my collection.

This species, because of its elytral asperities, is readily separated from its somber relatives. Because of its cribrate and noncarinate pronotum it should come before *cribricollis* (Say) which it simulates in size and general appearance though it is more elongate, with the punctures of pronotum not quite so large and the alternate elytral intervals evidently elevated and carinate.

Conotrachelus setiferous Van Dyke, new species

Rather small, short and robust, brown, the upper surface clothed with brown and gray appressed scalelike hair, and longer, erect, coarse setæ, shorter on head and pronotum and inclined forward and longer on the elytra, slightly inclined backward and arranged in rows on the elytral intervals. The gray hairs are rather generally dispersed though most noticeable on the front of the head, in the form of an arcuate line near the sides of the pronotum, and in spots at base of the third intervals; they are more or less massed about the humeri and along the sides, and form several evident spots on the alternate intervals near the declivity of the elytra, thus giving them a tessellated appearance. Head closely, coarsely punctured, the squamous hair arising from punctures; beak robust, slightly arcuate, as long as prothorax, carinate above and at sides, and punctured laterally in basal portion; antennæ inserted at outer third of beak, second funicular segment about as long as first. Prothorax broader than long, sides rather broadly arcuate, constricted near apex, the disk coarsely, cribrately punctured, and without a carina. Elytra two-fifths wider than prothorax and nearly three times as long, humeri prominent, rounded, sides arcuate and gradually narrowed toward apex, with a slight sinuation just before the apex; the disk with striæ shallow but coarsely, closely punctured; all intervals moderately equally elevated and convex. Beneath coarsely punctured, with short squamous hairs arising from each puncture. Mesosternum prominent, slightly protuberant. All femora armed with a single, well-defined tooth, tarsal claws divergent and toothed. Length, 4.5 mm.; breadth, 2.5 mm.

Holotype (No. 2644, Mus. Calif. Acad. Sci.), a unique collected at Patagonia, Arizona, August 3, 1924, by Mr. E. P. Van Duzee.

This species belongs near the preceding, but can readily be separated by its smaller size, the presence of very robust, erect setæ, equally elevated elytral intervals, the absence of asperities, more transverse prothorax, shorter body, and the color pattern. It closely simulates *cribricollis* in size, shape and color pattern, but has a more transverse prothorax, less coarse prothoracic punctures, and longer setæ.

***Conotrachelus nigromaculatus* Van Dyke, new species**

Short and robust, reddish brown with an irregular black area along the anterior half of the elytral suture; somewhat expanded in front and widened out into a transverse bar behind the middle; the upper surface sparsely clothed with white and yellowish white scale-like hair, most evident about the humeri and apical declivity, with fine setæ, sparse, short and inclined forward on head and pronotum, and longer, slightly bent backward and arranged in rows on the elytral intervals. Head coarsely, closely punctured, the beak robust, slightly curved, as long as head and prothorax, carinate above and laterally and coarsely punctured except at apex; antennæ inserted at outer third, the second funicular segment somewhat longer than first. Prothorax somewhat broader than long, the sides arcuate and narrowed from base and constricted before apex; the disk coarsely, cribrately punctured and without a carina. Elytra two-fifths wider than prothorax and about twice as long, the humeri prominent but rounded, the sides arcuate and gradually narrowed toward apex, the disk with striæ coarsely and shallowly punctured, all intervals moderately elevated, with the alternate ones somewhat carinate. Beneath coarsely punctured, with short hair arising from each puncture. Mesosternum prominent and but slightly protuberant. All femora unidentate, the tarsal claws approximate and cleft. Length, 4.5 mm.; breadth, 2.5 mm.

Holotype (No. 2645, Mus. Calif. Acad. Sci.), and one paratype, collected at Silver Creek, Chiricahua Mountains, Arizona, altitude 4500 to 6000 feet, October 7, 1927, by Mr. J. A. Kusche, in author's collection.

This species belongs near *echinatus* Horn, but is considerably larger, differently colored and with alternate elytral intervals evidently carinate.

***Rhyssematus beutenmuelleri* Van Dyke, new species**

Short, oval, robust; black, antennæ and tarsi rufous, subopaque, legs, undersurface, and much of elytra clothed with oval gray scales. Head rather coarsely punctured, partly clothed with gray scales, with a few erect black scales in front; eyes separated by a distance

equal to their own breadth, a small fovea between eyes; beak longer than prothorax, not depressed at base, grossly punctured basally and smooth apically. Prothorax one-fourth broader at base than long, sides arcuate and converging from base to beyond middle, thence sinuate and constricted to apex, the disk with well-elevated central crista and elsewhere rather coarsely and densely punctured, without trace of strigæ but with numerous erect black scales (it is possible that in fresh specimens these clothed all of the disk). Elytra about one-sixth wider than prothorax and twice as long, sides gradually arcuate from base almost to apex, where somewhat constricted; disk with suture slightly elevated and the third, fifth, seventh, and ninth intervals sharply cristate from base to apex, with two rows of coarse, deep, oblong punctures between the cristæ; the general surface finely granular and subopaque. Body beneath somewhat coarsely, closely punctured and opaque. Intermediate and posterior tibiæ not toothed or angulate some distance before the apex, each femur with a moderate tooth, the anterior coxæ fairly well separated. Length, 4.5 mm.; breadth, 3.75 mm.

Holotype (No. 2646, Mus. Calif. Acad. Sci.), a unique specimen in my collection, taken in the Black Mountains of North Carolina, May 30, 1912, by Mr. William Beutenmueller.

This rather small black species can readily be separated from any of our other eastern species by its more or less uniformly punctured pronotum, lack of pronotal rugæ and the presence of scaly vestiture.

***Rhysematus arizonicus* Van Dyke, new species**

Moderately elongate, oval, robust; black, antennæ and tarsi rufopiceous, somewhat shining, the elytra, legs and undersurface sparsely clothed with very fine and short white hair. Head moderately coarsely and closely punctured, a yellowish scalelike hair arising from each puncture; eyes very narrowly separated; beak not longer than prothorax, robust and but slightly curved, not depressed at base, coarsely punctured throughout basal area, smoother and more finely, sparsely punctured toward apex, with a sharply defined medial carina and several less distinctly marked lateral ones near the base. Prothorax twice as broad at base as long, sides slightly arcuate and rapidly converging toward apex before which it is slightly constricted, the disk with fine though distinct and complete median crista and numerous well-defined irregular though generally longitudinally arranged rugæ, more prominent at sides. Scutellum finely punctured. Elytra slightly wider at humeri than prothorax and about three times as long; sides sinuate posterior to humeri, thence gradually arcuately narrowed to base; disk with suture slightly elevated and with third, fifth, seventh, and ninth intervals cristate

from base to apex; eighth and tenth cristate at base, with two rows of coarse, deep oblong punctures between the cristæ; general surface irregularly punctured and rugose. Body beneath coarsely and rather closely punctured, the last ventral segment much more finely and closely punctured. Front coxæ slightly separated, each femur with a well-defined tooth; the intermediate and posterior tibiæ without defined teeth on outer surface before apex. Length, 7 mm.; breadth, 4.5 mm.

Holotype (No. 2647, Mus. Calif. Acad. Sci.), and paratype from Prescott, Arizona, collected August 13, 1909 and June 20, 1909, by Mr. J. A. Kusche, and two paratypes from Dewey, Arizona, in my collection.

This species does not fit the description of any of the Mexican species and among our own species would come closest to *lineaticollis* Say, from which it differs by being slightly larger, more elongate, with the sides of the prothorax straighter and more oblique, the dorsal crista better defined, the elytra distinctly rugose and shining, not minutely granular and sub-opaque, and by having a fine though sparse pubescence.

RHYSSEMATUS ACUTECOSTATUS Champ.

This large Mexican species may now be added to our list. It differs from the preceding by being slightly larger, more piceous, with the head and beak at base coarsely, rugosely punctured, the frontal striæ less complete and more oblique, the minute hair yellowish, the middle and posterior tibiæ toothed or angulate on their outer edge some distance before the tip and with the space between this and the outer apical angle more or less concave and ciliate. A specimen of this species is in the collection of the California Academy of Sciences which was taken at Badger, Santa Cruz County, Arizona, July 31, 1924, by Mr. J. O. Martin.

Chalcodermus martini Van Dyke, new species

Short, oval, convex, black, antennæ rufopiceous, elevated portions slightly shining, and conspicuously clothed with a sparse, erect, white setiferous pile, giving the insect a grayish appearance. Head alutaceous, rather coarsely, closely punctured in front; beak distinctly longer than prothorax, slightly curved, coarsely punctured at base and sides; eyes separated in front by about one-half the breadth of the beak. Prothorax one-fourth wider at base than long; sides slightly arched and convergent until near base, where rather suddenly con-

stricted; disk very coarsely punctured, the intervals between punctures elevated into a series of longitudinal rugæ at middle and irregular reticulations laterally, the reticulation gradually disappearing at sides beneath. Elytra somewhat over one-fifth broader at base than prothorax, sides almost parallel at basal two-thirds, thence gradually rounded to apex; disk with rows of very large, deep, and rather closely placed punctures, the intervals slightly elevated and convex and sparsely, very finely punctured. Beneath coarsely punctured, the last ventral segment more finely and closely. Length (without beak), 4.75 mm.; breadth, 2.75 mm.

Holotype (No. 2648, Mus. Calif. Acad. Sci.), a unique collected by Mr. J. O. Martin in Sabino Cañon, Santa Catalina Mountains, Arizona, August 13, 1924.

This species, because of its conspicuous cinereous vestiture, deep punctuation, and well-elevated intervals, stands apart from all of its fellows and thus should be easily recognized. It seems to resemble no Mexican species.

TYLODERMA MORBILLOSA (Lec.)

This species, described as having been taken in San Francisco, has not since been collected there. Recently, however, it has been secured in numbers by Mr. W. W. Baker of the Western Washington Agricultural Experiment Station near Grand Mound, in western Washington. It is reported as being quite injurious to strawberries.

COPHES GIBBUS Champ.

Three Arizona specimens of this large gray weevil, never before reported from north of Mexico, have recently been seen. The genus is close to *Cryptorhynchus*, but differs primarily by having the anterior tarsi in the males greatly dilated and fringed with long hairs on the inner side. Two of the specimens seen belong to the California Academy of Sciences, one a male, collected by Mr. E. P. Van Duzee near St. Xavier Mission, Tucson, Arizona, July 29, 1924, and the other, a female, collected by Mr. J. O. Martin in Florida Cañon, Santa Rita Mountains, Arizona, August 10, 1924. The third specimen is in the collection of the Oregon Agricultural College and was taken by Prof. W. J. Chamberlin, also in the Santa Rita Mountains and on July 24.

Subfamily Calendrinæ

Calendra (Sphenophorus) sequoiæ Van Dyke
new species

Rather small, somewhat elongated, subparallel; black, varying to reddish; undersurface and more elevated portions of upper shining, the depressed areas velvety (in fresh specimens). Rostrum slightly more than half as long as prothorax, moderately arcuate and compressed. Surface at base rather strongly and numerous punctured, base strongly dilated above scrobes, where it is acutely angled; interocular fossa deep and without channel in front. Front of head rather finely punctured. Prothorax about one-sixth longer than broad, widest at middle; sides slightly arcuate, suddenly and strongly constricted at apex; disk with vittæ well marked, the median Y-shaped, narrowed behind, the arms in front broad and arched to enclose the deep elliptical apical fossa, the lateral vittæ broad and more or less united with the median in front of middle; all vittæ rather finely punctured, the V-shaped depression between them at base very coarsely punctured, elsewhere less coarsely so. Scutellum declivous and channelled. Elytra more than one-sixth broader than prothorax and one-fourth longer, gradually narrowed to apex; disk moderately convex, the striæ fine but coarsely, deeply and somewhat remotely punctured, giving the intervals a crenulate appearance; the alternate intervals broader, distinctly elevated and finely, uniseriately punctured except the third which is biseriately punctured near base; humeral and subapical callosities well marked, smooth and shining. Beneath distinctly punctured throughout, the punctuation closest on metasternum. Legs finely and sparsely punctured, tibiæ feebly fimbriate on inner side, anterior tibiæ with outer angle protuberant, the others obliquely truncate, with inner angle produced into a long spur. Pygidium coarsely, closely punctured behind, more finely in front, and with minute tufts of silvery hair each side of apex. Length (excluding beak), 7.5 mm.; breadth, 3.25 mm.

Holotype (No. 2649, Mus. Calif. Acad. Sci.), and nine paratypes, collected by myself from near Camp Potwisha, altitude 2100 feet, Sequoia National Park, California, June 13, 1929, in my collection.

This species belongs in the *placidus* group of the genus as defined by Chittenden,³ and should perhaps be placed in the series with *neomexicanus* Chitt. and *phœniciensis* Chitt. From the former, the fine punctuation of the pronotal vittæ and the regular and fine punctuation of the elytral intervals will separate it; and from the latter, the elevation of the alternate intervals and coarse strial punctuation will distinguish it.

³ On the species of *Sphenophorus* hitherto considered as *Placidus* Say, Proc. Ent. Soc. Wash., VI, No. 3, pp. 130-137, June 25, 1904.

CONCERNING SCIENTIFIC NAMES

BY E. P. VAN DUZEE

In *Science* for January 10, 1930, Professor J. G. Needham, in an article on "Scientific Names," makes a plea for simplifying zoölogical nomenclature, suggesting a return to simple binomials with fewer and larger genera. The "larger genera" would appeal strongly to many and is right in line with a suggestion made by me in the April, 1926 number of the PAN-PACIFIC ENTOMOLOGIST (p. 215), that in ordinary use we ignore the finer subdivisions of both genera and species leaving such subdivisions for the taxonomist, to be used as subgenera, subspecies, or varieties if he so elect. Professor Needham hits the nail squarely on the head when he says that the number of generic names does concern the general worker [in entomology] "for if he has to learn a new genus name for almost every species that name is no aid at all, but an added burden on his memory."

We would most heartily endorse Professor Needham's plea for the more comprehensive genera, using their subdivision as subgenera. Such subdivisions are of great value to the systematist, but of little or no interest to the economic entomologist.

The matter of trinomials and quadrimomials has recently (*Science*, February 21, 1930, p. 217), been discussed by Professor Cockerell in a very clear and satisfactory way. It is hard to see how we could indicate the evolution of our species without these minuter subdivisions. Professor Needham's method of using the names of the more important of these subdivisions as species names would be particularly unfortunate with the recent tendency to arrange species names alphabetically in our catalogues, where all indications of relationship are lost. Most entomological systematists confine their studies to some one group of insects, and if they use these names of the minor divisions of genera and species in their proper logical categories this multiplicity of names will, up to a reasonable point, be a help to him by indicating the relationship and development of the species. The economic entomologist again can ignore these minor divisions. He can, for instance, use the name *Pieris napi* for all forms of that species, ignoring the subspecies, seasonal forms and aberrations.

THE LARVA OF CYLINDROCOPTURUS CRASSUS
VAN DYKEBY H. H. KEIFER
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Since this weevil is a pest in flower gardens and is most likely to be noted as such in the larval state, it seems advisable to attempt a partial description in connection with that of the adult to aid in future determination. These notes on the external morphology are not intended to be complete but are a series of remarks and figures to give the larva a taxonomic status.

Infested chrysanthemum plants were sent to the Department of Agriculture at Sacramento on August 8, 1929, from some locality in San Mateo County by A. W. Tate, Jr. It was immediately noted that several small weevil larvæ in each stalk had girdled the plant just under the bark at or immediately below the ground line. On examining these stalks in the latter part of November 1929, it appeared that the larvæ had formed small cells under the outer integument of the stem, pupated, and transformed to adults.

The larva (Fig. 1) of this species will tentatively run to the *Cylindrocopturini* in Boving's key (see ref.) The spiracles are as stated, but there is no posterior conical projection from the ninth tergum of the abdomen. There is, however, a small eyelike spot on each side of the head which is apparently within the head capsule, but does not correspond to the eyelike spot referred to in the above-mentioned key.

This *Cylindrocopturus* larva is approximately 5 mm. long. Its general shape is cylindrical, cyrtosomatic, tapering very little. The color is white and the hairs are not apparent, even under a binocular microscope, with the exception of a few posterior dorsal setæ. The position of these setæ could only be determined from stained mounts.

The head is light yellowish brown, elongate oval, four-fifths as wide as long, at least half retracted into the prothorax. Conspicuous whitish areas appear above: on the posterior half of the frons (Fig. 2, *f*); a rather wide longitudinal area near and parallel to the epicranial suture on each side. The frons is a little over half as long as the epicranial suture; it is longer than wide and ends posteriorly in an acute angle. The frontal carina (Fig. 1, *car*) is very distinct, about one-third the length of the frons. The frons has five setæ and two sensory spots on each side. The epicranium (Fig. 1, *ep*) and

frons are at all places distinct. The epicranial setæ are crowded forward due to the position of the prothorax; apparently nine anterior setæ, five sensory spots (one back within the prothorax), and four posterior minute setæ on each side of the head. The antennal lobe (Fig. 2, *b*) is small and located near the mandible at the suture separating the frons from the epicranium; the second segment is very reduced, anteriorly placed on the first segment; five sensory papillæ are posteriorly placed on the first segment. The ocellus (Fig. 2, *o*) is just posterior to the antenna and not pigmented. The mandibles are not large or prominent, have no definite teeth, but a rather wide grinding surface, and two small setæ. The maxillary mala (Fig. 2, *a*) tends to be flattened apically and has eleven stout setæ, the inner seven or eight bladelike. The epipharyngeal rods are subparallel and narrow, broadly joined posteriorly.

The body integument is generally covered with posteriorly projecting spinules. These spinules vary in size and number according to location. On the body in general they are comparatively small and arranged in almost scattered rows (Fig. 1, *d*). Notable exceptions to this are found on the prothorax and the last few abdominal sterna. On the prothorax a transverse band crosses the posterior part of the tergum (Fig. 1, *b*), where these small spines are crowded and large; more or less dense areas also recur on the pleura and the sternum of this segment. On the abdomen this condition also occurs on the last three abdominal sterna (Fig. 1, *g*).

The areas of the body are not very different from the majority of described weevil larvæ in regard to the number and position of the setæ. The prothoracic shield (Fig. 1, *psh*) is rather large, with ten conspicuous setæ on each side of the tergum. The terga of the other two thoracic segments are divided into the prescutum (Fig. 1, *prs*) and scuto-scutellum (*scl*), with one and four setæ respectively on each side. The alar area of each of these last two segments has one seta which is directly below and in line with the scuto-scutellar setæ. On the thoracic epipleura (Fig. 1, *epi*, *pre*) the prothorax shows no setæ; the mesothorax has two on the pre-epipleurum (*pre*) and two are on the metathorax. The hypopleurum of the prothorax has two setæ, with one each on the corresponding area of the other two segments (Fig. 1, *hyp*). The coxal lobes (*cx*) are inclined to be prominent and have six setæ. There is one seta on each side of the thoracic eusterna (*eus*).

Of the abdomen the first seven segments are alike. The tergum of each shows four areas; the prescutum (*prs*) with one seta on each side, the scutum (*sc*), the scutellum (*scl*) with five setæ, and the postscutellum (small and lateral) not attaining the dorsum (*pscl*). Two alar setæ are just above each spiracle. The epipleura (*epi*) and hypopleura (*hyp*) are rather elongate, each of one lobe; they are separated by a very distinct ventrolateral suture and have two setæ

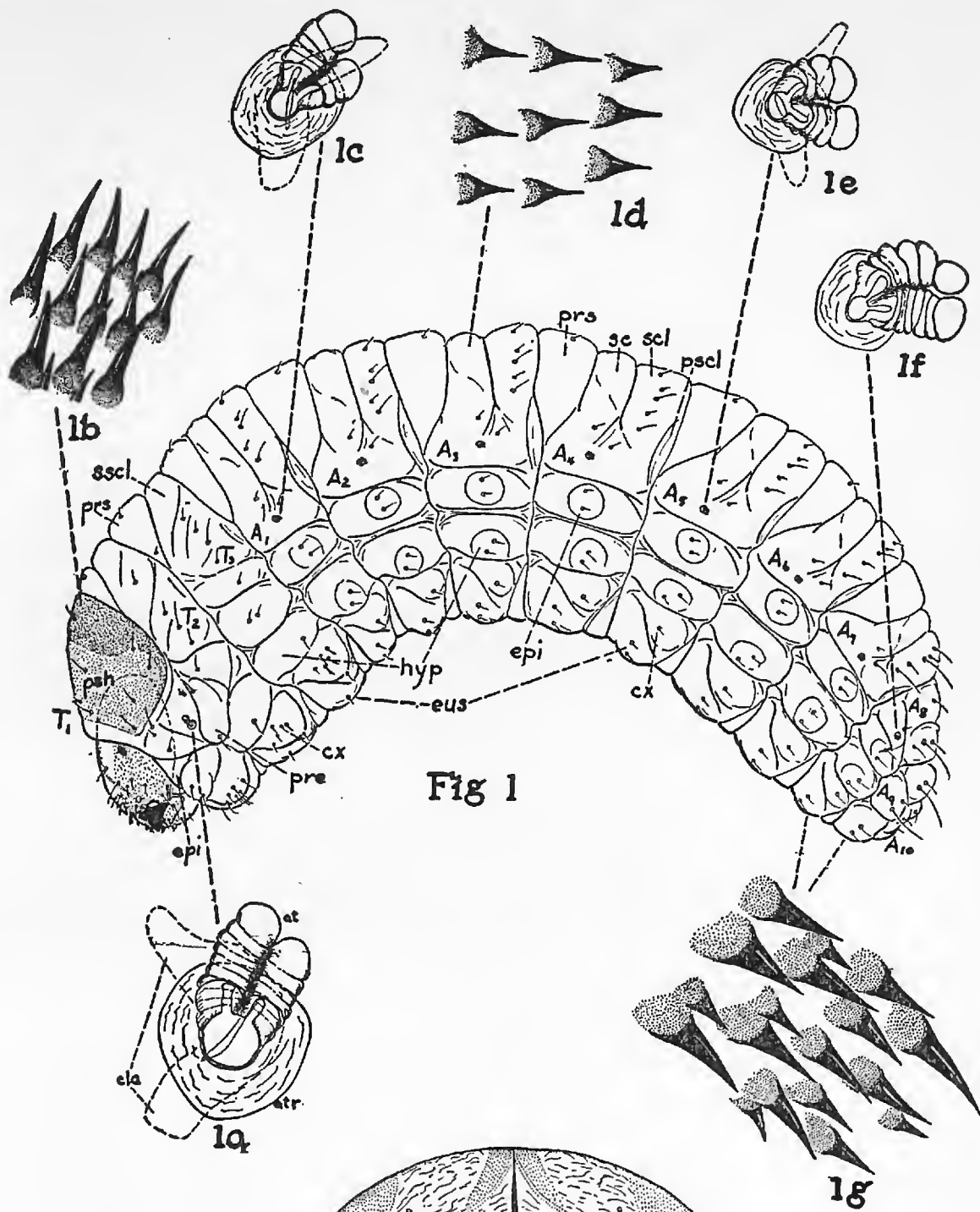


Fig 1

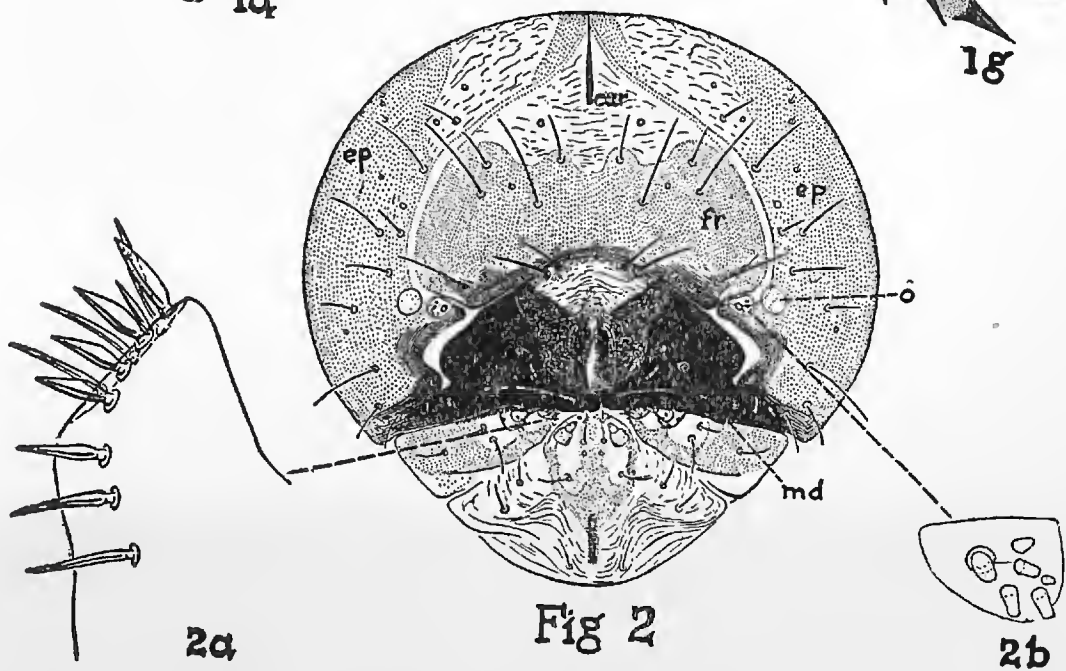


Fig 2

each. The parasterna (*cx*) have one seta each. The eusterna (*eus*) have a pair of setæ on each side. A poststernellum is indicated on each segment. The eighth segment (A_8) is like the preceding except that it has but two tergal areas, and one and three setæ on each lobe, respectively. The ninth (A_9) is still further reduced, with two dorsal, two lateral, and two ventral setæ on one side. The tenth (A_{10}) is very reduced, with two setæ on each side.

The spiracles (Fig. 1, *a*; 1, *c*; 1, *e*; 1, *f*) are bifore, the air tubes extending well beyond the atrium (Fig. 1, *a*, *atr*). The air tubes (*at*) are annulate, with the anterior (or dorsal) tube usually longer and somewhat curved onto the other. The mesothoracic spiracle (Fig. 1, *a*) is largest, the air tubes (*at*) point dorsally and somewhat posteriorly, the anterior tube has six or seven annulæ, the posterior tube with four or five. The abdominal spiracles are generally smaller. The first (Fig. 1, *c*) is inclined more posteriorly than the mesothoracic, with four or five annulæ on the anterior tube and three or four on the posterior. The fifth (Fig. 1, *e*) points directly posteriorly (horizontal to the body) with about the same number of annulæ on each tube. The eighth (Fig. 1, *f*) is somewhat larger than the average and has about as many annulæ as the mesothoracic spiracle, with more on the ventral tube.

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THE PLATE

Figure 1—Larvæ of *Cylindrocopturus crassus* Van Dyke; A_1 to A_{10} abdominal segments; *cx*, coxal or parasternal lobes; *epi*, epipleurum; *eus*, eusternum; *hyp*, hypopleurum; *pre*, preëpipleurum; *prs*, pre-scutum; *pscl*, postscutellum; *pah*, prothoracic shield; *sc*, scutum; *scl*, scutellum; *sscl*, scuto-scutellum; T_1 , T_2 , T_3 , thoracic segments.

Figure 1, *a*—Mesothoracic spiracle; *at*, air tubes; *atr*, atrium; *cla*, closing apparatus. Figure 1, *b*—Spinules of prothoracic tergum. Figure 1, *c*—First abdominal spiracle. Figure 1, *d*—Spinules as found on the body in general. Figure 1, *e*—Fifth abdominal spiracle. Figure 1, *f*—Eighth abdominal spiracle. Figure 1, *g*—Spinules as on the last two or three abdominal sterna.

Figure 2—Anterior view of head; *car*, median frontal carina; *ep*, epicranium; *fr*, frons; *md*, mandible; *o*, ocellus. Figure 2, *a*—Ental view of right maxillary mala. Figure 2, *b*—Antenna: the first segment is the basal part, the second segment is to the left, the sensory papillæ are on the right.

REVISION OF THE GENUS AND SPECIES OF
DINACOMA WITH DESCRIPTION OF A
NEW SPECIES (COLEOPTERA:
SCARABÆIDÆ)

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In 1885 Thomas L. Casey announced a new scarabæid, *Polyphylla marginata*, without description. In 1886 the description of the species appeared under the generic caption of *Thyce marginata*. In 1889 a new genus was established for the species by Casey, namely, *Dinacoma*. According to him the characters agreeing with *Thyce* are the structure of the labial palpi and tarsal claws, and those agreeing with *Polyphylla* are the greatly developed male antennal club and the "short" tarsi. On account of the disconnected publication of the original descriptions the following revision is presented. Colonel Casey's generic characterization follows with slight modification:

DINACOMA Casey (MELOLONTHINI)

Clypeus concave, parallel and subtruncate at apex; mentum moderate, concave, subquadrate and connate with the ligula; the latter transverse and feebly emarginate at apex. Maxillæ moderate, the palpi well developed; first joint very small, narrow and obconical; second and third longer than wide, the former the longer, both obconical and obliquely truncate; fourth slightly shorter than the preceding three together, pointed, deeply impressed or excavated on its outer face. Labial palpi very small; third joint ovoidal, obtusely acuminate, as long as the two preceding together. Labrum short, transverse, free, impressed in the middle. Antennæ ten-jointed; middle joints of funicle subankylosed, short; club trifoliate, very long and arcuate in the males. Anterior coxæ transverse, but slightly prominent. Metasternal episterna moderate in width. Abdominal segments connate, the sutures fine but not entirely obliterated, rendered distinct by the disposition of the vestiture. Metasternum well developed. Legs rather short and slender; tarsi moderate in length, the posterior shorter than the tibiæ; claws moderately evenly and strongly arcuate, toothed near the base, the teeth distinctly unequal, especially the anterior.

In both of the known species the anterior tibiæ have two teeth exclusive of the exterior and very pronounced apical spur; these teeth are very unequal, the one nearer the base being very short and obtuse.

DINACOMA MARGINATA Casey

Form moderately robust to somewhat parallel; sides more or less distinctly arcuate, least so in the parallel form. Color rufo-fuscous, the anterior parts somewhat piceous, legs fuscous. Head, pronotum and femora abundantly clothed with long flying hairs, less abundant on the abdomen and sparser and shorter on the tibiæ; sterna extremely densely clothed with long, soft, cinereo-fuscous pile. Squamous vestiture albo-plumbeous. Pronotum with three posteriorly divergent vittæ of cinereous squamæ, the exterior ones widest and interrupted in the middle, the median finer and more or less obsolete, especially toward the base. Each elytron having along the exterior edge a very wide line of plumbeo-cinereous and slender squamæ not very closely placed, which is incurved at apex, continuing thence along the suture as a narrow, whiter and usually better defined line to the base; between these another very fine vitta, terminating at about one-fifth of the length from the apex; squamæ of the intervening areas slender and sparser, while those of the vittæ and those otherwise distributed are stouter, all lanceolate and linearly acuminate apically, to linear or even hairlike. On the pronotum the visible surface between the vittæ is very sparsely punctate; punctures coarse, circular, variolate and shallow, each giving rise to a squama or a long, more or less erect, hair. Scutellum very densely clothed with cinereous squamæ. Beneath the inflexed sides of the pronotum and mesosternal and metasternal parapleuræ in part are densely clothed with albo-cinereous squamæ, each ventral segment has an irregular spot of similar character each side next to the epipleuræ; abdominal surface sparsely clothed with smaller lanceolate squamæ. Head rather densely clothed with long flying hairs, intermixed with moderately narrow lanceolate squamæ at periphery, especially on the clypeus, these more or less obsolete centrally and replaced by hairs; beneath, the hairs are more abundant and longer.

Head, excluding the eyes, slightly longer than wide, subquadrate; clypeus moderately reflexed, apex broadly and feebly sinuate, angles rectangular; frons densely and coarsely punctate, clypeus less so. Antennæ well developed, club three and a half times longer than wide and two and a fifth times longer than the funicle; the folia wider at apex than at base. Funicular joints nearly equal in length, the fifth and sixth with club in adduction appear transverse and briefly produced anteriorly; with club in abduction they appear longer and subequal to each of the other joints (Fig 9); scape obconical, short, and less than twice as long as wide at apex.

Pronotum widest at middle and there moderately arcuate, about one-half wider than long; sides thence strongly convergent and feebly arcuate to the apical angles which are very obtuse, toward base feebly convergent and straight to the basal angles. the latter obtuse and more or less rounded; base strongly arcuate, especially

in middle third, and feebly sinuate laterally toward each angle; disk strongly convex from side to side, sparsely and irregularly punctate, punctures shallow, variolate and circular, smaller and denser in the densely squamous areas.

Elytra at base slightly wider than the prothorax, sides parallel and more or less arcuate, together slightly less than one-half longer than wide, two and a half times as long as the pronotum, finely, sparsely, feebly and irregularly punctate, punctures somewhat asperate; apices separately rounded, sutural angles obtuse.

Pygidium slightly wider than long, feebly convex, finely and rather sparsely punctate, moderately sparsely and evenly clothed with small, slender squamæ and intermixed hairs. Posterior tarsi three-fourths as long as the tibiæ. Claws moderate, having a small erect tooth interiorly near the base; tooth of outer anterior claw small or obsolete with inferior margin thence to base more or less sinuate; inner teeth of the middle and posterior claws a little smaller than the outer.

Males with a large and rather feeble, more or less variable impression in the middle of the abdomen near the base. Female unknown.

Holotype, a male, in the Casey collection deposited in the United States National Museum. Length, 19 mm.; width, 8.5 mm.

Type locality: San Diego County, California, undoubtedly Ocean Beach near San Diego. Casey mentions five or six specimens taken by Mr. G. W. Dunn and that he received the type specimen from Mr. W. G. W. Harford. Six specimens studied as follows: Three in the Van Dyke collection, two taken by E. L. Ricksecker at Ocean Beach, and one collected at Riverside, California, July, 1914; one presented to the collection of the California Academy of Sciences by Dr. F. C. Clark, also taken at Ocean Beach; and two in the author's collection, taken by George Field at Ocean Beach on June 28, 1897. A specimen has been submitted to Mr. L. L. Buchanan, custodian of the Casey collection in the National Museum, who has very carefully compared it with the type and vouches for the correctness of the identification.

The specimen from Riverside presents some divergence from the typical *marginata*: the clypeus is moderately deeply and triangularly emarginate and the elytra are not noticeably vittate; the abdomen is more densely squamous and the lateral white spots not defined. Two other specimens taken at San

Diego by Mr. Field present other divergencies. These specimens may represent other species or subspecies.

In *marginata* the apical deflexed surface of the clypeus is glabrous and shining, with a row of slightly irregularly placed punctures at base near the labrum, each puncture well defined, coarse, shallow, and setigerous. The labrum is deeply and broadly emarginate, the rounded floor of the sinus is flush with the deflexed surface of the clypeus, the lateral lobes are small and obtusely rounded on the apical margin and not beaded.

Dinacoma caseyi Blaisdell, new species

Form moderately robust to somewhat parallel, in the former the sides are distinctly arcuate, less so in the parallel form. Moderately rufous in color. Squamous vestiture and pubescence albo-cinereous throughout. Head, pronotum, and legs rather sparsely clothed with long, soft, flying hairs, abdominal segments less so; sterna extremely densely invested with long, soft pile; anterior margin of the femora fimbriate with similar hairs. Head, pronotum and pygidium densely squamous, more or less hiding the general surface, sparser on the femora and tibiæ; squamæ extremely dense on the scutellum and undersurface of the body, especially on the abdominal segments. Pronotum with a more or less broad lateral vitta (usually attaining the margin) of densely placed squamæ, and a narrow median more or less evident vitta. Each elytron not densely squamous, a sub-sutural narrow vitta is most noticeable, lateral vittæ obsolete, a narrow median vitta is sometimes almost evident, always evanescent apically. Squamæ lanceolate and less elongate than in *marginata*, much less acuminate at apex.

Head excluding the eyes scarcely longer than wide, quite quadrate; clypeus rather less than moderately reflexed, apex truncate and feebly sinuate, angles rectangular, sides distinctly parallel; coarsely punctate, punctures circular, shallow and variolate, hidden by the bases of the squamæ when not desquamated, exposed piliferous punctures much fewer than in *marginata*. Apical deflexed surface of the clypeus glabrous, with a transverse line of coarse subobsolete setigerous punctures at middle; labrum deeply emarginate and impressed at middle and flush with the clypeal surface, lobes small and more or less beaded at apex. Antennæ well developed, club three and a half times longer than wide and two and a seventh times longer than the funicle, folia narrowed in about basal fourth and therefore widest at apex, the latter evenly rounded; funicle rather stout, second joint a little longer than the third, the latter and others quite equal in length when the club is abducted (Fig. 9); the last two funicular joints appear transverse and slightly produced anteriorly and flattened, when the club is adducted.

Pronotum widest at middle, where the sides are rather strongly arcuate and at that point a half wider than long, thence strongly convergent and slightly arcuate to the obtusely rounded apical angles, feebly convergent and almost straight to the moderately rounded basal angles; apex transverse in circular arc; base arcuate, feebly subangulate at middle, thence feebly sinuate laterally toward each angle; disk quite strongly convex from side to side, densely punctate, punctures circular, coarse, shallow and variolate when visible, base of each squama neatly fitted to the contour of the puncture, piliferous punctures not conspicuous and fewer in number than in *marginata*; lateral margins very loosely fimbriate with very long, recurving hairs.

Elytra at base slightly wider than the prothorax, sides parallel and more or less arcuate, together about a third longer than wide and about two and a half times as long as the pronotum; finely, not densely, feebly and irregularly punctate, punctures not noticeably asperulate; apices feebly subtruncate, each slightly inwardly oblique toward the obtuse sutural angle.

Pygidium about a fourth wider than long, convex, finely and rather densely punctate. Posterior tarsi a fifth of their length shorter than the tibia. Claws toothed near the base, teeth well developed, tooth of outer anterior claw small or obsolescent, the inner of the middle and hind tarsi slightly smaller than the outer.

Males with the abdominal segments slightly flattened or impressed along the middle. Female unknown.

Holotype, in my collection, a male (No. 2650, Mus. Calif. Acad. Sci.). Length, 19 mm.; width, 8 mm.

Type locality: **Palm Springs, Imperial County, California**; collected on May 10, 1923. Six specimens studied, five being paratypes, one to be deposited in the collection of the United States National Museum.

Distribution: Southeastern California. Taken at Palm Springs by Mr. J. O. Martin on June 8, 1916; and in Riverside County on April 17 by Mr. E. R. Leach. Specimens have also been examined in the collection of James E. Cottle that were taken in the vicinity of Palm Springs.

Caseyi differs in many characters from *marginata*—the rufous color, obsolete elytral vittæ, and the snowy white squamous vestiture that is extremely dense on the abdominal segments. In *marginata* the squamous vestiture is sparser, especially on the abdomen, the elytra distinctly vittate, and the color is more fuscous than rufous. *Marginata* is Polyphylla-

like in facies, while *caseyi* is more Thyce-like, except for the antennal club.

The male genitalia of *marginata* is figured below and compared with that of a male *Polyphylla 10-lineata*. The differences are very evident. In *marginata* the claspers have a tooth or hook on the inferior margin near apex, while in *Polyphylla* the claspers are decurved and incurved at apex.

In the species of *Dinacoma* the following device for maintaining the eyes free from foreign materials which obscure the vision may be described as follows: The eyes are deeply emarginated by a digitiform extension of the lateral frontal margin; the surface of the process is coarsely punctate. From the punctures arise moderately long and erect, rather rigid setiform hairs. The posterior surface of the first antennal joint or scape is quite densely fimbriate with unusually long apically curved hairs, which, when the antennæ are moved backward and forward, sweep the anterior part of the eyes and, in the backward movement, interdigitate with the erect hairs of the emarginating process which act as a comb, freeing the antennal fimbriæ from dirt. The posterior portion of each eye is swept by the postocular apical pronotal fimbriæ when the head is extended or retracted; also when the head is moved from side to side. The device is better developed in *marginata* than in *caseyi*. It is poorly developed in *Polyphylla*.

All comparative measurements have been made from camera lucida tracings. The measurements given above differ considerably from those given by Colonel Casey. In such scarabæids as *Polyphylla* and *Dinacoma* with large antennal clubs, the club should be abducted at right angles to the long axis of the funicle, which is straightened thereby, before making the comparative measurements; when the club is adducted the fifth and sixth funicular joints appear much abbreviated. Casey states that the tarsi are short; by direct measurement a posterior tarsus is found to be one-fifth of their own length shorter than the tibia. The author, therefore, states that the tarsi are moderate in length.

SYNOPTIC STATEMENT

Elytra vittate; color rufo-fuscous to more or less piceous; squamous vestiture not extremely dense on sterna and abdomen; squamæ

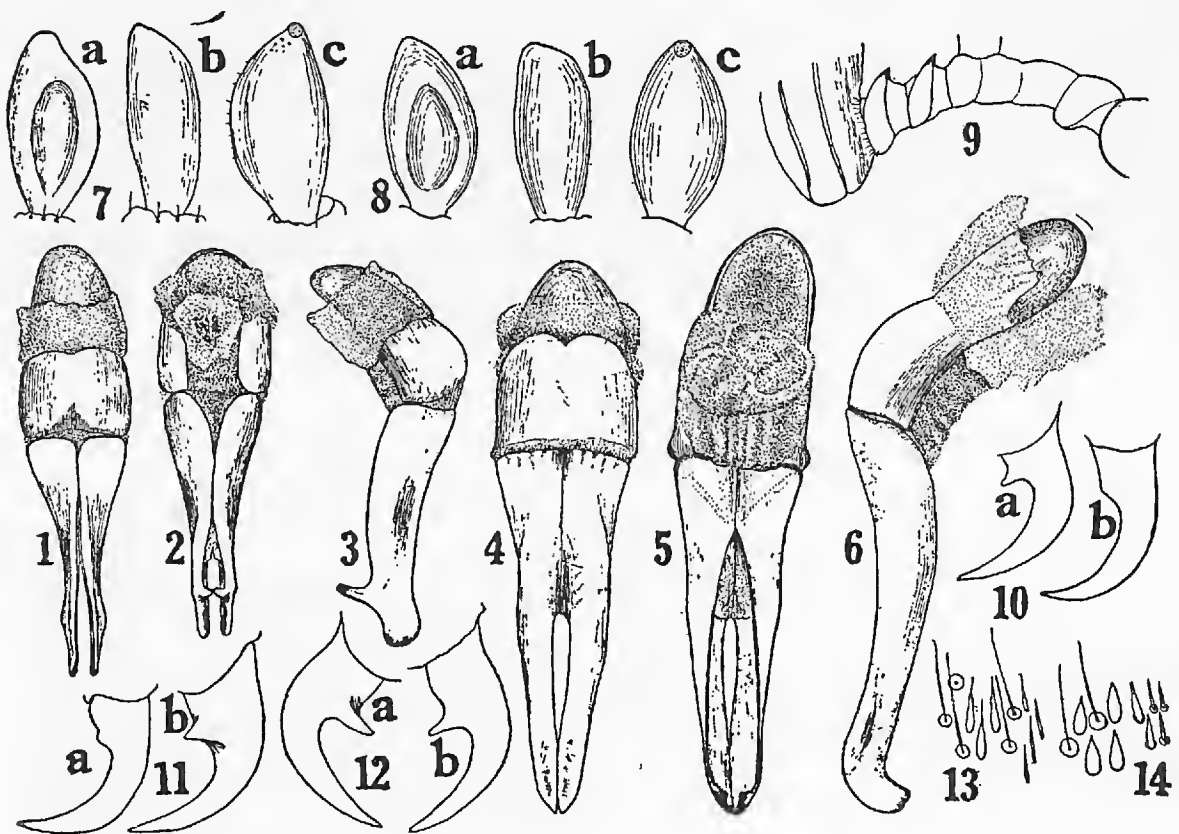
linearly acuminate at apex.....*marginata* Casey
 Elytra not vittate; color rufous; squamous vestiture extremely
 dense on sterna and abdomen, albo-cinereous in color; squamæ
 acutely acuminate at apex.....*caseyi*, new species

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1, male genitalia of *Dinacoma marginata*, dorsal view; 2, ditto, ventral view; 3, ditto, lateral view; 4, male genitalia of *Polyphylla 10-lineata*, dorsal view; 5, ditto, ventral view; 6, ditto, lateral view. 7, terminal joint of maxillary palpus of *marginata*: (a) outer surface, (b) upper surface, (c) inner surface. 8, ditto of *Dinacoma caseyi*: (a) outer surface, (b) upper surface, (c) inner surface. 9, antennal funicle of *caseyi*, club abducted at right angles to long axis of funicle, condyles of fifth and sixth joints showing; with club in adduction the fifth and sixth joints are transverse, condyles not visible. 10, anterior tarsal claws of *caseyi*: (a) inner, (b) outer. 11, anterior claws of *marginata*: (a) outer, (b) inner. 12, posterior left tarsal claws: (a) outer, (b) inner. 13, predominating squamæ of *marginata*. 14, predominating squamæ of *caseyi*.

TERMITES COLLECTED BY T. T. CRAIG ON
SOCORRO ISLAND

BY S. F. LIGHT

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In a recent note in this journal (1929) on the distribution of termites in Lower California, I pointed out that the six species known from that region are found also in California or Arizona. Through the kindness of Mr. T. T. Craig I have received for study three species of termites, collected by him in March 1928 on Socorro Island. Socorro Island lies in 18 degrees 45 minutes north latitude and 111 degrees west longitude, approximately three hundred miles nearly due south of the southern extremity of Lower California and some four hundred miles west of the coast of Mexico proper. While one of the species in this collection, *Kaloterme hubbardi* Banks, is found in Lower California, the other two seem to indicate a closer relation of the Socorro Island fauna to that of the mainland of Mexico. Small as this collection is, it furnishes very important information and provides another example of the extremely interesting finds awaiting the collector and student of termites in the Mexican region.

To insure correctness of identification in a region outside my previous experience, I sent the collection to Dr. T. E. Snyder of the United States Bureau of Entomology, well known authority on termites of the Americas, who confirmed my identification of the species represented as follows: *Kaloterme hubbardi* Banks; *Kaloterme jouteli* Banks; *Cryptoterme* sp. (a single dealate).

Mr. Craig's collections were made from mangrove logs in a dry wash near Braithwaite Bay, Socorro Island. His description (in lit.) of the vegetation of the island is of interest:

"The island—at least what I saw of it in my two hundred and five hours—is covered with a dense growth of brush, similar to the chapparal here at home, but about half again as high and many times more dense, unbelievably dense. It was, therefore, almost impossible to make any headway except by crawling in, under, and about the low mangrove trees that grow in the washes, very dry when I was there."

KALOTERMES HUBBARDI Banks

This record extends the range of *Kaloterme hubbardi* two hundred and fifty miles to the south of Cape San Lucas, where it was reported by Banks and Snyder (1920, Bulletin 108, United States National Museum) and in my recent note.

The present collection consists of a number of soldiers and nymphs. The soldiers are smaller than those commonly encountered, and certain other differences are apparent. Most striking of these are the greater length of the third antennal segment and the pronotum. These differences are brought out by the measurements and indices given below. Whether they represent anything more than the variation normal to the species can only be determined when more material is available for study.

Differences in size and proportion between a soldier of *Kaloterme hubbardi* Banks from Socorro Island, Mexico, and one from Phoenix, Arizona. Measurements in millimeters.

Measurement or Index	Socorro Island Specimen	Phoenix Specimen
Head width	1.61	1.76
Head length	1.83	2.10
Head index (head width divided by head length)	0.88	0.83
Mandible length.....	1.39	1.47
Mandible-head index (mandible length by head length).....	0.76	0.69
Length of third antennal segment.....	0.62	0.57
Third antennal segment index (length of segment by head length).....	0.35	0.27
Pronotum width.....	1.32	1.61
Minimum pronotum length.....	0.62	0.775
Maximum pronotum length.....	0.93	1.008
Pronotal index (maximum length by width)	0.56	0.626

KALOTERMES JOUTELI Banks

This large and interesting species was previously known only from the east coast of Mexico, southeastern Florida, and Cuba. Mr. Craig's collection of a single soldier on Socorro Island gives it a remarkable east and west range of some 1400 miles and makes it probable that it will be found throughout much of Mexico.

CRYPTOTERMES sp.

It seems unwise to attempt a specific identification of the single dealate *Cryptotermes* individual. It is particularly interesting, however, as representing the first record for the genus in western North America. Indeed the only record west of the eastern coast of Florida is that of a single specimen taken at Cotulla, Texas, which Banks has described (1920) as *Cryptotermes infumatus*.

NOTES ON TRICHOGRAMMA MINUTUM

BY STANLEY E. FLANDERS

Citrus Experiment Station, Riverside, California

When newly deposited eggs of the orange Tortrix were parasitized by *Trichogramma* and placed in an incubator at about 80 degrees Fahrenheit, the adult parasites emerged eight to nine days later. The larvæ from unparasitized eggs emerged at the same time.

One female *Trichogramma* oviposited eight times within fifteen minutes. Less than seven hours later the movement of newly hatched *Trichogramma* larvæ could be observed within the eggs. Twenty-four hours after oviposition some of the larvæ measured .32 of a millimeter in length and .13 of a millimeter in width. About forty-eight hours after hatching, the larvæ were full grown. The appendages of the larva consist only of a pair of slender, curved mandibles, which are apparently functionless.

After the larva has ingested all of the contents of the host egg, it apparently voids liquid fecal matter which spreads in a thin film over the inner surface of the host egg shell, drying into white crystal-like particles. This excrement, as well as the egg shell, usually turns black just prior to the pupation of the parasites. The cause of this common phenomenon is not known.

If *Trichogramma* oviposits in an egg after the embryo is about three-fifths developed, the embryo is destroyed but the parasite rarely completes its development.

The parasite just before its emergence from the egg is positively phototropic since it cuts an exit hole on the side exposed to the strongest light.

Trichogramma obtained from different localities may exhibit marked differences in fecundity and in the retention of pigmentation when reared under the same environmental conditions. Females from Yucaipa, California, a hot, dry interior section, lose their pigmentation when reared at room temperatures. Those from Saticoy, a cool, humid section, lose their pigmentation at higher temperatures, while a strain from El Dorado, Mexico, a hot, humid region, retains its pigmentation at all temperatures. In each case the density of pigmentation decreases with the rising temperature.

The difference in the fecundity of the females of these different strains when placed with *Sitotroga* eggs varied likewise, being decidedly low for the Yucaipa strain and very high for the Mexican strain.

The Yucaipa and Saticoy strains interbreed readily. All attempts of the writer to cross these strains with the Mexican have been unsuccessful. Copulation occurs, but the progeny are all males.

When the eggs of *Ephestia cautella* are parasitized and then held submerged in water for a week at 85 degrees Fahrenheit, the parasites develop normally up to the late pupal period and then die. It thus appears that the oxygen requirements of *Trichogramma* prior to the late pupal period are quite low.

PHLÆOSINUS KILLS TREES

There has been some question whether or not the cypress bark beetle, *Phlæosinus cristatus* Lec., could kill a healthy tree. Whether it will attack a vigorous growing tree has not been determined, but very few trees are in full vigor all their lives. Sooner or later a few unfavorable years slow up the growth and place them below par in health. The writer has observed several trees that were attacked from fifteen to twenty years ago and one side of the main trunk was killed. Since then the trees recovered, became vigorous enough to lay on five inches of wood over the edges of the wounds, and at present are alive and vigorous. Others survived the first attack and recovered, but were killed by later attacks.—H. E. Burke.

NOTES ON UTAH SYRPHIDÆ¹BY G. F. KNOWLTON AND H. J. PACK²

In connection with a study of the aphids occurring in the state, work toward a list of the syrphids of Utah was commenced in 1923. Mr. David G. Hall accompanied the senior author in a collecting trip over much of Utah during the summer of 1925; during this time a number of syrphids were collected. The writers are indebted to Mr. Hall for a list of Utah syrphids collected by himself and for the determination of much of the material in the Utah Agricultural Experiment Station collection. Dr. Vasco M. Tanner very kindly consented to our use of data from specimens in the collection of the Entomology Department at the Brigham Young University. The writers are also indebted to Messrs. C. H. Curran, C. T. Greene, and C. R. Jones for the determination of much of the material recorded in this list.

Family *Syrphidæ*

1. CHRYSOTOXUM DERIVATUM Walker

Dividend (Spalding³); Logan, June 1925 (Hall and Knowlton). Also collected at Black Sands Basin, Yellowstone National Park, Wyoming (Tanner).

2. CHRYSOTOXUM INTEGRUM Williston

Aspen Grove, Timpanogos, July 1926 (Tanner); La Sal Mountains, June 1927 (Tanner); Logan Canyon, June 1923 (Knowlton); Raft River Mountains, June 1928 (Beck); Parowan, August 1929 (Tanner). Also collected at Lava Hot Springs, Idaho (Beck).

3. CHRYSOTOXUM YPSILON Williston

Aspen Grove, B. Y. U. Campus, Timpanogos, July 1927 (Tanner).

4. CHRYSOGASTER BELLULA Williston

Spring Hollow in Logan Canyon, August 28, 1925 (Knowlton).

5. CHRYSOGASTER PARVA Shannon

Logan, May 2, 1923 (Knowlton); Logan Canyon, July 1925 (Hall).

¹ Contribution from the Department of Entomology, Utah Agricultural Experiment Station.

² Died January 5, 1930.

³ Unless otherwise indicated, localities listed are in Utah. Publication authorized by director February 28, 1930.

6. *PIPIZA CALIFORNICA* Davidson

St. George, July 1925 (Hall).

7. *PARAGUS BICOLOR* Fabricius

Logan, May 17, 1929 (Knowlton); St. George, July 1925 (Hall).

8. *PARAGUS TIBIALIS* Fallén

Portage, August 20, 1926 (Knowlton); Sheep Creek, Duchesne County, June 1926 (Tanner); Willard, September 10, 1925 (Knowlton). Also collected at Mesa Verde National Park, Colorado, June 1927 (Tanner).

9. *PARAGUS ANGUSTIFRONS* Loew

Riverdale, September 14, 1925 (Knowlton).

10. *CHILOSIA OCCIDENTALIS* Williston

City Creek Canyon, June 1925 (Hall and Knowlton).

11. *BACCHA LEMUR* Osten Sacken

Cedar Breaks, June 1925 (Hall and Knowlton); Duchesne, July 1926 (Tanner); Dividend, July 17 (Spalding); Indianola, June 1929 (Tanner).

12. *PYROPHÆNA OCYMI* Fabricius

Cedar City, July 1925 (Hall).

13. *PYROPHÆNA GRANDITARSUS* Förster

Brigham City, September 10, 1925 (Knowlton); Corinne, September 9, 1925 (Knowlton).

14. *PLATYCHIRUS QUADRATUS* Say

Logan Canyon, July 1925 (Hall).

15. *MELANOSTOMA CÆRULESCENS* Williston

Miner's Peak, July 11, 1919; Tony Grove Park in Logan Canyon, July 1925 (Hall).

16. *MELANOSTOMA CONCINNUM* Snow

Tony Grove Park in Logan Canyon, August 1925 (Hall).

17. *MELANOSTOMA MELLINUM* Linnæus

Lewiston, 1925 (Knowlton).

18. *MELANOSTOMA STEGNUM* Say

Logan, May 19, 1924 (Knowlton).

19. *MELANOSTOMA TIGRINUM* Williston

Logan, June 1925 (Hall).

20. *MELANOSTOMA OBSCURUM* Williston

Brigham City, September 1928 (Knowlton); Logan, June 1925 (Hall); Miner's Peak, June 11, 1919; St. George, July 1925 (Hall); Wellsville.

21. *EUPEODES BRAGGI* Jones

Madison River, Yellowstone National Park, Wyoming, July 1929 (Beck).

22. *EUPEODES VOLUCRIS* Osten Sacken

Aspen Grove, Timpanogos, August 1926 (Tanner); Bear River Bay, July 7, 1925 (Hall); Bear River City, July 1929 (Knowlton); Bluff (Rasmussen); Bountiful (Knowlton); Brigham City, September 2, 1927 (Knowlton); Cedar City, July 22, 1926 (Knowlton); Coal Creek, Deep Creek Mountains, June 1928 (Tanner); Dividend (Spalding); Glacier Lake, Timpanogos (Tanner); Indianola, June 1929 (Tanner); Logan, July 14, 1923 (Knowlton); Logan Canyon, June 24, 1925 (Hall); Moab (Call); Parowan, August 1929 (Tanner); on beets at Pleasant View, June 1928 (Knowlton); Provo (Brown and Curtis); Portage, July 20, 1927 (Knowlton); Salt Lake City, July 28, 1923 (Knowlton); Torry, June 26, 1926 (Knowlton and Titus); Wellsville Canyon, June 1926 (Brown); Widtsoe, August 1929 (Tanner); Zion National Park (Tanner and Bentley). Also collected at Kaibab Forest, Arizona, July 1927 (Call); Rim of Grand Canyon, Kaibab Forest, Arizona, 1927 (Tanner); Mesa Verde National Park, Colorado, June 1927 (Tanner); Lewis Lake, Yellowstone National Park, Wyoming, July 1929 (Tanner).

23. *LASIOPHTHICUS PYRASTRI* (Linnæus)

Aspen Grove, Timpanogos, July 1926 (Tanner); Bluff, July 1927 (Call); Logan, May 19, 1924 (Knowlton); La Sal Mountains, Mount Tuhuhnivats (Tanner); Miner's Peak, July 12, 1919; Indianola (Tanner); Murray, July 3, 1908; Provo (Tanner); Raft River Mountains, June 1928 (Tanner); Salt Lake City, June 16, 1929 (Tanner); Wellsville Canyon, June 1926 (Cottam); Zion National Park (Liddle). Also collected at Fort Bridger, Wyoming, June 1926 (Brown); Herford Ranger Station, Idaho (Tanner).

24. *SYRPHUS AMERICANUS* Wiedemann

Aspen Grove, B. Y. U. Campus, Timpanogos, July 1927 (Tanner); City Creek Canyon, June 1925 (Hall and Knowlton); Deep Creek Mountains, June 1928 (Tanner); Miner's Peak, June 11, 1919; Pine Valley (Liddle); St. George, May 26, 1919; Zion National Park, 1926 (Knowlton).

25. *SYRPHUS ARCUATUS* (Fallén)

Logan, July 1924 (Knowlton); Logan Canyon, June 1923 (Knowlton); Plain City, June 7, 1929 (Knowlton); Provo (Rowe); Wells-

ville Canyon, June 1926 (Tanner). Also collected at Mink Creek, Immigration Canyon, Idaho (Hall and Knowlton); Fort Bridger, Wyoming, June 1926 (Tanner); Lake Hotel, Yellowstone National Park, Wyoming, July 1929 (Tanner).

26. *SYRPHUS OPINATOR* Osten Sacken

Aspen Grove, B. Y. U. Campus, Timpanogos, July 1925 (Tanner); Bryce Canyon National Park, August 1929 (Tanner); numerous at Bountiful, May 8, 1929 (Knowlton); Central, June 1922 (Tanner); Far West, June 1926 (Hayward); Logan, June 6, 1922 (Knowlton), and April 18, 1915 (L. Davidson); Provo (Thomas); Raft River Mountains, June 1928 (Beck); Riverside, June 1926 (Hayward); Wellsville Canyon, June 1926 (Tanner). Also collected at Rim, Grand Canyon, Kaibab Forest, Arizona, July 1927 (Tanner); Kaibab Forest, Arizona, July 1927 (Call).

27. *SYRPHUS PERPLEXUS* Osburn

Numerous at Bountiful, May 8, 1929 (Knowlton); Woods Cross, May 8, 1929 (Knowlton).

28. *SYRPHUS RIBESII* (Linnæus)

Bear's Ears, Elk Ridge (Kartchner); Salt Lake City, 1923 (Knowlton).

29. *SYRPHUS PROTRITUS* Osten Sacken

City Creek Canyon, July 1925 (Hall).

30. *SYRPHUS PYRASTRI* Hine

Cedar Breaks, July 9, 1925 (Hall and Knowlton); Tony Grove in Logan Canyon, July 1925 (Hall).

31. *SYRPHUS WIEDEMANII* Johns

Mount Ben Lomond, 10,000 feet elevation, July 21, 1925 (Hall).

32. *ALLOGRAPTA OBLIQUA* Say

Cottonwood Canyon, July 27, 1925 (Hall and Knowlton); Logan Canyon; Parowan (Tanner).

33. *TOXOMERUS MARGINATUS* Say

Blacksmith Fork Canyon, July 17, 1925 (Hall); Bryce Canyon National Park (Rasmussen); Bluff (Tanner); on beets at Clearfield (Knowlton); Dry Lake (Knowlton); Eden, 6000 feet (Hall); Elsinore (Knowlton); Fielding (Knowlton); Glendale (Tanner); Lewiston (Knowlton); Logan (Knowlton); Parowan (Tanner); Provo (Rowe); Providence (Knowlton); Salt Lake City (Knowlton); Tremonton (Knowlton). Also collected at Rim of Grand Canyon, Kaibab Forest, Arizona, June 1927 (Tanner).

34. *TOXOMERUS GEMINATUS* Say

Corinne 1925 (Hall); Cove, August 24, 1925 (Knowlton); Logan, September 2, 1925 (Knowlton); Logan Canyon (Hall); Provo (Thomas); Wellsville, July 1925 (Hall).

35. *TOXOMERUS POLITUS* Say

Brigham, July 1925 (Hall); Wellsville.

36. *TOXOMERUS BOSCI* Macquart

Blacksmith Fork Canyon, July 17, 1925 (Hall).

37. *SPHÆROPHORIA CYLINDRICA* Say

Blacksmith Fork Canyon, 6000 feet elevation, July 17, 1925 (Hall); Far West (Tanner); Lake Town Canyon, June 1926 (Hayward); Kaysville, June 1926 (Tanner); Logan, June 4, 1923 (Knowlton); Logan Meadows, August 20, 1923 (Knowlton); Lewiston, August 20, 1925 (Knowlton); Paradise, August 18, 1925 (Knowlton). Also collected at Fort Bridger, Wyoming, June 1926 (Hayward and Brown).

38. *SPHÆROPHORIA SCRIPTA* Linnæus

Bear River City, September 9, 1929 (Knowlton); Blacksmith Fork Canyon, July 17, 1925 (Hall and Knowlton).

39. *SPHÆROPHORIA STRIGOTA* Staegman

Blacksmith Fork Canyon, July 17, 1925 (Hall).

40. *SPHÆROPHORIA INTERRUPTA* Jones

Provo (Thomas). Also collected at Mammoth Hot Springs, Yellowstone National Park, July 1929 (Beck); Fort Bridger, Wyoming, June 1926 (Brown).

41. *COPESTYLUM MARGINATUM* Say

Dividend, May 17 (Spalding).

42. *VOLUCELLA COMSTOCKI* Williston

Salina, June 28, 1927 (Knowlton).

43. *VOLUCELLA ISABELLINA* Williston

Salt Lake City, September 14, 1925 (Knowlton).

44. *VOLUCELLA SANGUINEA* Williston

Aspen Grove, B. Y. U. Campus, Timpanogos, July 1926 (Tanner); Logan Canyon, July 1926 (Knowlton). Also collected at Mink Creek in Immigration Canyon, Idaho, 1925 (Hall and Knowlton); Mammoth Hot Springs, Yellowstone National Park, Wyoming, July 1929 (Beck).

45. *VOLUCELLA SATUR* Osten Sacken

Copper Mountains, five miles south of Lucin, June 1928 (Tanner).

46. *SERICOMYIA CHALCOPYGA* Loew

Common in Utah (Hall).

47. *ARCTOPHILA FLAGRANS* Osten Sacken

Provo Canyon, July 1926 (Spalding).

48. *ERISTALIS FLAVIPES* Walker

Logan Canyon, July 2, 1925 (Hall and Knowlton).

49. *ERISTALIS LATIFRONS* Loew

Cedar City, July 3, 1919; Colton (Rasmussen); Eureka, June 19, 1920 (Spalding); Logan, July 1923 (Knowlton); Logan Canyon, 1923 (Knowlton); Miner's Peak, July 13, 1919; Moab (Rasmussen); Raft River Mountains, June 1928 (Tanner); St. George, May 30, 1919; Zion National Park (Tanner). Also collected at Franklin, Idaho, May 24, 1923 (Knowlton); Fort Bridger, Wyoming, June 1926 (Hayward).

50. *ERISTALIS MONTANUS* Williston

Aspen Grove, B. Y. U. Campus, Timpanogos (Tanner); Hyrum, July 1928 (Knowlton); Logan, August 8 and 20, 1923 (Knowlton).

51. *ERISTALIS SAXORUM* Wiedemann

Provo (Thomas). Also collected at Black Sands Basin, Yellowstone National Park, Wyoming, July 1929 (Tanner).

52. *ERISTALIS TEMPORALIS* Thomson

Common at Bountiful, May 8, 1929 (Knowlton); Woods Cross, May 8, 1929 (Knowlton).

53. *ERISTALIS TENAX* Linnæus

Aspen Grove, B. Y. U. Campus, Timpanogos, July 1926 (Tanner); Bluff (Rasmussen); Cedar City, June 30, 1919; Clover, July 6, 1926 (Knowlton); Dividend, June 1924 (Spalding); Logan, June 9, 1923 (Knowlton); Logan Canyon, August 10, 1925 (Knowlton); Tony Grove, Logan Canyon, July 1925 (Hall); Park City (Olsen); Parowan (Tanner); Provo (Tanner); Trenton, September 15, 1926 (Knowlton); Wellsville Canyon, June 1926 (Tanner). Also collected at Mesa Verde National Park, Colorado (Rasmussen); Moscow, Idaho (Sudweeks).

54. *ERISTALIS TRANSVERSUS* Wiedemann

Logan, July 1925 (Hall).

55. *ERISTALIS BRAUSI* Williston

Cache Junction, 1912 (Hagan); Logan, June 1923 (Knowlton); Trenton, September 5, 1926 (Knowlton). Also collected at Fort Bridger, Wyoming, June 1926 (Brown and Hayward).

56. *ERISTALIS ARBUSTORUM* Linnæus

Aspen Grove, B. Y. U. Campus, Timpanogos, August 1927 (Tanner); Hurricane, July 1925 (Hall); Kaysville, June 1926 (Hayward); Logan, April 18, 1909; Salt Lake City, July 1925 (Hall); Reserve Creek, Raft River Mountains, June 1928 (Tanner). Also collected at Fort Bridger, Wyoming, June 1926 (Hayward).

57. *ERISTALIS ANTHOPHORINUS* Fallén

Dividend, April 29 (Spalding); Vinyard, April 29 (Spalding).

58. *ERISTALIS OBSCURUS* Loew

Logan Canyon, June 1925 (Hall).

59. *ERISTALIS ÆNEUS* Scopoli

Provo (Tanner).

60. *ERISTALIS DIMIDATUS* Wiedemann

Utah, May 4, 1920 (Spalding).

61. *ERISTALIS MEIGENII* Wiedemann

La Sal Mountains (Tanner); Parowan, August 1920 (Tanner). Also collected at Lehman Cave, Mount Wheeler, Nevada (Tanner); Mesa Verde National Park, Colorado, June 1927 (Tanner).

62. *HELOPHILUS LATIFRONS* Loew

La Sal, June 1927 (Kartchner); Logan, May 15, 1923 (Knowlton), July 4, 1923 (Knowlton), July 1925 (Hall); Logan Meadows, July 3, 1929 (Knowlton); Trenton, September 15, 1926 (Knowlton). Also collected at Driggs, Idaho, June 1928 (Kartchner); Fort Bridger, Wyoming, June 1926 (Tanner and Cottam).

63. *HELOPHILUS SIMILIS* Macquart

Aspen Grove, B. Y. U. Campus, Timpanogos, July 1927 (Tanner); Brigham City (Knowlton); Lewiston (Knowlton); Logan, July 1925 (Knowlton); Logan Peak, July 1925 (Hall); Salt Lake City, 1926 (Knowlton).

64. *HELOPHILUS FASCIATUS* Walker

Lewiston, June 5, 1929 (Knowlton).

65. *ASEMOSYRPHUS MEXICANUS* Macquart

Tony Grove, Logan Canyon, July 1925 (Hall).

66. *SYRITTA PIPIENS* Linnæus

Blacksmith Fork Canyon, July 17, 1925 (Hall); Cedar City, June 28, 1919; Eden, July 1925 (Knowlton); Gunnison, October 1903; Hooper, July 1928 (Knowlton); Hyrum, July 1929 (Knowlton); Lewiston, October 25, 1925 (Knowlton); Little Salt Lake, June 13, 1919; Logan, June 6, 1923 (Knowlton); Ogden, 1928 (Knowlton);

Parowan, July 16, 1919; Richfield, July 1926 (Knowlton); Richmond, June 1929 (Knowlton).

67. *XYLOTA BATON* Walker

Utah.

68. *XYLOTA FLAVITIBIA* Williston

Mesa Verde National Park, Colorado, June 1927 (Tanner).

69. *EUMERUS STRIGATUS* Fallén

Lewiston, August 24, 1925 (Knowlton); Wellsville (R. Christensen).

70. *SPILOMYIA INTERRUPTA* Williston

Aspen Grove, Timpanogos, July 1927 (Tanner); Provo (Tanner).

Note: Mr. Knowlton authorizes me to include six additional species taken by me in Utah in July 1922. *Chilosia petulca* Will., Vivian Park, Park City; *Syrphus intrudens* O. S., Mount Timpanogos; *Mesogramma marginata* Say, White Pine Lake, above Logan; *Sphaerophoria sulphuripes* Thom., Salt Lake City; *Polydontomyia curvipes* Wied., Salt Lake City.—E. P. Van Duzee.

THE SYNCHRONIZATION OF LIFE HISTORIES

BY PROF. C. W. WOODWORTH

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In the temperate regions, where insects have been most extensively studied, there is in nearly all cases a very definite synchronization in the development associated with the winter rest. This is so evident that we all expect an insect in the spring to appear suddenly and all the individuals to be in the same stage of development, while in the fall there may be specimens in different stages of development, and if more than one brood, we expect to find it in every stage. In some species there is a total mortality in the fall for every stage but one, and in this surviving stage the growth during the cooler weather, either fall or spring, brings most, or all, to a molt or other point of physiological reversal which they cannot pass till the warmer weather of spring. These two causes, acting together, brings the species to a very complete synchronization.

The fundamental thing in the seasonal adjustment of an insect is the mechanism for this developmental synchronization. Below I have attempted to tabulate the outstanding features of this process:

SYNCHRONIZATION

- Cause*—differential
 lethal—
 thermal (heat, cold)
 dryness
 nutritional
 dimorphic
- Type*—mono
 bi
 di (morphic)
- Season*—vernal
 summer
 autumnal
- Stage*—egg: after maturation
 after embrionation
 larva: any stadium, particularly (initial, penult, ultimate)
 before feeding
 before molting
 pupa: before adult formation
 before emergence
 imago: before sexual maturity
 between ovipositions

Certain insects in the tropics and parasites on warm-blooded animals may be beyond the influence of seasonal changes, but even in the tropics most insects have accomplished some sort of adjustment associated there with the dry and rainy season rather than with heat and cold.

The length of life of various species vary between seventeen years in a cicada and scarcely as many days in some aphids, and within the same species the different forms of the honey bee may range from perhaps eight years for the queen and in summer perhaps ten weeks for the worker. The great majority of insects, however, are annual brooded with the total length of the life of a generation only a little over twelve months and with each generation completely separated from the preceding and following generation. This we have come to look upon as the normal condition of insect life.

In the case where the life is more than one year, it can be measured by year units, being two or three or four years, and not two and a half, nor any other fraction. Sometimes a species may have individuals requiring two and others taking three years. Some individuals of an annual species may sleep

over to a second summer. There is in all these cases a single seasonal synchronization period which, if passed without the effective reaction, will transfer the individual along to the next period one year later unless it dies in the interim.

Some species may have two or even more synchronizations operating on different stages of the same insect, so that an adult and a larva may both hibernate, the former giving rise to a spring generation and the latter to a fall generation; both remaining quite distinct, or with considerable shifting of individuals from one series to the other.

Where the species has more than one brood a year, there may be two periods of synchronization almost equally effective; for example, the double migration of many aphids show in connection with the wing production in midsummer and fall, resulting in the bringing together of the progeny of three or more generations into a flying swarm of insects, all in precisely the same developmental stage.

More commonly, however, the species proceeds from a synchronized condition in the spring to complete overlapping (what are called "partial broods") in the fall, all to be returned to the synchronized condition by the next spring.

There are two periods in each stadium, one just preceding, and the other just following the molt, where there is a sudden complete change in the physiological activity of every tissue in the body. Normally these changes come in orderly procession, but there may be an interval between the stopping of one function and the starting of the next, so that the entire organism, or nearly all of it, may be brought to a standstill. These potential resting intervals are the points at which the synchronization may be accomplished. Failure or inability of any tissue to stop at one of these intervals is the usual condition making effective the lethal causes mentioned in the table above.

In attempting to classify the life histories, it is necessary to determine the precise stage and season at which synchronization occurs, together with its type and cause. The number of broods is very inadequate without this additional data.

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E. P. VAN DUZEE, Editor S. B. FREEBORN, Ph.D., Treasurer

EDITORIAL COMMENT

The Department of Entomology of the California Academy of Sciences has recently added 292 new insect trays to fill the metal cases purchased a year ago. These trays are 17 x 19 inches in size and 2 inches deep, the standard size now used in this department. They are made in three styles: one with plane wood bottoms for the unit boxes now used for all groups of the smaller insects, one with masonite bottoms for moths and similar insects, and one with glass bottoms for butterflies. In these glass-bottomed boxes are placed from three to nine or more strips of patent compressed cork cut to one-fourth inch in width and attached to the glass by a thin coating of Le Page glue, the number of strips being regulated by the size of the specimens to be placed in the trays. The butterflies, or at least the larger ones, are shingled more or less to save space. This method of mounting butterflies in the trays enables one to study the lower surface as readily as the upper, and has proved entirely satisfactory here. In these boxes the names are written on both sides of the labels so they can be read from below as well as from above. The arrangement of the Coleoptera and Hemiptera into the unit boxes progresses steadily. So far about 750 trays have been filled with rearranged material in the unit boxes. Twenty-five such unit boxes, or their equivalent in half units or double units, just fill one of our standard trays. The systematic arrangement of the Diptera and Hymenoptera, and some of the smaller Neuropteroid orders, must await the purchase of the necessary trays and cases to hold them.

The arrangement of the Academy collection of Sphingidæ, largely the gift of Mr. B. Preston Clark, has just been completed. The Academy series in that family numbers 1270 specimens, representing 287 species or subspecies. A special case has just been secured for the *Catocalas* and that interesting genus of moths will soon be put into systematic order.

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