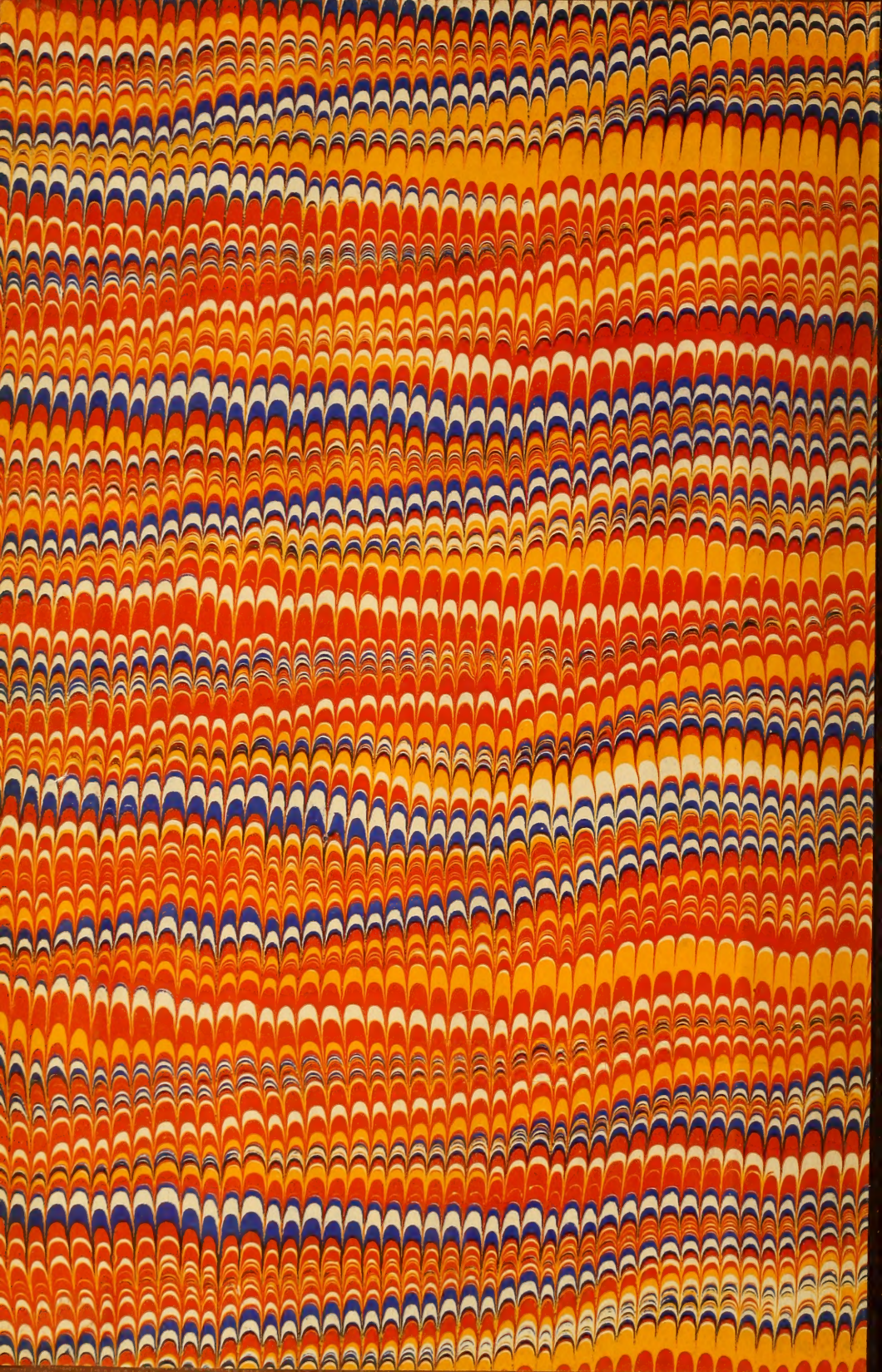

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PROCEEDINGS

OF THE

Biological Society of Washington

15

VOLUME 38
1925

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WASHINGTON
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The Committee on Publications declares that each paper of this volume was distributed on the date indicated on its initial page. The Index, title page, and minutes of meetings for 1925 (pp. i–xi; 167–170) were issued on February 23, 1926.

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I. Facing p. 22. Wing of fossil Termite, Ulmeriella bauckhorni.
II. Facing p. 32. Wings of Meloid Beetles.
III. Facing p. 66. Development of Termites.
IV. Facing p. 146. McAtee and Malloch on Coccivora californica.

Vol. 38, pp. vii-xi

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

PROCEEDINGS.

The Society meets from October to May, on alternate Saturdays, at 8 P. M. All meetings during 1925 were held in the new lecture hall of the Cosmos Club, except the special meeting of January 24 and the joint meeting of January 31, both of which were held in the National Museum.

January 17, 1925—673d Meeting.[1]

President Rohwer in the chair; 121 persons present.

The membership of the following committees was announced: Committee on Communications: W. R. Maxon, Chairman, H. C. Oberholser, C. E. Chambliss; Committee on Publications: C. W. Richmond, Chairman, J. H. Riley, T. E. Snyder, F. C. Lincoln, G. S. Miller, Jr.; Committee on Zoological Nomenclature: G. S. Miller, Jr., Chairman, P. Bartsch, A. C. Baker, E. A. Chapin, H. C. Oberholser; Trustees of Permanent Fund of Society: T. S. Palmer (2 years), H. C. Oberholser (1 year), A. S. Hitchcock (3 years).

New members: W. M. Mann (life member), C. P. Roberts.

Informal communications: T. S. Palmer, Winter feeding of quail in the District of Columbia; H. C. Oberholser, Occurrence of a Baltimore oriole in the District of Columbia in January; F. C. Lincoln, Recovery in Newfoundland of a kittiwake banded in England.

Formal communications: A. B. Howell, Mice that live in trees; R. F. Griggs, Scientific results of the Katmai Expeditions.

January 24, 1925—Special Meeting.[2]

Vice-President Oberholser in the chair; 85 persons present.

[1] Abstract in Journ. Washington Acad. Sci., vol. 15, p. 220–221, May 19, 1925.
[2] Abstract in Journ. Washington Acad. Sci., vol. 15, p. 221, May 19, 1925.

Formal communications: Frits Johansen, A trip to the eastern shore of Hudson Bay.

January 31, 1925—674th Meeting.[1]

Joint meeting with the Audubon Society of the District of Columbia.

President T. S. Palmer (Audubon Society) in the chair.

Formal communication: A. A. Allen, Our disappearing birds.

February 14, 1925—675th Meeting.[2]

Vice-President Oberholser in the chair; 63 persons present.

New member: Mrs. T. E. Snyder.

Informal communications: V. Bailey, Observation of a duck hawk on Pennsylvania Avenue; A. Wetmore, Early occurrence of the purple grackle; E. A. Goldman, Observation of a Chinese pheasant; A. Wetmore, Local history of the Chinese pheasant; S. F. Blake, Observation of a bat in Poli's Theatre in February.

Formal communications: Edgar Brown, The longevity of buried seeds; E. P. Walker, Commercial development of blue fox farming in Alaska; H. L. Shantz, Collecting experiences in East Africa.

February 28, 1925—676th Meeting.[3]

President Rohwer in the chair; 129 persons present.

New members: C. J. Drake, A. B. Horsfall, M. A. Stewart.

Formal communications: O. J. Murie, The white sheep of the Alaska range; H. V. Harlan, Plant exploration in Abyssinia.

March 14, 1925—677th Meeting.[4]

President Rohwer in the chair; 75 persons present.

New members: P. S. Ridsdale, R. W. Westwood.

Informal communications: C. W. Stiles, Experiments on the pollution of ground water; L. O. Howard, Note on newspaper reports of the loss of biting power by mosquitoes.

Formal communications: R. C. Shannon, Parasitic flies in man and animals; James Silver, The European hare in North Amer-

[1] Abstract in Journ. Washington Acad. Sci., vol. 15, p. 221, May 19, 1925.
[2] Abstract in Journ. Washington Acad. Sci., vol. 15, p. 221–223, May 19, 1925.
[3] Abstract in Journ. Washington Acad. Sci., vol. 15, p. 223, May 19, 1925.
[4] Abstract in Journ. Washington Acad. Sci., vol. 15, p. 223–224, May 19, 1925.

ica: is it a menace; W. M. Mann, A collecting trip in Sinai, Palestine.

March 28, 1925—678th Meeting.[1]

President Rohwer in the chair; 89 persons present.

New members: Anne Benton, E. A. Back, J. E. Graf, C. H. Popenoe.

Informal communications: P. B. Johnson, Observations of certain animals in zoological gardens; A. S. Hitchcock, Correction of the locality of a grass ascribed to Alaska.

Formal communications: H. C. Oberholser, The future of the Potomac Valley below Great Falls; W. B. Greeley, The national forests of the United States.

April 11, 1925—679th Meeting.[2]

President Rohwer in the chair; 73 persons present.

Informal communications: Katherine Stuart, Injury done to lawns by solitary bees at Oxford, North Carolina; M. K. Brady, A nest of *Cryptotis parva* with 20 young; A. E. Imms, History of the Rothamsted Experiment Station; W. F. Thompson, The treaty between the United States and Canada for the protection of the halibut.

Formal communications: L. O. Howard, Something about estimates of loss through insect damage; V. Bailey, Making pets of insect-eating bats.

April 25, 1925—680th Meeting.[3]

President Rohwer in the chair; 42 persons present.

New members: W. P. Harris, Jr., Dorothy Popenoe, Wilson Popenoe (life member).

Informal communications: A. A. Doolittle, Exhibition of a cross-sectioned ostrich egg, and Note on a method of waterproofing labels for fluid specimens; I. N. Hoffman, Capture of a young *Clemmys muhlenbergii* near Stubblefield Falls, Virginia; S. A. Rohwer, Further note on damage to lawns by solitary bees (*Andrena* sp.).

Formal communications: Smith Riley, Forest fires and wild

[1] Abstract in Journ. Washington Acad. Sci., vol. 15, p. 351–352, August 19, 1925.
[2] Abstract in Journ. Washington Acad. Sci., vol. 15, p. 374–375, September 19, 1925.
[3] Abstract in Journ. Washington Acad. Sci., vol. 15, p. 375–376, September 19, 1925.

life; Wilson Popenoe, Peruvian agriculture of Pre-Columbian days.

October 24, 1925—681st Meeting.[1]

President Rohwer in the chair; 51 persons present.

New member: W. F. Rubey.

Informal communications: V. Bailey, Destruction of muskrats by fire; J. N. Rose, Note on the proposed arboretum near Los Angeles; A. A. Doolittle, Infestation of a cat by a tapeworm usually found in man; S. A. Rohwer, Note on the death of Dr. W. D. Hunter; P. B. Johnson, Observations on viscachas in the National Zoological Park.

Formal communications: V. Bailey, Two years' progress in beaver farming; Agnes Chase, Hunting grasses in Brazil.

November 7, 1925—682d Meeting.[2]

President Rohwer in the chair; 59 persons present.

New members: Frank Thone, J. K. Strecker, G. M. Lind.

Informal communications: H. C. Oberholser, Establishment of the Upper Mississippi River Wild Life and Fish Refuge; V. Bailey, Recent observation of a woodchuck near Washington; F. C. Lincoln, Unusual actions of a woodchuck.

Formal communications: L. O. Howard, Something about the salt marsh mosquito problem; E. A. Goldman, Over-browsing by Kaibab deer.

November 21, 1925—683d Meeting.[3]

President Rohwer in the chair; 120 persons present.

New members: F. H. Chittenden, Mabel Colcord.

Formal communications: T. S. Palmer, Report on the recent meeting of the American Ornithologists' Union, New York; W. C. Henderson, When the elk come down; H. C. Oberholser, The bird reservations of Louisiana.

December 5, 1925—684th Meeting.[4]

President Rohwer in the chair; 48 persons present.

New member: D. N. Shoemaker.

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[1] Abstract to appear in Journ. Washington Acad. Sci.
[2] Abstract to appear in Journ. Washington Acad. Sci.
[3] Abstract to appear in Journ. Washington Acad. Sci.
[4] Abstract to appear in Journ. Washington Acad. Sci.

Informal communications: L. D. Miner, Late observation of the black-billed cuckoo near Washington; A. S. Hitchcock, Occurrence of *Brachyelytrum erectum* in China.

Formal communications: W. B. Greeley, The proposed changes in the boundaries of Yellowstone National Park in relation to wild life; T. H. Kearney, Pollination in cotton.

December 19, 1925—685th Meeting.[1]

FORTY-SIXTH ANNUAL MEETING.

President Rohwer in the chair; 24 persons present.

Reports were received from the Corresponding and Recording Secretaries, the Treasurer, and the Committee on Publications.

New members: C. Denley, G. B. Grant, O. J. Murie.

The following officers and members of the council were elected:

President, H. C. Oberholser.

Vice-Presidents, E. A. Goldman, A. Wetmore, C. E. Chambliss, H. H. T. Jackson.

Recording Secretary, S. F. Blake.

Corresponding Secretary, T. E. Snyder.

Treasurer, F. C. Lincoln.

Members of the Council, H. C. Fuller, W. R. Maxon, C. W. Stiles, A. A. Doolittle, B. H. Swales.

President-elect H. C. Oberholser was nominated as a Vice-President of the Washington Academy of Sciences.

[1]Abstract to appear in Journ. Washington Acad. Sci.

Vol. 38, pp. 1–4 January 27, 1925

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

NOTES ON THE RATIOS OF INSECT FOOD HABITS.

BY HARRY B. WEISS.

In the Ohio Journal of Science for March, 1924 (vol. xxiv, no. 2, pp. 100–106), the suggestion was made that in a large area embracing different types of vegetation, the ratios between the types of insect food habits vary but little if the numerical ratios between the species and the factors tending to reduce their numbers are considered as constant. Since this was written, the insects recorded from Connecticut (Bull. 31, State Geol. & Nat. Hist. Survey Conn.), were tabulated in accordance with their food habits and the results published in Entomological News (vol. xxxv, pp. 362–364, Dec., 1924) under the title "Ratios Between the Food Habits of Insects." The present paper is written for the purpose of presenting the results of the various tabulations in a more comparable form and should be considered as supplementary to the two papers mentioned above.

Table I shows the distribution ratios of the types of food habits present in three large areas, each area embracing different types of vegetation. These ratios are expressed as percentages of the total numbers of species listed in the left hand column, regardless of numerical abundance and are based on the predominating larval habits of the families. It will be noted that these percentages do not differ widely and that they suggest a fixed relation or at least a relation fluctuating within comparatively narrow limits. While assuming that the numbers of species listed from New Jersey and Connecticut are "complete counts," it is realized that numerous future additions in the parasitic Hymenoptera or more complete information about the food habits of many species would change the ratios but this would not affect what appears to be a fixed relation or natural order of things. Another factor which would change the ratios is the numerical abundance of the various species. As various species maintain

themselves in certain numerical ratios with respect to factors or combinations of factors tending to reduce their numbers and as these relationships are usually normal, such numerical ratios have been considered as constant in all of the tables.

TABLE I.

	No. species	*Phytophagous* %	*Saprophagous* %	*Harpactophagous* %	*Parasitic* %	*Pollen feeders, misc. spp.* %
Western Arctic Coast of N. A.	400	47	27	14	10	2
State of New Jersey	10,500	49	19	16	12	4
State of Connecticut	6,781	52	19	16	10	3
Above areas combined	17,681	50	19	16	11	4

TABLE II.

	No. species	*Phytophagous* %	*Saprophagous* %	*Harpactophagous* %	*Parasitic* %	*Pollen feeders, misc. spp.* %
Moist woods on Piedmont Plain of N. J.	415	37	35	20	5	3
A thicket on Piedmont Plain of N. J.	273	63	9	19	7	2
Dry woods in "pine barrens" of N. J.	381	45	21	18	14	2
Open area in "pine barrens" of N. J.	246	41	10	24	18	7
Salt marsh on coast of N. J.	210	39	21	26	13	1
Above areas combined	1,525	45	21	21	10	3

In table II the distribution ratios are shown for various areas in New Jersey, the vegetation in each area being more or less uniform and each area being relatively small in comparison with the areas listed in table I. The figures in table II show more variation or dispersion than those in table I and appear to indicate that the ratios between the various types of food habits vary in accordance with the vegetation when small areas, each with a uniform type of vegetation, are considered.

In table III will be found comparisons, using the parasitic food habit as a base. For example, if the parasitic food habit in the state of New Jersey is represented by 1, the relative importance of the other types will be, harpactophagous, 1.3; saprophagous, 1.6; phytophagous, 4.1, etc.

TABLE III.

	No. species	*Phyto-phagous*	*Sapro-phagous*	*Harpacto-phagous*	*Para-sitic*	*Pollen feeders, misc. spp.*
Western Arctic Coast of N. A.	400	4.7	2.7	1.4	1.0	0.20
State of N. J.	10,500	4.1	1.6	1.3	1.0	0.33
State of Conn.	6,781	5.2	1.9	1.6	1.0	0.30
Above areas combined	17,681	4.5	1.7	1.4	1.0	0.36
Moist woods on Piedmont Plain of N. J.	415	7.4	7.0	4.0	1.0	0.6
A thicket on Piedmont Plain of N. J.	273	9.0	1.3	2.7	1.0	0.3
Dry woods in "pine barrens" of N. J.	381	3.2	1.5	1.3	1.0	0.1
Open area in "pine barrens" of N. J.	246	2.3	0.5	1.3	1.0	0.4
Salt marsh on coast of N. J.	210	3.0	1.6	2.0	1.0	0.07
All New Jersey areas combined	1,525	4.5	2.1	2.1	1.0	0.3

Table IV shows the variation of the percentages in tables I and II by means of coefficients of variation. For example, the dispersion or variation among the items 47, 49 and 52, the phytophagous series in table I is much less than in the pollen series 2, 4, 3 and the coefficient of varia-

tion for each food habit group affords a simple means of comparison. If the variations in a series are large then the coefficient is large and *vice versa*. The coefficient of variation was arrived at by dividing the standard deviation by the arithmetic means of the series and the standard deviation was secured by squaring each item in a series; adding the squared items and dividing by the number of items; subtracting from the quotient the square of the arithmetic average of the series and extracting the square root of the difference. Although a more refined method designed to take into consideration the "true averages" shown at the bottoms of tables I and II could have been used, the "true averages" are close to the arithmetic averages. The coefficient of variation is used not to give a fictitious accuracy to the subject but solely to reduce the different series to a comparable basis.

TABLE IV

COEFFICIENTS OF VARIATION.

	Phytophagous	*Saprophagous*	*Harpactophagous*	*Parasitic*	*Pollen feeders, misc. spp.*
New Jersey areas	0.208	0.491	0.143	0.417	0.699
Other areas	0.055	0.191	0.090	0.095	0.270

According to the above table, the variation in each series of food habits is much greater for the different areas in New Jersey than for the other areas, i. e., the entire state of New Jersey, the entire state of Connecticut and the western Arctic coast of North America. This taken into consideration with the figures shown in table I appears to indicate that the ratios between the various types of food habits based on the species present vary but little when large areas each embodying different types of vegetation are considered *in toto* and when the numerical ratios between the species present and the factors tending to reduce their numbers are considered as constant; also that in relatively small areas each with a uniform type of vegetation, the ratios between the types of food habits, based on the species present, vary in accordance with the type of vegetation if the numerical ratios between the species and the factors tending to reduce their numbers are considered as constant. It should be understood that these conclusions do not apply to areas under cultivation but to such as are relatively unchanged by man.

Vol. 38, pp. 5–6 January 27, 1925

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

Smithsonian Institution
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DESCRIPTION OF A NEW ORIOLUS.

BY HARRY C. OBERHOLSER.

Three specimens of *Oriolus indicus* from Corea seem to prove its breeding in that country, and to represent an undescribed race. As there seems to be no name available, the Corean bird may be known as

Oriolus indicus ochroxanthus.

Chars. subsp.—Similar to *Oriolus indicus indicus* from China and the Malay Peninsula, but male with the yellow less golden, and the black occipital patch decidedly wider, 21 to 25 (instead of 12 to 23) mm.; female with lower parts much paler.

Description.—Type, adult male, No. 114413, U. S. Nat. Mus.; near Seoul, Corea, June 17, 1883; P. L. Jouy; original number, 1104. Forehead and middle of crown, gamboge yellow; lores, orbital ring, and wide superciliary stripe, continuous with a broad occipital band, black; cervix and sides of neck between gamboge yellow and light cadmium; back, rump, and scapulars, gamboge yellow, overlaid with sulphine yellow; upper tail-coverts dull gamboge yellow; tail black, the four outer rectrices broadly, three of the four remaining feathers narrowly, tipped with rather dull lemon chrome, this occupying on the outermost feather a space of 37 mm.; wings black, but the inner margins of the quills brownish, the tips of the outer webs of the secondaries and broad terminal portion of the primary coverts, straw yellow, broad outer margins of secondaries, excepting the extreme unexposed basal portion, wax yellow, the greater wing-coverts of the same color, but somewhat brighter, the median and lesser coverts, gamboge yellow slightly washed with sulphine yellow; cheeks, chin, throat, and breast, between lemon chrome and gamboge yellow; abdomen, crissum, and lining of wing, lemon chrome; "iris, dark reddish brown."

Measurements.—Male: wing, 151 mm.; tail, 94; exposed culmen, 28.5; height of bill at base, 12.5; tarsus, 25; middle toe without claw, 20.5.

Female: wing, 147 mm.; tail, 97; exposed culmen, 29.5; height of bill at base, 12; tarsus, 23.5; middle toe without claw, 20.

Remarks.—The male in juvenal plumage shows the same differential characters as do the adult male and adult female, and compared with the juvenal plumage of *Oriolus indicus indicus* is much darker, more greenish

(less golden) above, and paler below. Birds from southeastern Manchuria, 180 miles up the Yalu River, seem to verge slightly toward the Corean race, but are certainly to be referred to *Oriolus indicus indicus*. The specimens examined besides the type come from near Chemulpo, September 8, 1883, and from 30 miles east of Seoul, August 12, 1883.

The use of the name *Oriolus indicus* Jerdon instead of *Oriolus diffusus* Sharpe has already been explained by Dr. E. Hartert.[1] We quite agree with him that there is no reason for the rejection of Jerdon's name as Sharpe proposed when instituting the name *Oriolus diffusus* for this species.[2] This species is apparently distinct from *Oriolus maculatus*, since the difference in the yellow areas on the tertials and inner secondaries is not bridged over in any of the specimens of the subspecies of *Oriolus maculatus* or of *Oriolus indicus* examined. Furthermore, there is a gap in the range of the two species.

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[1] Vögel paläarkt. Fauna, I, Heft I, November, 1903, p. 53.

[2] Cat. Birds Brit. Mus., III, 1877, p. 197.

Vol. 38, pp. 7–8 January 27, 1925

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

Smithsonian Institution
National Museum

A NEW CLUBIONID SPIDER OF THE GENUS PHRURONELLUS FROM CALIFORNIA.

BY RALPH V. CHAMBERLIN.

From Mr. Carl D. Duncan of Stanford University I have received for identification a number of spiders taken from a nest of *Vespa occidentalis* Cresson which was dug up in the vicinity of Stanford University, Calif., in July. "The nest," Mr. Duncan writes, "was a very interesting one in that it had persisted throughout the winter just past instead of dying out in the fall as is customary. There was but a mere handful of wasps left but there were many other forms present, including the spiders I am sending."

Among the spiders were about thirty specimens of the new clubionid described below. The other spiders were all gnaphosids, and all were immature excepting one female of *Nodocion barbaranus* Chamberlin. Some of the immature specimens apparently pertain to the latter species, but most of them belong to *Zelotes*, sp.

Genus **Phruronellus** Chamberlin.

Canadian entomologist, 1921, Mar., p. 69.

The members of this genus have typically shining chestnut or blackish bodies and lack the markings usual in the related genus *Phrurolithus* from which they differ structurally, particularly in the features of the male palpus. They are ground forms often found associated with ants.

The males of the known species may be separated by means of the following key.

KEY TO MALES OF SPECIES OF PHRURONELLUS.

a. Femoral apophysis of palpus proximad of middle.
Ventral (mesal) prong of tibial apophysis long, distally acute.
P. pugnatus (Emerton).

aa. Femoral apophysis of palpus at or distad of middle.
  b. Ventral prong of tibial apophysis of palpus broad, laminate, with two equal distal angles.....*P. formica* (Banks).
  bb. Ventral prong of tibia apophysis not of this form.
    c. This prong rather long, slightly bent at middle, distally truncate.....*P. similis* (Banks).
    cc. This prong very short, distally acute, with a smaller supplementary tooth.....*P. duncani*, sp. nov.

Phruronellus duncani, sp. nov.

Male.—Specimens in full color have the carapace dusky over a light brown background. Sternum light brown. Legs yellowish. Abdomen black above its venter yellowish. Cephalothorax low, broad, laterally rounded, the pars cephalica wide as usual. Abdomen broadly subovate in outline.

Tibia I with five pairs of long spines beneath, the most distal pair of these well proximad of outer end of joint. Metatarsus I with four pairs of ventral spines.

Femur of male palpus angularly extended ventrad at middle, the apophysis projecting from apex of angle; apophysis bearing a pencil of setae at its free end extending toward distal end of joint. Tibial apophysis furcate as usual; the upper prong geniculate or strongly curved proximally slender and distally acute; lower (mesal) prong very short, slightly curved, a supplementary tooth below apex between it and the upper prong towards which it points.

Length of male, 2 mm.

Locality.—California: Stanford University. 19 July, 1924.

Vol. 38, pp. 9–12 January 27, 1925

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

THREE NEW BIRDS FROM WESTERN CHINA.

BY J. H. RILEY.[1]

During the year 1923 and early part of 1924, Doctor Joseph F. Rock made a botanical exploration of the high mountains of northwest Yunnan, under the auspices of the National Geographic Society. On this occasion he employed a Chinese taxidermist and made a large collection of birds which have been presented to the U. S. National Museum by the National Geographic Society.

The three new forms described herewith have been discovered in working up this material and are published in advance of a more detailed report.

Ithaginis rocki, sp. nov.

Type, adult male, U. S. National Museum, No. 296085, Hofuping Mountains, Mekong Valley, Yunnan, November, 1923. Collected by J. F. Rock (original No. 1351).

Similar to *Ithaginis kuseri* Beebe, but ear-coverts broadly streaked with grayish-white and the lores black not red.

Description.—Forehead nopal red, bordered posteriorly by a few cinnamon-buff shaft-streaks of the gray feathers of the pileum; pileum neutral gray with grayish-white shaft-streaks; rest of the upper-parts, lesser and median wing-coverts neutral gray with white shaft-streaks, bordered upon each side by blackish; chin and throat nopal red; lores and feathers surrounding the naked eye space black; ear-coverts black with broad grayish-white shaft-streaks, these streaks buffy anteriorly; a black gorget, extending from behind the ear-coverts across the fore-neck, with a few very fine shaft-streaks on the side of the neck; the fore-neck with a few red and buffy streaks; chest nopal red, the feathers anteriorly with cinnamon shaft-streaks and posteriorly with chrysolite green bordered by a shade of the same color; breast light cress green with chrysolite green shaft-streaks, the lower breast feathers with the shaft-streaks bordered

[1]Published by permission of the Secretary of the Smithsonian Institution.

on each side by blackish, all the feathers neutral gray basally; belly light neutral gray; flanks neutral gray with white shaft-streaks, bordered on each side with black posteriorly, a few tinged and centered with greenish; under tail-coverts nopal red with the shaft and tip white; exposed portion of the greater wing-coverts and longer scapulars cress green with chrysolite green shaft-streaks, bordered on each side with blackish posteriorly; primaries and their coverts deep mouse gray, the shaft white; secondaries deep mouse gray, the outer web cartridge buff, the shaft white; longer upper tail-coverts neutral gray with white shaft-streaks bordered on each side by blackish, the outer web broadly bordered by nopal red; tail pale smoke gray, mottled with dark mouse gray and becoming wholly of this color basally, the shaft white, the outer web fringed with nopal red, except the outer pair; thighs neutral gray with white shaft streaks; bill black, the cere ochraceous salmon; feet coral red (in the skin); "iris peach red." Wing, 204; tail, 141; culmen from cere, 14.5; tarsus, 68; middle-toe, 43 mm.

Remarks.—Dr. Rock obtained three males and three females of this interesting bird. One male resembles the type, except that the red on the chest has more green-centered feathers while the other male does not have the black extend across the fore-neck, but the red of the throat continues right down onto the chest without interruption and the exposed part of the tail is smoke gray without any mottling, becoming whitish at the tips. The type and second male have two spurs on the tarsus, the third male without the black across fore-neck none; otherwise they are essentially alike.

The females resemble the females of *Ithaginis clarkei* Rothschild taken more to the eastward in the Likiang Mountains, but the hind-neck is not so extensively neutral gray; the forehead, cheeks, and throat are cinnamon-rufous, not tawny-olive; and the bills are smaller and red, only black basally, not wholly so.

Named in honor of the collector.

Strix aluco nivipetens, subsp. nov.

Type, adult male, U. S. National Museum, No. 296208, Likiang Mountains, 11,000 feet, Yunnan, May 8, 1923. Collected by J. F. Rock (original No. 380).

Similar to *Strix aluco nivicola* (Blyth), but much darker, the back and chest with the white spots replaced by ochraceous-buff, except those on the scapulars and greater wing-coverts; flanks and feet ochraceous-buff; the face darker; under wing-coverts ochraceous-buff instead of buffy-white; bars on the tail darker and broader. Wing, 310; tail, 188; culmen from cere, 22 mm.

Remarks.—In addition to the type, Rock collected another specimen in the same general region, which while like the type above is lighter below. Both the above specimens are so different from *Strix aluco nivicola,* or any of the related forms that they hardly need comparison and it is very doubtful if they belong to the same species. The principal difference is the replacement of the white in *Strix aluco nivicola* by ochraceous-buff,

above and below, except for the white jugular patch, the white spots on the belly, the white spots on the scapulars, and greater wing-coverts.

I have not seen *Syrnium aluco harterti* La Touche (Bull. Brit. Orn. Club, 40, 1919, 50) described from Hupeh, but also recorded from Formosa and Yunnan. The description certainly does not fit the present race, as no mention is made of the ochraceous-buff of the upper or lower parts that so strongly characterizes it.

Aethopyga dabryii bangsi, subsp. nov.

Type, adult male, U. S. National Museum, No. 213223, Hongsurkou, Hupeh, May 15, 1907. Collected by Walter R. Zappey.

Similar to *Aethopyga dabryii dabryii* (Verreaux), but chest and back a lighter, duller red, rump and belly lighter yellow, the middle tail-feathers violet not steely blue, bill and tail shorter. Wing, 56; tail, 71; culmen, 14.5 mm.

Remarks.—Ten adult males of *Aethopyga dabryii* from the high mountains of northern Yunnan are uniformly more of a scarlet-red while two from Hupeh have these parts scarlet. The Hupeh birds also differ as described above and the differences are quite striking upon comparison. They evidently represent two races, but which one to bestow a name upon needs consideration. *Nectarinia dabryii* Verreaux (Rev. et Mag. Zool., 1867, 173, pl. 15) came from the province of Szechuan. The U. S. National Museum contains a male from Tatsienlu, Szechuan, and it agrees with the Yunnan series. Verreaux's plate is poor. The red is more like the Hupeh bird, while the color of the tail, pileum, rump, and belly more closely resemble the Yunnan form. As certain water-colors, especially red (the plate is hand-colored), are known to change with age, and as the color of the tail, pileum, rump, and belly more closely resembles the Yunnan bird, it would seem Verreaux's type originally came from the mountains of western Szechuan.

Named in honor of Mr. Outram Bangs.

1.0623

Vol., 38, pp. 13–14 January 27, 1925

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

DESCRIPTION OF A NEW SPECIES OF LUMINOUS LIZARD FISH, SCOPELOSAURUS SMITHII, FROM OFF THE COAST OF BRAZIL.

BY BARTON A. BEAN.

On returning from Argentina, in December, 1922, Dr. Hugh M. Smith, of Washington, was handed a "Rare Fish" which had been brought aboard the steamer by a large suction hose, and upon examination I find it to belong to Dr. Bleeker's genus, *Scopelosaurus* described in 1860 from a specimen taken off the coast of Amboina, the type (*S. hoedti*) being preserved in the Leiden Museum. This type has been redescribed and figured in the Fishes of the Indo-Australian Archipelago, II, by Dr. Max Weber, and Dr. L. F. de Beaufort, Leiden, 1913, pages 175 and 176. The genus has an elongate, well-rounded body with the snout long and pointed; a prominent lower jaw, the wide mouth being superiorly bordered by the intermaxillary and having the intermaxillary situated above it. The dorsal fin slightly behind middle of body; ventrals forward, anal in the beginning of the posterior one-fourth of the length. The narrow adipose fin above last anal rays; pectorals situated in the middle of the height of the body. Three rows of scales intervening between the opercle and its origin. The caudal forked; teeth small, a single series on intermaxillary, palatines and vomer; several series on the mandible, none on tongue. Lateral line straight; scales cycloid, head scaleless. Bleeker described this genus as having three ventral series of luminous organs between isthmus and anal. Drs. Weber and de Beaufort state that they could not make out on the type specimen, which is in a bad state of preservation if these three rows as mentioned by Bleeker really are luminous organs. It is un-

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fortunate that our specimen is in pretty much the same condition. The organs are very difficult of detection, even with the aid of a glass. Some few, however, are present.

Scopelosaurus smithii, new species.

The head is contained $3\frac{2}{3}$ times in the standard body length; eye four in head, its long diameter slightly exceeding the width of the interorbital space. Depth of body $2\frac{1}{2}$ in head; pectoral long, almost one-fifth length of body.

Dorsal 11; anal 18; scales in the lateral series about 60; caudal fin deeply incised, its lobes filamentous. Owing to the manner of capture the scales are mostly wanting. The color must have been a deep purplish black. The species here briefly described is well differentiated from its Indo-Pacific relative, by the longer head, larger eye, longer pectorals and caudal rays.

The total length of the type, 190 mm., is divided as follows: Length of head, 45 mm; body from end of head to middle caudal rays, 120 mm.; caudal, 25 mm. The type is No. 86676, U. S. National Museum. Captured off the coast of Brazil.

I take pleasure in naming this remarkable fish for my friend Dr. Hugh M. Smith, who preserved the same for us.

Vol. 38, pp. 15–16 February 10, 1925

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

NEW PLANTS FROM NEVADA.

BY IVAR TIDESTROM.

In the preparation of a flora of Utah and Nevada forms have come to light which appear to be new to botany. They are described herewith:

1. **Gilia nevadensis,** sp. nov.

Perennial with a branched caudex; stems 10 cm. high or less; leaves ovate in outline, deeply pinnatifid, arachnoid-villous, the lobes oblong, apiculate; flowers in a densely capitate cluster, densely arachnoid-villous; corolla purple, little exceeding the calyx, its lobes elliptic, about 2 mm. long, the filaments not exserted.

Type in the U. S. National Herbarium, No. 766176, flowering specimens collected by Albert E. Hitchcock (No. 865) on Bunker Hill Mountain, Toyabe National Forest, Nevada, July 29, 1913.

Closely related to *Gilia congesta,* from which it differs in its nearly uniformly pinnatifid leaves, smaller corolla, and included stamens.

2. **Verbena gooddingii nepetifolia,** var. nov.

Hirsute perennial, 20 cm. high or more; stems numerous from a deep root; leaves broadly ovate, coarsely and unevenly toothed, the blades about 2 cm. long, abruptly narrowed into a cuneate, decurrent base; flowers in a short, long-pedunculate spike; calyx about 8 mm. long, villous-hirsute, the teeth subulate; corolla 10 mm. long or more, pinkish, the rotate limb about 8 mm. broad.

Type in the U. S. National Herbarium, No. 1221478, flowering specimens collected by Ivar Tidestrom (No. 8835) in El Dorado Cañon, Nevada, near the Colorado River, at an elevation of 600 meters, May 2, 1919.

This form differs from the species chiefly in its much less indented and broader leaves.

Vol. 38, pp. 17–20 March 12, 1925

PROCEEDINGS

OF THE

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THE ADULT OF OUR COMMON NORTH AMERICAN CHIGGER.

BY H. E. EWING.

The adult instar of our common North American chigger (*Trombicula irritans* (Riley)=*Trombicula tlalzahuatl* (Murray)) was first demonstrated by the writer in 1923.[1] During the summer of 1923 several adults of *Trombicula cinnabaris* Ewing were obtained in Stone Valley, Pennsylvania, and brought to the National Museum. These were kept in small breeding cells and a single larva was obtained which proved to be no other than *Trombicula irritans* (Riley).

This summer (1924) as many as five larvae were obtained from a single isolated female kept in a small breeding cell on my table in the United States National Museum. This adult female was collected at North Beach, Maryland, July 23. She was placed in a cell made out of a large neckless vial. The bottom of the vial was filled with sand and on top of the sand was placed a disk of cork. Water was added to the cork and sand until the atmosphere of the cell was brought to about saturation. As food for the adult a single fecal pellet from a springtail was added. On July 25 the adult *Trombicula* was placed in a new and similar cell but with many fecal pellets from springtails as food and also one dead springtail. In this cell the adult was observed to be very active and to feed from the fecal pellets and also from the cork that had now begun to undergo decay.

On August 13 two very active larvae were observed in the cell. They ran with great rapidity about the same and were ceaselessly restless. The next day five larvae were observed.

[1]See Science (1924), Vol. LIX, No. 1515, Sup., p. XIV.

These were all killed and mounted on microscope slides. They agreed perfectly with the larva obtained in 1923, and were no

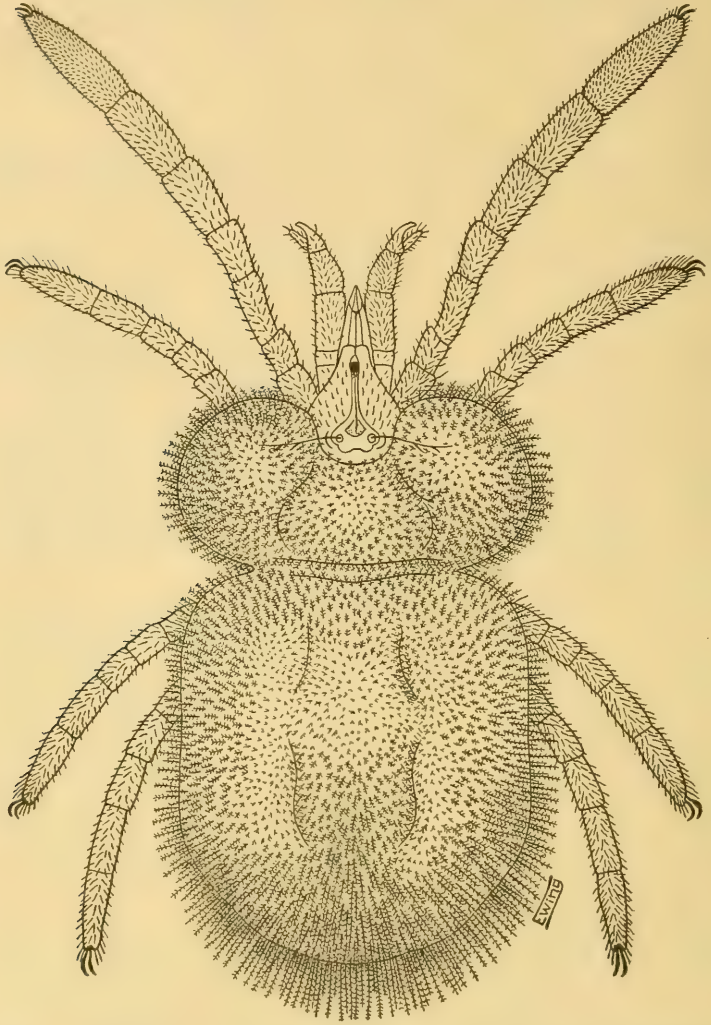

Fig. 1. Adult instar of our common North American chigger, *Trombicula irritans* (Riley). This drawing is of a female from which five larvae were obtained.

other than our common North American chigger, *Trombicula irritans* (Riley). Thus the prediction of the writer that, "The

adult form of our common chigger is very probably *Trombicula cinnabaris* Ewing,—" (Jour. Agr. Res., Vol. XXVI, No. 9, p. 402) is shown to have been a good one.

Already much has been learned in regard to the distribution, habits, etc., of the adult of *Trombicula irritans* (Riley). It is desired to state here only that it is a scavenger which lives in nature largely on fecal matter and decaying woody substances. Upon these materials I have kept many adults indefinitely in captivity and in the best of condition.

Vol. 38, pp. 21–22 March 12, 1925

PROCEEDINGS

OF THE

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A FOSSIL TERMITE FROM GERMANY.

BY T. D. A. COCKERELL AND T. E. SNYDER.

Some time ago, Mr. Heinrich Bauckhorn of Siegburg, Germany, forwarded to the senior author a very interesting fossil wing, labeled "Flügel von Phryganidae, gen. n. sp. (Meunier) Miocän, Rott." The well-known beds at Rott are ascribed by Handlirsch and others to the Upper Oligocene (Aquitanian), approximately equivalent in time to the upper part of the John Day Beds in Oregon. The wing referred to is evidently not that of a caddis fly, but is a termite. It is exquisitely preserved, but unfortunately the base is lacking. It is dilute reddish with brown veins; evidently it was more or less dusky or reddish in life.

The characters are as follows: Length as preserved 11 mm., probable length 12 mm.; width 4.2 mm.; radius heavy and conspicuous, media and cubitus weak as in living forms; membrane delicately wrinkled; costo-apical region with evident but incomplete reticulation; subcosta running extremely close to and parallel with costa, terminating beyond middle of wing or further, no branches between costa and subcosta; radius with three very oblique branches above, the first ending in subcosta, the second and third running parallel (their origins nearly 2 mm. apart) and ending in subapical region of costa; below, the radius has two oblique branches, leaving it at a larger angle, the first just beyond the last superior branch, the second 2.7 mm. beyond the first; end of radius curved downward, directed toward apex of wing; media with two very oblique long branches below, the first about 6.5 mm. long, the second a little over 6 mm.; cubitus with two divisions, each forked near its end; below the cubitus are two or three widely spaced parallel veins

visible, but the rest of the anal field has been obliterated. (Plate I, figs. 1–2.)

This termite can only be allied to Mastotermitinae, Termopsinae or Kalotermitinae. There is certainly a strong resemblance to *Mastotermes*, as shown by the inferior branches of the radius, but the media is less complex. *Termopsis* is much less similar and *Kalotermes* will not do at all. The really striking feature is that of the radius emitting superior and inferior branches from the same stem (and such a condition is feebly indicated in *Termopsis*), there being no separate radial sector.

The wing therefore appears to form a very distinct new genus, but apparently no new name is required. Meunier's *Ulmeriella bauckhorni* (Versl. Afd. Natuurk, XXII, 1919–20, pl. 1, f. 1) appears to be the very same species, though it was supposed to be Trichopterous. *Ulmeriella* Meunier is then a genus of Isoptera. Hagen long ago (Palaeontographica 10, p. 250, pl. 44, f. 1, 2) described *Calotermes rhenanus* from one winged and one deälated adult, from the Rott deposit. Kurt von Rosen (Trans. Second Entom. Congress, 1912, p. 323) found Hagen's insect in the British Museum, and gives notes on its characters, as well as a third larger winged adult from the Upper Oligocene, which he placed in *Hodotermes*. Handlirsch thought that Hagen's two figures might represent different species; the heads of these two adults appear differently shaped.

The termite *Ulmeriella bauckhorni* Meunier is larger than *Calotermes rhenanus* Hagen, the wings are darker colored and shorter in relation to their width. In *rhenanus* there are five oblique branches from the subcosta to the costa and the latter is close to and parallel to the costa; the median is near and parallel to the subcosta and apparently has no branches (doubtful because of indistinctness). In the remainder of the wing there are only some indistinct branches running to the lower margin of the wing. Even with a different (from Hagen's) interpretation of the venation, the radial sector is not branched as in *Ulmeriella*.

In the specimen found by Von Rosen and which he ascribed to *Hodotermes*, the radial sector has several branches to the inner margin. *Ulmeriella* certainly is not a *Hodotermes!*

Specimen deposited in the collection of Isoptera in the Division of Insects of the U. S. National Museum as a plesiotype.

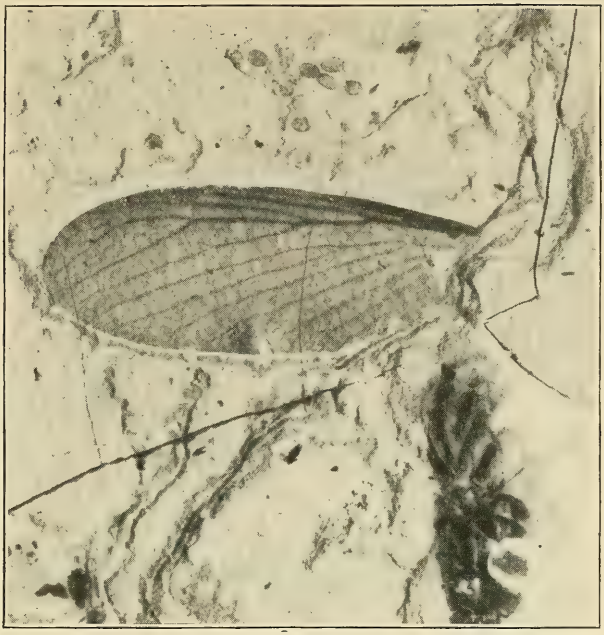

Plate I, fig. 1. Wing of the fossil termite *Ulmeriella bauckhorni* Meunier, from the Rott, Miocene, Germany. Photo. slightly over 5 ×.

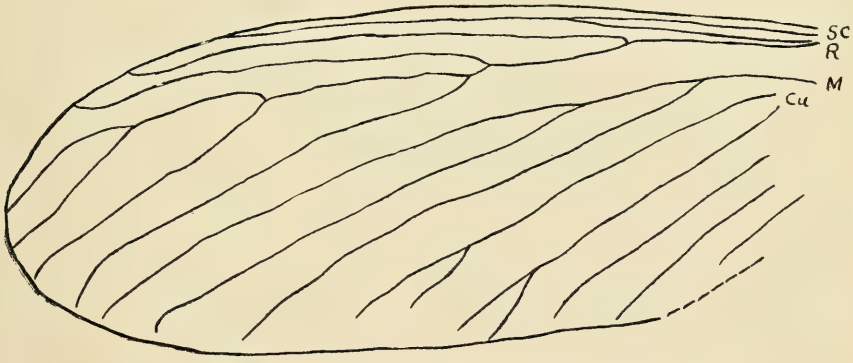

Plate I, fig. 2. Wing of the fossil termite *Ulmeriella bauckhorni* Meunier. (Camera lucida-Bausch & Lomb (Carl Zeiss) binocular, low power, no. 4 oculars, Leitz projector.)

Vol. 38, pp. 23–24 March 12, 1925

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

A NEW BAT OF THE GENUS TRACHOPS FROM GUATEMALA.

BY E. A. GOLDMAN.

The Howard E. Coffin Expedition to Guatemala financed by Mr. Coffin and directed by the Biological Survey, began its work in 1923. The primary object of the enterprise is to secure breeding stock of certain valuable game birds, especially ocellated turkeys, with a view to their introduction, and acclimatization in the southern United States. Incidentally the field work has resulted in the accumulation of a valuable collection of museum specimens of birds and mammals from a little known region. One of the more interesting of the species represented is a new bat of the genus *Trachops*, described below, and named in honor of Mr. Howard E. Coffin whose generous support of the work led to its discovery.

Trachops coffini, sp. nov.

COFFIN'S FRINGE-LIPPED BAT.

Type (skin, skull, and nearly complete skeleton) from Guyo, Peten, Guatemala, No. 244266, ♀ adult, U. S. National Museum (Biological Survey collection), collected by Harry Malleis, June 30, 1923. Original number 388.

General characters.—Similar in general to *Trachops cirrhosus* but distinctly smaller throughout; forearm less than 60 mm. (in *cirrhosus* about 62); dentition differing in detail, especially the relatively broader upper and lower premolars; lips and chin studded with wart-like protuberances and ears large and clothed with hairs projecting conspicuously beyond anterior margins as in *cirrhosus*.

Color.—Type: Upperparts near cinnamon-brown, varying to a darker tone in some examples; underparts dull brownish, tinged with gray owing to light colored tips of hairs. *Young* (about half-grown): Brownish black above and below.

Skull.—Much like that of *T. cirrhosus*, but considerably smaller; molari-

form toothrows shorter, but individual teeth relatively broad and heavy, this character most noticeable in premolars above and below; vestigial lower premolar relatively large; face of upper incisors with a broad, open groove leading to a distinct notch in the cutting edge (rather faintly indicated in *cirrhosus*); lower canines with cingulum on inner side rising less prominently above level of incisors as viewed from the front.

Measurements.—*Type* (dry skin): Forearm, 58.2 mm.; tibia, 25.3; foot, calcaneum to end of claw, 19 (without claw, 15.2). *Skull* (type): Greatest length, 28.2; breadth behind audital bullae, 13.2; zygomatic breadth, 13.5; interorbital breadth, 5.2; maxillary toothrow (front of canine to back of posterior molar), 10.3; mandibular toothrow (front of canine to back of posterior molar), 11.1; distance between outer sides of upper canines at cingulum, 5.5.

Remarks.—Comparison with specimens from Venezuela, Colombia, and Panama, which agree closely among themselves and are assumed to represent typical *Trachops cirrhosus*, indicates that the Guatemalan species is quite distinct. It is easily recognized by smaller size.

Under the name *Tylostoma mexicana*, Saussure described[1] a species from the "regiones chaudes du Mexique." This name was placed by Dobson[2] in synonymy under *Trachops cirrhosus*, but there seems to be no evidence that he examined the type specimen. Following Dobson recent authors have assumed that the range of *T. cirrhosus* extends north to Mexico. Reference, however, to the original description of *Tylostoma mexicana*, especially the measurements given, indicates that the species is probably not assignable to the genus *Trachops*. The definite status of the name, therefore, remains to be determined.

Specimens examined.—Eighteen, all from the type locality.

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[1]Rev. et Mag. Zool., 2d Ser., Vol. 12, p. 484, Nov., 1860.

[2]Cat. Chiroptera Brit. Mus., p. 481, 1878.

Vol., 38, pp. 25–32 March 12, 1925

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

THE WINGS OF THE MELOID BEETLES.

BY T. D. A. COCKERELL AND R. C. HARRIS.

Among the Meloidae are winged and wingless genera, and occasionally (as *Gynaecomeloe* Wellman) the male is winged and the female apterous. Moreover certain genera differ from others to which they are closely related by the absence of wings, so that we must believe the apterous condition to have arisen independently in various divisions or groups of the family. When examining the wings of a number of Rocky Mountain species we became convinced that these structures were of considerable taxonomic significance. Thanks to the authorities of the U. S. National Museum, and especially to Mr. E. A. Schwarz, we have been able to study the venation of numerous additional genera, sufficient to permit a fairly comprehensive survey of the subject.

Relation to Other Families.

Meloid wings are remarkable for an undulation or plication of the membrane, which is even observable in fossils, as for instance in a specimen of *Lytta aesculapii* Heer, preserved in the Geological Museum of the University of Cambridge. This fossil comes from the Miocene of Œningen in Baden. This peculiarity of the membrane also occurs in the Rhipiphoridae, but we do not find it in other families supposed to be more or less related. Thus it is absent in *Lecontia discicollis* (Leconte) of the Pythidae, *Oxacis collaris* Sharp and *Ananca aldabrana* Champion of the Œdemeridae, species of Mordellidae and Lampyridae, etc. This condition of the membrane must be regarded as the common possession of the Meloidae and Rhipiphoridae, dating back to a time before the separation of these families. Nevertheless, it may be secondarily almost lost without the Meloidae. *Alosimus collaris* (Fabricius) shows little of it though it is plainly visible on close inspection at the tip of the wing. *Tricraniodes stansburyi* (Haldeman) also shows it plainly only at the apex of the wing. In these forms the membrane character is still unmistakable, if one knows where to look for it, and

probably no Meloid has lost it entirely. The question may be raised, whether the feature is not actually a primitive one in the Coleoptera, as it is well developed in the other orders of insects, such as Diptera (e. g. Asilidae and Stratiomyidae) and Hymenoptera (e. g. *Halictus*). It also exists in quite unrelated Coleoptera, being very distinct in the Scarabaeidae. Whether or not the Œdemeridae, Pythidae, etc., are derived from ancestors which had undulated wing-membranes, they are less specialized than the Meloidae in respect to their venation. In Meloidae the cubitus is simple and degenerate, often failing basally; in Œdemeridae and Pythidae it is branched, as in Lampyridae. In *Lecontia* the cross-vein from Cu_2 to the first anal is imperfect. It is also imperfect on *Ananca;* in *Oxacis* it is entirely lacking, though there is a slight bend or angle to show where it should be. In Meloidae the second is always imperfect, and occasionally (*Tricraniodes*) absent; but in *Lecontia* and *Oxacis* it is better developed, uniting at length with the first, forming a long cell. In *Lecontia* the second anal is as robust as the first; in *Oxacis* it is very weak, and the cell it bounds is very long, narrow and pointed. This kind of cell, but greatly diminished in size, appears in the Meloid *Horia auriculata* Champion. The Mordellid wing has a widely branched cubitus but the whole vein is very pale and weak. Only the first anal is distinctly developed. Thus the Mordellidae have the anals more reduced than the Meloidae, but the cubitus less so. Mordellid and Œdemerid wings, so far as examined, have a very well developed fringe; in *Lecontia* (Pythidae) this is extremely short and sparse, though clearly present. Meloidae have no fringe at all, and it is also totally absent in the Rhipiphoridae, in which the venation is much more reduced than in the Meloids. The Rhipiphoridae are thus an end-product of the series.

COLORATION OF WINGS.

Meloid wings show varying degrees of melanism, evidently independently acquired in different series. In *Alosimus collaris*, *Tetraonyx fulva* and *quadrimaculata*, *Eupompha fissiceps*, *Zonitis flavida* and *atripennis*, the wings are deep fuliginous, nearly black, but with a flavescent base in *T. quadrimaculata* and *Z. flavida*. *Epicauta pennsylvanica* has more dilute blackish wings, not flavescent basally. *Zonabris cichorii* has the wings deep fuliginous, but strongly and broadly suffused with red about the middle; in *Z. dicincta* this red suffusion has extended, leaving only the apical field and below dark fuliginous. In *Coryna kersteni* the apical half of the wing is deep fuliginous, the basal half pale dilute reddish; *Ceroctis interna* has the same coloration except that the fuliginous is more extensive, covering about three-fifths of the wing. *Actenodia chrysonelina* has the wings dilute blackish, pallid in the anal region. Thus it may be said that the Zonabrini (Mylabrini of Wellman) are very dark-winged, though dark wings appear in quite other groups.

Another type of wing is essentially hyaline, with very dark costa, subapical region, and inner anal. This is seen in *Macrobasis longicollis* and *Lytta vidua*. *Phodaga alticeps* is similar, but has all the anals and even the cubitus dark.

Tricraniodes stansburyi and *Horia auriculata* have the wings colored in the same manner; warm red, with a large subapical blackened patch below the costa. *Lytta vesicatoria*, the type of the genus, has the wings dilute brown; in *L. nuttalli* they are hyaline, with the apical field dusky, the cubitus and anals practically colorless. The wings of *Pyrota* are dark; in *P. invita* fuliginous throughout, in *P. mylabrina* not so dark, in *P. terminata* still paler, yellowish basally.

VENATION.

On the characters of the venation, the two subfamilies recognized by Wellman appear to be justified. In the Nemognathinae[1] the outer branch connecting the end of the radius with the media is directed downwards and inwards, making with the dark subapical costal shade an extremely wide angle or none. Also, the apical medial cell (apparently bounded by the ends of M_1 and M_2) has its base only touching the lower apical corner of the large cell between the branches of the media (here called medial cell), instead of being widely based on it or obsolete. In the Meloinae (Lyttinae of Wellman) the conditions just described do not obtain, except that in the peculiar *Alosimus collaris* (Fabricius), from Adana, Asia Minor, the subapical downward branch is directed inward as in the Nemognathinae, while the apical medial cell is wholly absent. This may be said to approach *Horia auriculata* Champion, among the Nemognathinae, as that has the apical median cell incomplete, represented only by the lower side and a parallel streak. However, there are striking differences in other respects. In the *Horia* the second anal forms a small cell appended to the first; in *Alosimus* there is the V-like arrangement common to the majority of Meloine genera, but so far as observed never clearly developed in the Nemognathinae.

In describing the venation, we have followed the nomenclature of Fowler;[2] but Gahan[3] recognizes our branched cubitus as Cu_1, and A_1 of Fowler's figure is marked Cu_2, making the vein from the V the first anal. Handlirsch[4] makes the lower side of our medial cell Cu_1, and our branched cubitus Cu_2. In *Necrophorus*, the Cu of Handlirsch is the M_2 of Fowler, and Fowler's branched Cu is Handlirsch's first anal. These inconsistencies illustrate the disadvantages of the Comstock-Needham system, where the homologies are sufficiently obscure to permit distinguished doctors to disagree. According to Tillyard,[5] the vein separating the anal area from the rest of the wing in Blattidae is Cu_2, and on the same basis the first anal of Comstock in the Homoptera is also Cu_2. The vein occupying apparently the same position in *Necrophorus* is called A_1 by Gahan and is the second anal of Handlirsch. The persistence of the V in numerous Meloid genera suggests an analogy with the meeting anals in Homoptera and Trichoptera.

[1]Zonitinae of Wellman; see Entomological News, 21 (1910), p. 307, for change of name.

[2]Fauna of British India, Coleoptera, General Introduction (1912), p. 41, fig. 20 (*Lygistopterus*).

[3]Entomologist, XLIV (1911), p. 125 (*Lampyris*).

[4]Verh. Zool.-bot. Gesellschaft Wien, 1907, p. 190, f. 3 (*Lygistopterus*).

[5]Proc. Linn. Soc. New South Wales, XLIV (1919), p. 859.

Tillyard[1] gives a figure of the hind wing of a Trichopterous insect (Polycentropidae), in which the branching Cu_1 appears to correspond exactly with the branched cubitus in Œdemeridae, and the V is present between two simple veins, exactly as in such Meloid genera as *Macrobasis*, except that its end is prolonged to form a complete vein running to the margin. If this resemblance indicates true homology, then our first anal is Tillyard's Cu_2, and the vein from the V is his first anal. This supports Gahan's interpretation in his figure of *Lampyris noctiluca*. Gahan's figures of *Necrophorus* and *Lampyris* appear to be inconsistent in their labelling.

The apically closed cell within the branches of the media, so characteristic of the "Cantharid" type of wing, appears to be homologous with the similar cell in other orders, as Homoptera (*Cicada*), Lepidoptera (*Synemon*) and Diptera. Thus our medial cell in the Meloidae corresponds to the discal cell of Diptera, and the branched cubitus to that of Diptera (e. g. *Rhyphus*). It is worthy of note that even the M-Cu cross-vein found in Diptera (cf. *Rhyphus, Protoplasa*) is to be seen in the Phytid beetle *Lecontia* (where it is oblique, the lower end basad), and more doubtfully in other beetles.

NEMOGNATHINAE.

The species studied may be separated on the venation as follows:

Second anal (Fowler) represented by an elongate cell appended to first....1.
No such elongated cell....3.

1. The elongated cell complete, with a short apical process (continuation of second anal) from its outer side; apical medial cell narrow, incomplete by the reduction of its upper side to a streak (Cuernavaca, Mexico; R. Müller)....*Horia auriculata* Champion.
   The elongated cell weak or incomplete apically, with no appendiculation; apical medial cell almost or quite complete except in *Nemognatha*....2.
2. Veins dark brown....*Zonitis atripennis* Say.
   Veins pale yellowish....*Zonitis* sp.[2]
3. Second anal represented by a distinct rudiment (process) attached to the first, and a slight deflection of the third anal opposite....4.
   Second anal represented only by a thickening of the first....5.
4. Apical medial cell hardly contracted apically, and slightly incomplete next to apex of medial cell....*Zonitis flavida* Leconte.
   Apical medial cell narrow, contracted apically, evanescent basally *Nemognatha bicolor* Leconte.
5. Upper side of medial cell distinct for fully or over half its length *Tricraniodes stansburyi* (Haldeman).
   Upper side of medial cell absent....*Gnathium minimum* Say.

Thus *Gnathium* has the most specialized (reduced) venation of the series.

[1] Proc. Linn. Soc. New South Wales, XLIV (1919), p. 629.

[2] This species, from Las Cruces, New Mexico, had been identified as *Nemognatha immaculata* by a distinguished authority, and it was only when the venation was examined that the error was suspected. The wide-spread genus *Zonitis* (abounding even in Australia) has a less specialized venation than *Nemognatha*, at least in some of its members.

Tricraniodes stansburyi was taken at Boulder, Colorado, May 6, 1922, by Miss Maxy Pope.

MELOINAE.

TRIBE SYBARINI (SYBARIDES, WELLMAN).

Of this group we have examined only *Alosimus collaris* (Fabricius), which stands apart from all the Meloinae seen by the oblique vein from the end of the radius, pointing directly to the upper apical corner of the medial cell. In addition, the apical medial cell is absent, as also is the upper side of the medial. The first anal is strongly arched, and the V is very well developed. The beetle looks much more like a *Lytta* than a Zonabrine, and has two black spots on the thorax just as in *Lytta biguttata* Leconte.

TRIBE ZONABRINI.

If we follow Reitter in excluding the Cerocomini as another tribe, the species studied are separable thus:

Vertical vein from radius to end of medial cell (called simply vertical vein below) conspicuously bent or curved in its upper part; upper-outer side of apical medial cell represented only by basal portion.....1.

Vertical vein not or not conspicuously curved or bent.....2.

1. First anal with a nearly even curve; angle formed by downwardly directed subapical vein with costal thickening beyond clearly less than a right angle (Wusih, Kiangsu Province, China; H. F. Loomis) *Zonabris cichorii* (Linnaeus).

   First anal distinctly bent; angle (etc.) greater. (Mt. Kenia to Ft. Hall, British East Africa; E. A. Mearns).....*Zonabris dicincta* Bertol.

2. Upper-outer side of apical medial cell represented only by the basal part, which arises opposite to and in a line with upper side of medial cell; first anal very far from third (Kilimanjaro, Africa; W. L. Abbott).....*Coryna kersteni* Gerstaecker.

   Upper-outer side of apical medial cell also represented only by the basal part, but this arises distinctly below the level of upper side of medial cell.....3.

3. Medial cell rounded at end (Benguella; F. C. Wellman).....*Actenodia chrysomelina* Erichson.

   Medial cell broadly obliquely truncate at end, the upper corner more apicad. (Luebo, Congo; D. W. Snyder).....*Ceroctis interna* Harold.

All these beetles are marked with black and fulvous in a similar fashion and have a characteristic appearance. *Alosimus*, like *Ceroctis*, has the medial cell obliquely truncate at end, but in *Alosimus* it is the lower corner which is more apicad.

TRIBE CEROCOMINI.

Cerocoma kunzei Frivaldsky is a green beetle with extraordinary antennae, and not at all like the Zonabrini. It differs from the Zonabrini by having the subapical downwardly directed vein at right angles to costa, whereas in all the above Zonabrini it is distinctly oblique, with its lower end apicad.

The upper side of the medial cell is more completely obsolete than in the Zonabrines; the end of the cell is formed about as in *Actenodia*. The upper side of the apical medial cell is virtually absent, but there is a small faint streak. The vertical vein is distinctly bent near its upper end, after the manner of *Zanobris*. The V is distinct.

TRIBE LYTTINI.

First anal strongly and abruptly bent downward near end (all belonging to Calospastides).....1.

First anal not strongly and abruptly bent (Lyttides, except *Calospasta*).....3.

1. Apical part of M_1 (upper side of apical medial cell) present, arising at level of upper side of medial cell; cubitus curving at base to meet M_2. (Los Angeles County, California; Coquillett).....
Phodaga alticeps Leconte.

Apical part of M_1 absent or represented by a little patch of color.....2.

2. Cubitus straight; lower apical corner of medial cell less than a right angle (on *Lycium berlandieri*, plains east of San Andreas Mts., New Mexico; E. O. Wooton).....*Eupompha fissiceps* Leconte.
Cubitus curved; lower apical corner of medial cell at least a right angle (Los Angeles, California; Coquillett).....*Tegrodera erosa* Leconte.
(This arrangement of the Calospastides omits *Calospasta*, because that has the first anal less strongly bent; but it could be run next to *Eupompha*, separating thus:
Basal section of M_1 represented by a distinct rudiment (dusky line).....
Eupompha.
Basal section of M_1 wholly absent.....*Calospasta*.
Among these Calospastides, only *Eupompha* has a distinct bend in the vertical vein.)

3.[1] Cell between first and third anals distinctly contracted apically, the first anal being evidently curved (in *Zonitis* this cell is narrowed apically; in the following genera it is broad apically, though narrower than in or beyond middle.).....4.
Cell between first and third anals not distinctly contracted apically.....7.

4. Terminal portion of M_1 present; lower apical angle of medial cell a right angle; vertical vein strongly bent very near its upper end (Mesilla Park, New Mexico, at light; Cockerell).....
Pleuropompha costata Leconte.
Terminal portion of M_1 absent (or represented by a rudiment in *Pomphopoea*).....5.

5. Lower apical angle of medial cell an acute angle (Southern California).....*Calospasta perpulchra* Horn.
Lower apical angle of medial cell a right angle.....6.

6. Vertical vein strongly curved to its upper end.....
Lytta nuttalli Say.

[1] From all these Lyttides *Horia auriculata* is separated thus:
A complete elongated cell attached to lower side of first anal, emitting a stump of a vein near its apex; first anal much more remote from third apically than basally.....*Horia*.
No complete elongated cell attached to lower side of first anal.....Lyttides.

Vertical vein straight to upper end (New York State) ..... *Pomphopoea sayi* Leconte.

7. Terminal portion of M_1 represented by a rudiment; a pale V in apical field; lower apical angle of medial cell much less than a right angle..... *Tetraonyx fulva* Leconte and *T. quadrimaculata* (Fabricius).[1]

(*Pomphopoea sayi* might be looked for here; it has no pale V in apical field, and lower apical angle of medial cell a right angle.)

Terminal portion of M_1 well developed..... 8.

8. Apical medial cell narrowed, much longer than broad..... cf. *Zonitis* in Nemognathinae, but although the cell is broader, *Epicauta cinerea* might be looked for here.

Apical medial cell broad; lower apical angle of medial cell always a right angle or nearly..... 9.

9. M_1 after leaving medial cell directed apicad, forming about a right angle with apex of cell..... 10.

M_1 after leaving medial cell directed upward..... 11.

10. Apical medial cell distinctly broadening apically (Albuquerque, New Mexico; Cockerell)..... *Pyrota mylabrina* Chevrolat.

Apical medial cell hardly or not broadening apically (Austin, Texas)..... *Pyrota invita* Horn.

(As the name of one of these indicates, there is a strong superficial resemblance to the Zonabrines, though the thorax has two spots as in *Alosimus*. The vertical vein in *Pyrota* is sharply bent at its extreme upper end, much nearer the end than the curve in *Zonabris;* the first anal is much straighter than in *Zonabris*. The apical continuation of M_1 is distinctly below the level of upper side of medial cell, in the manner of *Actenodia* and *Ceroctis;* the medial cell is squarely truncate at end. The V formed by second anal is distinct. There is then no difficulty in separating *Pyrota* from the Zonabrines on venation.)

11. Cubitus with basal part absent..... 12.

Cubitus practically complete, at least as far back as a slight angle which appears to represent the lost fork..... 13.

12. Apical medial cell about as broad apically as long (Lava, New Mexico; H. G. Toussaint)..... *Macrobasis longicollis* Leconte.

Apical medial cell broader apically than long. (Anahuac, Texas; H. C. Hanson.)..... *Epicauta vittata* (Fabricius).

13. Rudiment of second anal (end of V) very short; medial cell very narrow at end; vertical vein bent near upper end as in *Pyrota*. (Texas.)..... *Gnathospasta mimetica* Horn.

Rudiment of second anal (at end of V) well developed..... 14.

14. Rudiment of second anal distinctly curved toward first anal apically..... *Epicauta pennsylvanica* (DeGeer).

[1] It is a remarkable thing that the streak which represents the hardly noticeable rudiment of end of M_1 arises from, or rather points toward, the *lower* apical angle of medial cell, as in the Nemognathinae. This is fairly well developed in *T. fulva*, almost wholly obsolete in *T. quadrimaculata*.

Rudiment of second anal straight.....*Epicauta corvina* Leconte.

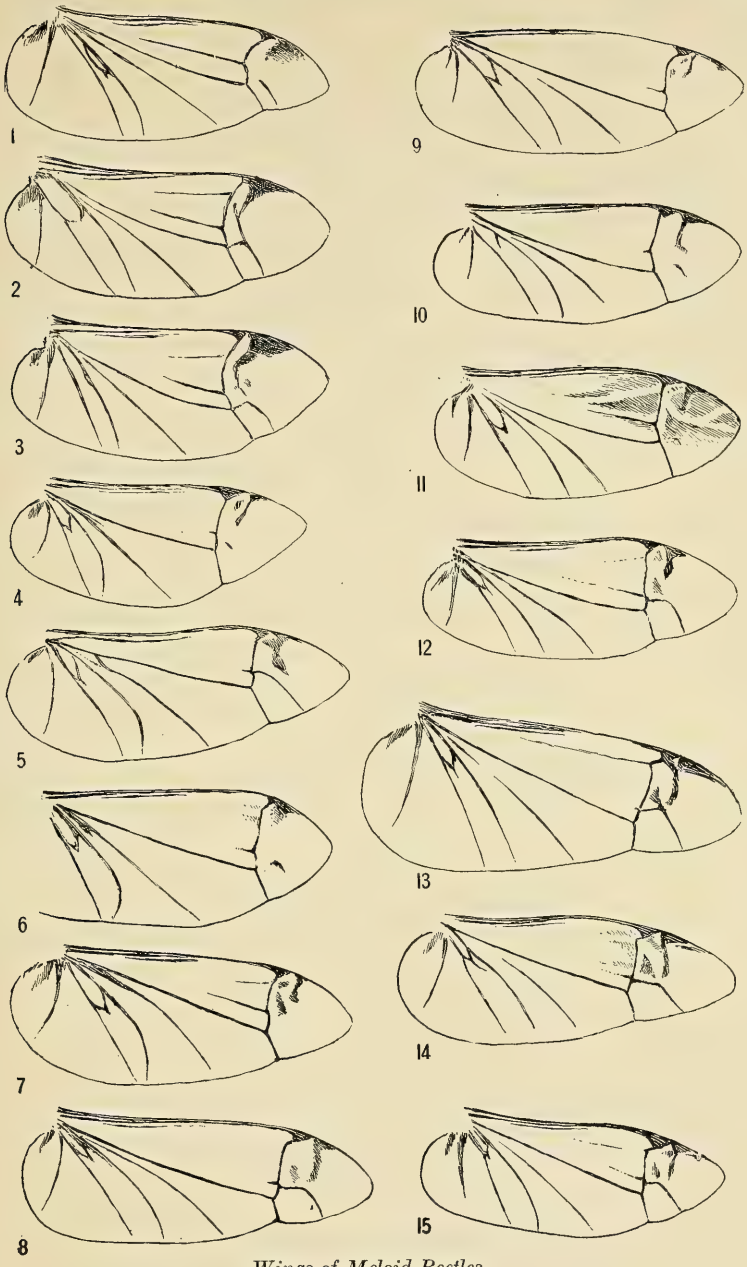
(In *Epicauta* the vertical vein is sharply bent near upper end; so also in *Macrobasis*. This feature at once distinguishes these genera from *Lytta*, as represented by *L. vesicatoria* (Linnaeus) and *L. nuttalli* (Say). But *Lytta* (*Causima*) *vidua* Klug, from Sapucay, Paraguay, has the vertical vein bent at the upper end in the manner of *Macrobasis* and *Epicauta*. The whole appearance of the wing is like that of *M. longicollis*, except that it is not so long, and is broader in proportion to its length. In *L. vidua* the apical medial cell is much narrower than in *M. longicollis*, and its upper side is more humped or curved. In *L. vidua* the cubitus clearly shows the rudiment of the fork, but this part of the cubitus is wholly absent in *M. longicollis*. We infer that *L. vidua* is not congeneric with the type of *Lytta*.)

Lytta vesicatoria of Europe would run in the above table better to *Pomphopoea* than to *L. nuttalli*, because the vertical vein has only a very gentle double curve. It is however distinctly more curved than in *Pomphopoea*. However, *Pomphopoea* has a strong dark streak representing the rudiment of apical part of M_1, and this is absent in *L. vesicatoria* and *L. nuttalli*. So far as the venation goes, we should hardly suppose *Pomphopoea* to be a genus distinct from *Lytta*.

From the Tertiary of the Kudia River, Siberia, we have a wing showing the characteristic undulated membrane of the Meloidae, but the medial cell ends about the middle of the wing, and its end is acute; the cubitus is strongly curved. This can not go in Meloidae, but appears to belong to Scarabaeidae.

EXPLANATION OF PLATE.

Fig. 1.—Wing of Horia auriculata,
Fig. 2.— " Zonitis flavida,
Fig. 3.— " Tricraniodes stansburyi,
Fig. 4.— " Calospasta perpulchra,
Fig. 5.— " Phodaga alticeps,
Fig. 6.— " Eupompha fissiceps,
Fig. 7.— " Tegrodera erosa,
Fig. 8.— " Pleuropompha costata,
Fig. 9.— " Lytta nuttalli,
Fig. 10.— " Pomphopoea sayi,
Fig. 11.— " Tetraonyx quadrimaculata,
Fig. 12.— " Pyrota invita,
Fig. 13.— " Macrobasis longicollis,
Fig. 14.— " Epicauta vittata,
Fig. 15.— " Gnathospasta mimetica.



Wings of Meloid Beetles.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

A NEW KANGAROO RAT OF THE GENUS DIPODOMYS FROM OREGON.

BY E. A. GOLDMAN.

In northern California and southern Oregon *Dipodomys heermanni* has hitherto been known to occur only on the eastern side of the Cascade Mountains. The collection of specimens in the Rogue River Valley on the western side of these mountains is, therefore, of considerable interest. These represent an undescribed subspecies which is characterized as follows:

Dipodomys heermanni gabrielsoni, subsp. nov.

GABRIELSON'S KANGAROO RAT.

Type from Brownsboro, Jackson County, Oregon, No. 244514, ♂ adult, U. S. National Museum (Biological Survey collection), collected by Ira N. Gabrielson, June 21, 1924.

General characters.—One of the darkest colored of the known forms of the genus. Most closely allied to *Dipodomys heermanni californicus*, but color darker; maxillary arches broader; mastoid bullae smaller. Hind foot with four toes. Tail white at tip as in *D. h. californicus*.

Color.—Upperparts in general near cinnamon-buff (Ridgway, 1912), purest on cheeks and sides, heavily mixed or overlaid with black over top of head and back; underparts, forelimbs, upper surface of hind feet, sides of tail to subterminal dark zone, usual hip stripes, supraorbital and postauricular spots pure white; face heavily masked with black as in *californicus;* planter surface of hind feet, and outer sides of legs near ankles, black; tail blackish above and below to near tip where it becomes dark all around, the tip white (in the type the terminal color is indicated, but most of the tip has been broken off).

Skull.—Similar in general to that of *D. h. californicus* but relatively narrower posteriorly, maxillary arches decidedly broader, more expanded, the posterior angle more prominent and projecting laterally; mastoid bullae smaller.

Measurements.—Type: Total length, 294; tail vertebrae, 188; hind foot, 46. Average and extremes of 4 adults, including type: 286 (281-294);

129 (175–188); 45.7 (45–46). *Skull* (type): Greatest length on median line, 38.5; greatest breadth (between outer sides of audital bullae), 23.9; breadth across maxillary arches, 23.5; interorbital breadth, 12.8; least width of supraoccipital (near interparietal), 2.6; maxillary toothrow, 5.1.

Remarks.—In dark coloration, as well as in cranial details, this kangaroo rat contrasts strongly with *D. h. californicus*. In color it is similar to *D. morroensis*, but the two forms require no close comparison.

Specimens examined.—Fourteen, all from the type locality.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

NOTES ON CHILOPODS AND DIPLOPODS FROM BARRO COLORADO ID., AND OTHER PARTS OF THE CANAL ZONE, WITH DIAGNOSES OF NEW SPECIES.

BY RALPH V. CHAMBERLIN.

In recent months there have come into the author's hands several small collections of chilopods and diplopods from Barro Colorado Id. In 1923 Mr. James Zetek, specialist in tropical insects of the United States Bureau of Entomology and the man primarily responsible for the move which resulted in the setting aside of Barro Colorado as a Natural Park, sent in several forms from the island with material taken from termite nests from various other points in the Canal Zone. In the spring of 1924 Prof. W. C. Allee made a collection on the island in conjunction with his ecological studies. During the following summer Nathan Banks also collected a considerable number of these organisms incidentally to collecting in his own special lines. Although these collections obviously represent but imperfectly the myriopod fauna of the island, they are sufficient to indicate clearly that the fauna is largely peculiar in comparison with those previously made known from the Central American region and that it is essentially South American in its character. While most of the species are new, it seems desirable because of the importance this region is likely to assume in biological work to list the known forms in these collections along with the diagnoses of the new ones. The types of the new forms are in the Museum of Comparative Zoology.

CHILOPODA.

CRYPTOPIDAE.

Cryptops zeteki, sp. nov.

Cephalic plate with paired longitudinal sulci which extend forward only a short distance from caudal margin. Cervical groove of first dorsal plate

pronounced, angled at the middle; the paired longitudinal sulci furcate at anterior ends behind the cervical groove which they do not cross. Prosternal margin straight or a little convex at middle, not at all doubly convex or mesally notched; marginal setae very small, 2+2. Last ventral plate with sides convex converging caudad, the caudal corners strongly rounded and the caudal margin convex. Coxopleurae convex caudally, not at all produced. The femur of anal legs wholly lacks teeth, bearing merely short epinescent setae which leave no naked ventral area. Tibia with a single ventral tooth, this near the beginning of the distal fourth of length. Metatarsus with five or six seriate teeth ventrally. First tarsal joint with three teeth. None of the joints of anal legs with dorsal tooth. Anterior tarsi not biarticulate.

Length, 19 mm.

Locality.—Panama: Largo Remo Id. Two specimens, of which one is not fully grown and lacks the anal legs, taken 31 Aug., 1923, in nest of *Microtermes panamensis* Snyder. Zetek and Molino.

Cryptops, sp.

Too immature for specific determination.

Locality.—Barro Colorado Id. One specimen taken in nest of *Obtusitermes biforma* Snyder, 22 Aug., 1923, by Zetek.

Cryptops floridanus, sp. nov.

Cephalic plate not sulcate. First dorsal plate with cervical groove strongly angled at middle, the angle in a depression; paired longitudinal sulci furcate anteriorly, their inner branches uniting before reaching the cervical groove. Sulci of succeeding tergites complete. Prosternal margin slightly notched at the middle; marginal setae weak, 3+3 or 4+4. Last ventral plate with sides converging caudad, corners rounded, the caudal margin nearly straight. Anal legs much as in *C. zeteki*, but with only two teeth on first tarsal joint; tibia with spiniform setae on the mesal surface and mesoventral ridge, but with only ordinary hairs on the ventral surface proper where some spinescent setae are present in *zeteki*. Anterior tarsi not biarticulate.

Length, 16 mm.

Locality.—Florida: Sebastian, one specimen, 2 Nov., 1919; Paradise, one younger specimen, 21 Feb., 1919.

Distinguishable from preceding species in lacking paired sulci across caudal border of head and in characters of anal legs.

OTOSTIGMIDAE.

Rhysida nuda (Newport).

Locality.—Panama: Ancon. One individual taken 1 June, 1923, by Zetek and Molino in the termitarium of *Leucotermes tenuis*.

This species is widely distributed, occurring in America from Mexico to Paraguay, and also in Australia, Ceylon, and various parts of the East Indian region.

SCOLOPENDRIDAE.

Cupipes ungulatus Meinert.

Localities.—Barro Colorado Id. Several specimens taken by Zetek in termitarium of *Eutermes* sp., 23 Aug., 1923, and by Banks in June and July, 1924; also one specimen in rotten wood near headwaters of Rio Chinilla taken by Molino, 27 Aug., 1923.

This species is known also from the West Indies and Brazil. It seems to be common throughout Panama.

Scolopendra sumichrasti Saussure.

Locality.—Panama: Balboa, Florence Id. One specimen taken by Zetek.

A species previously known from Mexico, Guatemala, and British Honduras.

SCUTIGERIDAE.

Pselliodes, sp.

Too young for specific determination.

Locality.—Barro Colorado Id. One specimen taken by Banks, 15 July 1924.

ORYIDAE.

Orphnaeus brevilabiatus (Newport).

Localities.—Barro Colorado Id., one specimen taken by Allee, and one by Banks, 2 Aug., 1924; Frijoles, one specimen taken by Wheeler and Zetek, 14 Mar., 1923, and three by Wheeler and Molino, 28 Mar., 1923, in termitarium of *Nasutitermes colombicus* Holmgren; Rio Aojeta, one specimen taken by Zetek 19 Aug., 1923, in termitarium of *Anoplotermes parvus* Snyder; Punta Paitilla, near Panama City, two specimens taken from *Tillandsia* sp., by Zetek, 2 Mar., 1923.

CHILENOPHILIDAE.

Suturodes tardus Chamberlin.

Locality.—Barro Colorado Id. Five specimens taken by Allee, 1924, and one by Banks, 2 Aug., 1924.

The species was previously known only from Honduras. The specimens from Barro Colorado Id. present slight differences from the types, but these are apparently due in part to differences in age and in part to local variation of less than subspecific importance.

DIPLOPODA.

PLATYDESMIDAE.

Platydesmus nicaraguanus, sp. nov.

The color at present is brown, without a median longitudinal stripe, but the color may have been modified by long preservation. Body moderate

in width, being nearly four times longer than wide. The first tergite does not completely cover the head from above; its anterior border is widely emarginate and is deeply notched at middle, the notch rounded at the bottom. Of the two rows of tubercles present on the tergites the anterior row extends laterad nearly to ends of keels, the posterior row much shorter.

Length, 15 mm.; width, 4 mm.

Locality.—Nicaragua: One specimen.

STEMMIULIDAE.

Stemmiulus bioculatus Gervais.

Locality.—Barro Colorado Id. Five females taken by Allee and one by Banks, 1924.

Without reexamination of the type it is impossible to be wholly certain that these specimens represent the same species as Gervais had; but the fact that the type was from Panama makes the identity very probable.

SPIROSTREPTIDAE.

Orthoporus canalis, sp. nov.

General color fuscous, lighter below, the caudal portion of each segment ferruginous, more yellow adjacent to margin. Last segment lighter brown. Legs yellowish. Collum on each side with five complete striae and a shorter curved one between the two uppermost of these; not prominent ridge below the uppermost stria. Segments wholly smooth above in front of sulcus, but behind the sulcus strongly longitudinally ridged. Last tergite not covering the anal valves above; surface densely punctate, the caudal angle set off by a curved sulcus. Anal valves also punctate, otherwise not roughened. In the anterior gonopods the posterior lamina is expanded and rounded at its distal end is extended into a process on ectal side which is short and slender, much as in *O. cordovanus* but with the process more slender.

Number of segments, 60.

Length, about 56 mm.; width, 3.5 mm.

Locality.—Barro Colorado Id. One male taken 12 July, 1924, N. Banks.

Orthoporus nicaraguanus, sp. nov.

Fuscous or black, with posterior portion of segments ringed with ferruginous. Legs light brown. Collum strongly inflexed below; with six or seven longitudinal striae, a ridge-like elevation below the uppermost of these, this stria at its anterior end bending up dorsad parallel with anterior margin of plate. Segments above wholly without rugae either behind or in front of the sulcus, minutely and not densely punctate, otherwise smooth and shining. Last tergite much exceeded by the strongly compressed valves, not transversely furrowed. Readily recognizable by the form of the gonopods of male. In these, e. g., the posterior lamina of the anterior pair is truncate at distal end and is extended ectad, with a large spinous process extending a little ectad of proximad from this lateral end.

Number of segments, 52.
Width, 5.2 mm.
Locality.—Nicaragua. One male broken into sections.

Diaporus barroensis, sp. nov.

Light brown in general color, the segments somewhat ferruginous brown back of the sutures; repugnatorial glands showing as a series of small dark dots along the sides, the body below the level of the series lighter than above; last segment paler than the preceding ones. Legs light ferruginous. Collum strongly inflexed below, the inflexed wing almost at right angles to side of plate; crossed on each side by five sulci, a prominent smooth ridge separating the upper two. Dorsally the segments are densely punctate behind the segmental suture, punctae being weaker immediately in front of the suture and absent further forward; surface above otherwise not at all roughened, smooth and shining. Last dorsal plate a little exceeded by the anal valves, very obtusely angled behind, the caudal portion set off by a pronounced and rather long transverse furrow behind which it is depressed; surface finely punctate similarly to metazonites of preceding segments. Anal valves also similarly punctate.

Number of segments, 50–53.
Length, about 47 mm.; width, 4 mm.
Locality.—Barro Colorado Id. One female taken 22 Aug., 1923, by Zetek and Molino; one immature specimen taken by Allee; and three adult females taken by Banks in July, 1924.

Rhinocricidae.

Rhinocricus insulatus, sp. nov.

Head dilute ferruginous brown. Collum dark anteriorly, lighter, dilute ferruginous, posteriorly. Exposed portion of prozonites black above, areolated below and becoming thus much lighter ventrally. Metazonites ferruginous, more yellowish brown adjacent to suture. Last tergite dark, almost black except caudal margin. Anal valves of similar color. Legs brown of ferruginous cast. Head smooth and shining; sulcus obscure or interrupted at level of lower portion of eyes. Sensory cones of antennae four in number. Collum smooth and shining, widely rounded below. Second tergite extended below level of collum, lower margin nearly straight, neither excavated nor angulate. Segmental sulcus complete on second and following segments. Segments smooth and shining, striate only below. Anterior impression of scobina deep, transversely elliptic, the impressions widely separated from each other; the posterior, striate area pointed behind. Scobina extending to near the thirty-sixth segment, becoming gradually indistinct. Anal tergite a little surpassing the valves. Anal scale triangular. Posterior gonopods in male with telopodite of the typical biramous form; the broader branch blade-like, not triangular but of nearly uniform width, exceeding the stulus.

Number of segments, 45–46.
Length, 40 mm.; width, 3.5 mm.

Locality.—Barro Colorado Id. Two males and nine females taken by W. C. Allee, three females taken by Banks in July, 1924, and six females taken by Zetek and Molino in August, 1923.

Oxypyge benedictus, sp. nov.

Dark brown, nearly black, a narrow caudal border on each segment paler. Legs ferruginous yellow. Head smooth and shining; sulcus widely interrupted in frontal region. Sensory cones of antennae numerous. Segmental sulcus distinct throughout, sharply angled at level of pore which it embraces; in front of sulcus a supplemental sulcus across dorsum. Scobina with anterior impression deep, marginal in position and commonly appearing like excavations in border; striate area short, pointed behind; scobina about twice their greatest width apart. Last tergite acutely pointed behind, exceeding the valves exclusive of their processes, but the latter passing beyond it and curving up behind it.

Number of segments, 45.

Length, about 32 mm.; width, 3.2 mm.

In the telopidite of posterior gonopods the major branch is bent almost at right angles to the principal axis, of nearly uniform width over much of length, with a spinous process from lower angle, the stylus parallel with major branch which exceeds it.

Locality.—Barro Colorado Id. One male and one female collected by Allee, 1924.

Oxypyge isolatus, sp. nov.

Prozonites pale brown, the metazonites black except the pale caudal border, the black encroaching on prozonites dorsally, especially on the more caudal segments. Antennae and legs ferruginous. Head smooth and shining; sulcus interrupted as usual. Sensory cones of antennae numerous. Segmental sulcus sharply impressed throughout. Prozonite covered with transverse striolae which are wavy and branch to a limited extent. Scobina relatively much smaller than in the preceding species; anterior impressions lunate, the straite area strongly narrowed behind and its sides incurved; scobina four or five times their width apart. Last tergite acutely pointed behind, equalling the valves exclusive of their processes, the latter extending caudad much beyond it. Telopodite of male gonopods with branches of same general type as in *benedictus*.

Number of segments, 49.

Length, 42 mm.; width, 4.2 mm.

Locality.—Barro Colorado Id. One male and one female taken by Allee.

Zipyge, gen. nov.

The Panamic species of Oxypyge sens. str., so far as known, have short thick antennae bearing numerous sensory cones at the end. It is thought proper to separate the Guatemalan species described by the author (Proc. U. S. National Museum, 1922, 60, art. 8, p. 27 et seq.) as a distinct genus

characterized by having more slender antennae bearing only four sensory cones.

Genotype.—Zipyge ferruginipes (Chamberlin).

SPIROBOLELLIDAE.

Barrobolus, gen. nov.

Differing from Microspirobolus in having the telopodite of the posterior gonopods distally biramous, with one of the branches again typically partite. Also differing in the anterior gonopods in having the sternite smaller, much exceeded by the coxoids which are distally pointed and are notched below free end on ectal side.

Genotype.—Barrobolus grammicus sp. nov.

Barrobolus grammicus, sp. nov.

Body in general blackish brown, with two broad yellow stripes along the dorsum, the lower part of sides and the venter also yellowish. Legs dusky yellow. Collum narrowly rounded on each side below. Segments of body conspicuously constricted at level of segmental suture, the furrow crossed by longitudinal raised lines. Last tergite caudally rounded, exceeded by the valves. Valves smooth, not compressed. Anterior gonopods of male with sternite acutely narrowed distad; telopodite slender, exceeded by the coxoid. In the telopodite of the posterior gonopods the superior distal branch is constricted at base and strongly expanded distad, its inner or mesal angle prolonged into a slender process that curves proximad distally and sends off at the curve a short process; the inferior (mesal) branch is tripartite, with the inner finger longest, the middle one shortest, the ectal one bent towards its end.

Number of segments, 33.

Length, about 12 mm.

Locality.—Barro Colorado Id. One male taken 20–24 June, by Banks.

EURYURIDAE.

Aphelidesmus panamicus, sp. nov.

Deep chocolate brown to black along sides of dorsum and across prozonites, the dark color in the latter extending down sides below level of keels, the mid-dorsal region otherwise and the keels yellow. Sides dilute chocolate brown on upper part of prozonites and on metazonites just below keels, otherwise yellow like the venter. Legs yellow. Collum yellow in middle in an area widest caudad and not fully reaching the anterior margin. Head blackish. Antennae with two first joints yellow, the others brown. Last tergite yellow excepting on sides of basal part.

Length, 46 mm.; width, 7 mm.

Locality.—Panama: Canal Zone near headwaters of Rio Chinilla. One female with eggs taken in log by Zetek, 19 Aug., 1923.

LEPTODESMIDAE.

Chondrodesmus panamenus, sp. nov.

Dorsum and sides dark chocolate brown to black, the keels light brown to yellow. A yellow spot on each prozonite and one just behind it on anterior part of metazonite in middorsal line. Legs light brown to yellow. Head dark chocolate brown. Antennae yellow. Keels all well developed, moderately wide. In the anterior and middle regions of the body the anterior corner of keels rounded and the posterior corner in the first ones subrectangular and farther back becoming a little produced caudad; lateral margin wholly untoothed, notched in front of pore-swelling on porigerous segments; posterior margin with a single tooth. On the seventeenth, eighteenth, and nineteenth keels the posterior corners are more strongly produced caudad, but the nineteenth keels are reduced in size, the tooth of posterior margin in these segments situated on mesal side of process.

Length, 68 mm.; width, 11.5 mm.

Locality.—Barro Colorado Id. One female taken by Allee, and two females by Banks, July, 1924.

Chondrodesmus atrophus, sp. nov.

The metazonites yellow throughout; the prozonites red across dorsum and upper part of sides but the red band interrupted on the middorsal line and at the level of the keels on each side. Cauda yellow, the proximal portion of segment red. Legs yellow. Contrasting strongly with the preceding form in the great reduction of the posterior keels. Anterior keels normally developed, their anterior corner prominent and with a slight tooth on ectal side. Ectal margin deeply notched in front of the proigerous swelling. In the posterior region the keels are very narrow, anteriorly rounded and but little raised from level of segment; one tooth on posterior margin.

Width, 5.8 mm.

Locality.—Canal Zone: Ft. Sherman. One not quite adult female taken 3 July, 1924, by Banks.

Chondrodesmus panamenus Chamberlin.

Locality.—Barro Colorado Id. Three females collected by Allee and two by Banks.

These specimens conform to the types of the species, but are larger and the body is darker, with the legs in part of reddish cast.

Trichomorpha nidicola, sp. nov.

Dorsum in general brown, with the metazonites behind the sulcus and the keels excepting anterior corners yellow; a pale middorsal line and a pale line in constriction between prozonite and metazonite. Sides of body brown below level of keels. Venter yellow. Dorsum but little convex, the keels nearly horizontal. Dorsum of segments smooth, or with a few longitudinal impressed lines or rugae behind the suture but no definite tubercles or areas; sulcus deeply impressed. Posterior angles of collum a

little produced, those of all other tergites strongly so, acute. Caudomesal margins of processes of keels toothed, the teeth prominent and from four to six in number.

Length, near 18 mm.; width, 2.9 mm.

Locality.—Barro Colorado Id. One female taken in its mud nest by Allee.

Trichomorpha panamica, sp. nov.

Keels yellowish or light brown, the rest of the dorsum as well as the sides of the body solid black. Legs pale brown or in part yellow. Metazonites depressed along sulcus smooth, without raised areas or tubercles. Keels elevated, prominent, the processes large, the outer margin running ectocaudad at a prominent angle with the axis of the body, usually with three small teeth with a seta behind each one. Mesocaudal edge of processes toothed, but the teeth less uniform than in *nidicola*. Three to five teeth on this margin, the anterior ones commonly reduced; on caudal margin of keel mesad of process often several small additional teeth, the total number of teeth being sometimes as many as nine. The tarsal pads on anterior legs of male unusually small.

Length, about 30 mm.; width, 3.8 mm.

Locality.—Barro Colorado Id. One male and one female taken 1 Aug. and 24 June, 1924, by N. Banks and several females taken by Allee earlier in the year.

Trichomorpha recta, sp. nov.

Dark chocolate brown, uniform, the keels no lighter excepting the tips of their processes. Keels horizontal, rather narrow, with outer margin nearly parallel with the axis of body. Second and third keels with two lateral teeth of which the anterior one is at the anterior corner. Posterior processes of keels comparatively short. Caudal margin of keel toothed only in angle at base of process and mesad of this, the teeth small. Dorsal surface of metazonites wholly smooth, the sulcus deep.

Length, 24 mm.; width, 3.1 mm.

Locality.—Barro Colorado Id. One female taken 1 Aug., 1924, by Banks.

Trichomorpha extrema, sp. nov.

Light brown, the lateral margin of keels and the posterior processes yellowish. Keels horizontal or somewhat raised above level of dorsum. They much resemble those of *recta* but are obviously broader and in particular the outer margin is more strictly parallel with axis of body and it is straighter, this margin in *recta* being obviously convex between the anterior tooth and the caudal angle. The second, third and fourth keels with two lateral teeth, the others with only the one at anterior corner. Caudal margin of anterior keels not toothed, but in the posterior keels this margin is irregularly denticulate mesad of the process the margin of which is always smooth. The processes of keels are proportionately clearly longer than in *recta*.

Length, 18 mm.; width, 2.8 mm.

Locality.—Barro Colorado Id. One specimen taken 2 Aug., 1924, by Banks.

XYSTODESMIDAE.

Rhysodesmus mayanus, sp. nov.

Original color probably altered. At present light brown, the metazonites paler than prozonites and the keels yellow. Collum narrowed on each side, with anterior margin of angle convex and the posterior margin straight. Dorsum but little convex, much as in an ordinary *Polydesmus*. Second and third keels bent forward. Keels in general of moderate width; lateral margin thickened and raised, the pore-swelling elongate; smooth, without teeth or indentations; anterior corner rounded; posterior angles in middle and posterior regions produced caudad. Ventral branch of gonopods cylindrical over the first two-thirds of length and then abruptly narrowed to a slender blade which curves cephalomesad and at tip a little dorsad, meeting the other gonopod at the middle line; at apex a little expanded, with an angle directed cephalad; basal division setose. Dorsal branch of gonopod straight, distally acute, extending forward a little distance beyond base of terminal blade of ventral branch.

Width, 6.2 mm.

Locality.—Yucatan. One male taken from the stomach of a toad.

SPHAERIODESMIDAE.

Sphaeriodesmus conformans, sp. nov.

General color of dorsum yellowish, darkened on the sides. Second and third keels slender, the third decidedly longer than the second. The fourth keels much longer as usual, somewhat broader at base than distally, the anterior margin at distal end convex, the corresponding posterior margin concave, the keel moderately curving backward toward end. The fifth keel no narrower than the fourth, the free end almost even rounded. In the male the first legs are enlarged and the femur has a prominent setiferous tubercle toward proximal end. In the gonopods the coxa is stout, narrowing distad to base of telopodite; telopodite long and slender, curving ventrad distally, with a narrower, short distal division which has a retrorse barb at end; the telopodite setose to base of this distal division; telopodite without branch or process

Length, 13 mm.; width, 4.5 mm.

Locality.—Barro Colorado Id. One male taken 15 July, by Banks.

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PROCEEDINGS

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TWO NEW SPECIES OF SCIAPHILA.

BY S. F. BLAKE.

The small family of saprophytic Monocotyledons known as the Triuridaceae is represented in America by about 13 species, divided among two genera (*Sciaphila* and *Triuris*) by Bentham & Hooker and by Engler. Dr. Karl Schumann, in his monographic treatment of the American representatives of the family in the Flora Brasiliensis (3^3:645–668. *pl. 116–117.* 1894), recognized also two other genera (*Soridium* Miers and *Peltophyllum* Gardn.). The principal American genus is *Sciaphila,* of which 7 species (8 if *Soridium* be included) are described by Schumann. The only new species described since Schumann's work is *S. richardi* Baill. (Bull. Soc. Linn. Paris 2:1189. 1895), a remarkable plant from tropical America (French Guiana?). In the present paper two new species are described, both collected by Mr. Henry Pittier. One, from Venezuela, is of interest from its close relationship to *Sciaphila spruceana* (Miers) Engl., which has hitherto constituted a monotypic group (the genus *Soridium* of Miers); the other, from Panama, is the first species of the genus found in the New World outside of South America. A note is added regarding *Sciaphila picta* Miers, to which are apparently to be referred specimens collected in Panama by Mr. Pittier.

Sciaphila brevipes Blake, sp. nov.

Roots pilose; pedicels 1.3 mm. long or less, much shorter than the bracts, these about equaling the flowers; perianth in both sexes 4-parted, 2.8–4 mm. wide, the segments ovate, acute, papillose on margin; stamens 2, sessile; fruit indehiscent, 1 mm. long, papillose especially above, yellowish; seed fuscous-brown.

Rhizome not seen; roots slender, about 1 cm. long, densely pilose with whitish hairs; plant 5.5–10.5 cm. high, the stem simple or sometimes with a

sub-basal branch, whitish, slender, 0.5–0.8 mm. thick, glabrous, usually flexuous at base; leaves chiefly below middle of stem, few, scattered, triangular to triangular-ovate, acute to acuminate, 1.5–2.2 mm. long, fleshy, glabrous; raceme 12–15 mm. long, 2.5–4 mm. wide, 9–11-flowered, the lowest flowers remote, the others crowded, the lower 5–7 flowers ♀, the others ♂; bracts narrowly triangular, acuminate, decurved, glabrous, with purplish-brown spots toward apex, the lower 2.5–2.8 mm. long, the upper 1.5 mm. long; pedicels of the ♀ flowers stout, erect or spreading even in fruit, 0.5–0.8 mm. long (in fruit 1–1.3 mm.); ♀ perianth 3.6–4 mm. wide, spreading in anthesis, reflexed in fruit, greenish (when dry), the segments suborbicular-ovate or ovate, 1.8–2 mm. long, 0.8–1.3 mm. wide, acute or acutish, sometimes apiculate, united at base for about 0.3 mm.; carpels about 35, densely papillose, about 0.4 mm. long, the styles sub-basilar, subcapitate and tufted at apex, from slightly shorter to slightly longer than the ovaries; pedicels of the ♂ flowers 0.5–1 mm. long, erectish or spreading; ♂ perianth similar to the ♀ but smaller, 2.8–3.2 mm. wide, the segments papillose on margin, sometimes with 2 or 3 short hairs at apex; stamens oblong, 0.6 mm. long, 0.3 mm. high; fruit oval-obovoid, 0.7 mm. wide, papillose except on the sides below, apparently indehiscent, about twice as long as the more or less persistent style.

Venezuela: A saprophyte, along Lora River, on high hill above Camp 2, Perijá Exploration Company, State of Zulia, 14 Dec. 1922, *Pittier* 10953 (type no. 1,187,489, U. S. Nat. Herb.).

This curious little plant is a close relative of *Sciaphila spruceana* (Miers) Engl., differing primarily in its very short pedicels, considerably surpassed by the bracts. *S. spruceana*, which has hitherto been unique, at least among American species, in its indehiscent fruits, constantly 4-parted perianth, and diandrous ♂ flowers, was originally described by Miers as the type of his genus *Soridium*. Although reduced to *Sciaphila* by Bentham & Hooker, who were followed by Engler, *Soridium* was reinstated as a genus by Schumann in his treatment of the family in the Flora Brasiliensis. Examination of the features mentioned as diagnostic by Schumann shows that the two groups are unequivocally distinct only in the character of the fruit (indehiscent in *Soridium*, dehiscent in *Sciaphila*). In all other respects they are so closely allied that their continued separation on the basis of this difference alone is scarcely warranted.

Sciaphila panamensis Blake, sp. nov.

Roots pilose; pedicels of the ♀ flowers 2.5–4 mm. long, about twice as long as the bracts, of the ♂ flowers 1.5–3 mm. long, surpassing the bracts; ♀ perianth 6-parted, the segments ovate, acute, papillose on margin, 1.8–2 mm. long, reflexed in fruit; ♂ perianth 6-parted, the segments ovate or lance-ovate, acutish, 1.5 mm. long; stamens 3, subsessile; fruit obovoid, 1.5 mm. long, 0.7 mm. wide, whitish, slightly papillose above, dehiscent.

Rhizome (imperfect) slender, whitish; roots slender, scattered, about 1.2 cm. long; plant 8–11 cm. high, the stem simple or rarely with a branch near middle, slender, flexuous, whitish, glabrous, obscurely striate; leaves about 3–6, scale-like, triangular, acutish to acuminate, brownish, glabrous,

1–2 mm. long; raceme 1.2–3.5 cm. long, 7–8 mm. wide, about 12–27-flowered, the lowest flowers subremote, the lower 6–10 flowers ♀, the others ♂; bracts narrowly triangular, acuminate, with purplish glandular thickenings on margin, the lower 2–2.5 mm. long, the upper 1.5–2 mm., all spreading or applied to the pedicels, essentially free; pedicels of the ♀ flowers spreading or ascending, recurving at apex in fruit, stoutish, always surpassing the bracts and usually about twice as long; ♀ perianth 3.5–4 mm. wide, greenish white (when dry), the segments 0.6–0.8 mm. wide, united at base for about 0.4 mm., spreading in anthesis, not tufted at apex; carpels about 25, in anthesis about half as long as the basilar style, this papillose-fringed nearly throughout; pedicels of the ♂ flowers slender, sometimes twice as long as the bracts, spreading or erectish, essentially straight; ♂ perianth 2.5 mm. wide, the segments 0.5 mm. wide, united at base for about 0.3 mm., spreading, greenish white, papillose on margin, not pilose-tufted; stamens 0.7 mm. long, 0.3 mm. high; fruit apparently dehiscent dorsally; seed pale brown, 1.2 mm. long.

Panama: A saprophyte, in forests around Puerto Obaldia, San Blas coast, alt. 0–50 m., August, 1911, *Pittier* 4290 (type no. 679403, U. S. Nat. Herb.).

This species, the first of the genus found north of Venezuela, is nearest *Sciaphila albescens* Benth., of the Province of Alto Amazonas, Brazil. In that plant, according to Schumann's description, the pedicels are considerably longer (4–6 mm. in the ♂ flowers, 4–8 mm. in the ♀), and the fruits are 2 mm. long.

Sciaphila picta Miers, Trans. Linn. Soc. 21:48. *pl. 6, f. 13–18.* 1852.

Included with the material on which *S. panamensis* is based were two specimens differing decidedly from that species in the purplish color of the inflorescence, the more numerous flowers, all staminate and on strongly decurved pedicels, and the smaller, reflexed, purple perianths, their segments with long apical tufts of hairs. It seems best for the present to refer these to *S. picta* Miers, although they may prove distinct when that plant is better known. Through the kindness of Dr. A. W. Hill, Director of the Royal Botanic Gardens at Kew, I have been able to examine an original specimen of *S. picta* collected by Wm. Purdie. Dr. Hill informs me that the locality given by Miers ("in Venezuela, ad fluv. Opure") is erroneous, and that the correct locality is "in woods of the Opon River, Santander, Colombia." The Opon is a tributary of the Magdalena, about 6° or 7° N., between the rivers Carare and Sogamoso, and rises near Velez. The specimen sent bears so few flowers in good condition that I have not felt at liberty to dissect any. A small fragment examined of an imperfect flower seems to agree fairly well with Miers' figures. Miers' description is probably erroneous in some particulars, and there are discrepancies between his illustrations and text. The species is described as with flowers "hermaphroditis (an semper?)," but the figures show "a single male flower" (fig. 14, 15) and "a female flower" (fig. 16). Figures 15 and 16 look essentially alike and seem to be normal pistillate flowers. The perianth segments

are shown as ovate or ovate-triangular, acute, subequal in length, and about half as wide as long. Schumann, although stating that this is the only South American species of which he was unable to examine a specimen, nevertheless gives the dimensions of the segments as 1 mm. by 0.2–0.3 mm., which does not agree with Miers' figures. In Pittier's plants the segments are narrowly triangular and alternately unequal, those opposite the stamens 1.5 mm. long, 0.4 mm. wide at base, the others 1.2 mm. long. Until more specimens are available it is best to refer Pittier's plants tentatively to *Sciaphila picta* Miers.

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A REVISION OF THE OSMERID FISHES OF THE NORTH PACIFIC.

BY CARL L. HUBBS.

The family of Osmeridae, or true smelts, is confined to Arctic and North Temperate waters. Like many other families of the Holarctic Realm, it is represented by more genera and species in the North Pacific than in the North Atlantic. The genus Osmerus alone is better developed in the latter region, where otherwise only one species, *Mallotus villosus*, occurs. A species of Osmerus, as well as *Mallotus villosus*, also occurs, however, along the Arctic coasts and also in the North Pacific. In addition, *Allosmerus attenuatus*, *Thaleichthys pacificus*, three species of *Spirinchus* and four species of *Hypomesus* characterize the North Pacific fauna. They are all compared in the following key.

In the preparation of this paper, nearly all the material preserved in American museums has been examined. We wish to thank the authorities of the National Museum, in particular, for the privilege of examining the specimens deposited in that institution.

KEY TO THE GENERA AND SPECIES OF OSMERIDAE.[1]

a[1]. Scales of moderate size (fewer than 80 in the lateral line); scales on sides not forming villous bands in the breeding male.

b[1]. Teeth on the vomer canine-like, few in number, and not covering the whole head of the bone.

c[1]. Vomerine teeth confined to lateral tips of U-shaped vomer, fang-like, one to three in number on each side; teeth

[1]With the exclusion of the Atlantic species of *Osmerus* and of *Therobromus callorhini* Lucas, known only from bones taken from the stomachs of fur seals, and perhaps not an Osmerid.

very strong, not deciduous at spawning. Pelvic fins inserted distinctly behind origin of dorsal.

(Genus *Osmerus.*)

d^1. Gill-rakers in moderate number, 8 to 10+19 to 23 on first arch. Scales 66 to 69 in lateral line. Anal fin low, its height contained 2.6 to 3.3 times in head. Upper jaw about reaching vertical from posterior margin of eye. Spawning in streams.

Osmerus dentex.

c^2. Vomerine canine moderate, inserted at front of vomerine arch (often flanked on one side by a smaller tooth); other teeth of moderate strength. Pelvic fins inserted distinctly in advance of origin of dorsal fin.

e^1. Teeth larger and stronger; never deciduous. Head sharply pointed as seen from above. Opercles weakly striate. Gill-rakers longer, 10 or 11 + 22 to 26 in number on the first arch. Anal fin of moderate length, with 15 to 17 rays. Probably spawning in the ocean.

Allosmerus attenuatus.

e^2. Teeth smaller and weaker; deciduous at spawning, the breeding fish being almost completely edentulous. Head bluntly rounded anteriorly, as seen from above. Opercles strongly striate concentrically. Gill-rakers much reduced in size and number, only 4 to 6 + 13 to 16 on first arch. Anal fin elongate, with 20 to 22 rays. Spawning in streams.

Thaleichthys pacificus.

b^2. Teeth on the vomer not canine-like, rather numerous and forming a convex series along the entire head of the bone; teeth not deciduous, all small, or scarcely canine-like.

f^1. Mouth large (as in all preceding genera and species). Teeth larger, always evenly uniserial on vomer and palatine bones.

(Genus *Spirinchus.*)

g^1. Fins less elongate, the pectoral not longer than the head, and not reaching pelvic insertion.

h^1. Pectoral fin, 1.25 to 1.4 in head; upper jaw, 1.8 to 1.9; eye, 3.6 to 4.4; head in length to caudal, 4.0 to 4.2. Spawning in the surf.....*Spirinchus starksi.*

h^2. Pectoral fin longer, 1.1 to 1.25 in head; upper jaw, 2.0 to 2.15; eye, 4.4 to 4.8; head in standard length, 4.35 to 4.6.

Spirinchus lanceolatus.

g². Fins much enlarged, the pectoral longer than the head, and extending beyond pelvic insertion. Spawning in fresh water.....*Spirinchus thaleichthys*.

f². Mouth much smaller. Teeth minute; in biserial arrangement, or nearly so, on vomer and palatine bones.

(Genus *Hypomesus*.)

i¹. Scales larger than in *H. pretiosus*, 54 to 62 along lateral line. Pelvic fins usually inserted a little before origin of dorsal; fins all larger than in *pretiosus*, the pectoral reaching more than half-way to pelvic insertion. Color darker. Breeding at a small size in fresh water.....*Hypomesus olidus*.

i². Like *olidus*, but scales about 63 to 65 in number, and pelvic fins inserted distinctly behind origin of dorsal. (Breeding habits unknown.)

Hypomesus verecundus.

i³. Like *pretiosus*, but scales averaging larger, 63 to 68 in number along lateral line. (Breeding habits unknown.)

Hypomesus japonicus.

i⁴. Scales smaller, in 66 to 76 series along lateral line. Pelvic fins usually inserted behind origin of dorsal; fins all shorter than in *olidus*, the pectoral not reaching half-way to pelvic insertion. Color more silvery. Breeding at a larger size in the surf.

Hypomesus pretiosus.

a². Scales of small size (about 150 in the lateral line; scales on sides forming two villous bands in the breeding male. Mouth large. Teeth small..... *Mallotus villosus*.

Genus 1. Osmerus Linnaeus.

1. *Osmerus dentex* Steindachner.

If all the Atlantic smelt be referred to a single species, as Smitt has proposed[1], then the Pacific form can not be satisfactorily distinguished.

[1]History of Scandinavian Fishes, Pt. 2, 1895, p. 868.

According to this author, *dentex* differs constantly from *eperlanus* only in having fewer gill-rakers and a lower anal fin. That these distinctions fail to separate *dentex* from the Atlantic smelt as a whole is quite evident from our counts and measurements.

	Osmerus dentex.	Atlantic smelt.
Gill-rakers	8 to 10+19 to 23	7 to 11+15 to 24
Height of anal fin (in head)	2.6 to 3.3	2.3 to 3.4

The point of the matter is, that the Atlantic smelt may be divided into several local species (or subspecies). Excluding certain land-locked types from New England (*O. spectrum* Cope, *O. abbotti* Cope, and perhaps others), which are now being critically studied by W. C. Kendall, at least two forms may be recognized on each side of the Atlantic.

The smelt of the Eastern Atlantic, so far as observed by Smitt and ourselves, have higher anal fins than *dentex*. The Scandinavian form (which may be construed as typical *eperlanus*), however, has more gill-rakers than shown by English and French specimens examined; those on the lower limb of the outer arch number 22 to 26 instead of only 17 to 22; the total number is 32 to 37, rather than 25 to 32. It is not certain what name should be accredited to the form with the reduced number of gill-rakers.

The common smelt of the New England and Canadian coasts, probably Mitchill's *mordax* and certainly Le Sueur's *viridescens*, agrees with *dentex* in the low anal fin and low number of gill-rakers. South of New York it is (or was) represented by a smaller form with the anal distinctly higher and the gill-rakers still fewer. This southern species (possibly race) may be known as *Osmerus sargenti* Norris[1]. The two forms may be characterized as follows:

	O. mordax	*O. sargenti*
Gill-rakers (first arch)	10 or 11+19 to 24	9 or 10+15 to 18
Height of anal in head	2.6 to 3.4	2.4 to 2.6

Of these five or more Atlantic forms, *Osmerus mordax* is most like the Pacific form. In fact the only reliable difference we can discover is in the backward extension of the upper jaw, and even this difference is not wholly constant. In the adult of *dentex* the end of the maxillary lies about on the vertical from the posterior margin of the orbit, while it falls more or less short of this vertical in all specimens of *mordax* examined. *Osmerus dentex* is apparently close also to the species of the Arctic Coast of Eurasia (called *dvinensis* or *spirinchus* by Smitt), but according to him that form has as many gill-rakers as the Scandinavian *eperlanus*. Smitt's claim that the Arctic species occurs in Alaska is not confirmed by our studies, for we have found only *dentex* from the northern coast of Alaska to Japan.

The record of *Osmerus dentex* from Matsushima Bay, Japan, by Smith and Pope[2] was based on a fish of a distinct family, namely *Plecoglossus altivelis*.

[1]Proc. Acad. Nat. Sci. Phila., 1868, p. 95. Types, and series from the Raritan River, New Jersey, examined.

[2]Proc. U. S. Nat. Mus., 31, 1906, p. 463.

Genus 2. **Allosmerus** Hubbs (new genus).

Type, *Osmerus attenuatus* Lockington.

This genus is intermediate in most respects between *Osmerus* and *Thaleichthys*. Its characters are given in the preceding key.

2. *Allosmerus attenuatus* Lockington.

Allosmerus attenuatus is common in and about San Francisco Bay, and ranges northward at least as far as Central Oregon (44° 56′ N. 124° 12′ 30″ E.). It probably spawns in the ocean. The development is much more protracted than that in *Spirinchus thaleichthys*, the young remaining in the translucent postlarval condition until a length of about three inches has been attained. It is a small species, a mature female only 104 mm. long to caudal having been examined.

Genus 3. Thaleichthys Girard.

3. *Thaleichthys pacificus* Richardson.

This species ranges from the Klamath River in northern California to Bering Sea. During most of its life it is probably pelagic, but it ascends streams to spawn.

In the pelagic stage, named *Osmerus albatrossis* by Jordan and Gilbert (1898), the teeth are well developed. The breeding specimens, especially the males, are largely or entirely edentulous, but occasionally a few to many of the teeth may be retained. We have been able to trace a complete transition between "*Eperlanio*"[1] *albatrossis* and *Thaleichthys pacificus*.

Genus 4. Spirinchus Jordan and Evermann.

This group of three very closely related species should certainly be recognized as generically distinct from *Osmerus*. The vomerine dentition, as outlined in the key, is particularly distinctive.

4. *Spirinchus starksi* Fisk.

Osmerus starksi Fisk, Proc. U. S. Nat. Mus. 46, 1913, p. 293, fig.

Re-examination of material shows that the records of *Osmerus thaleichthys* from Monterey, California, made by Jordan and Gilbert (1881) and by Fowler (1912) were based on specimens of this species. A good series of specimens, almost in the breeding condition, was obtained at Eureka, Humboldt County, northern California, where the species is known as the "night surf smelt" to distinguish it from *Hypomesus pretiosus*, which is known as the "day surf smelt." These specimens were seined on the beach near the mouth of Mad River.

5. *Spirinchus lanceolatus* Hikida.

Osmerus dentex Franz, Abh. bayer. Akad. Wiss., Suppl. 4, vol. 1, 1910, p. 6, pl. 3, fig. 5 (young, from Misaki).

[1] *Eperlanio* Jordan, Proc. Acad. Nat. Sci. Phila., 1918 (1919), p. 341. Type *Osmerus albatrossis* Jordan and Gilbert.

"Osmerus lanceolatus Hikida, Zool. Mag., 25, 1913, p. 127, pl."

We have not seen Hikida's description (which we quote from the Zoological Record), but we have seen a specimen so named by Japanese ichthyologists. It is a tuberculate male, collected in Iburi, Hokkaido, and presented to Dr. Jordan by Dr. Kawamura. We have examined series from Kushiro and from Tomakomai in Japan, in both cases taken with *Osmerus dentex*. A redescription of this species is being published by Jordan and Hubbs in the Memoirs of the Carnegie Museum.

S. lanceolatus is extremely like the Californian species *S. starksi*, but differs in details of proportions as indicated in the key.

6. *Spirinchus thaleichthys* Ayres.

This species has been rather extensively confused with other forms. As already observed, Monterey records were based on *S. starksi*. We find no basis for Jordan and Gilbert's (1881) records of San Luis Obispo and Puget Sound. The records of *thaleichthys* from Nushagak River, Alaska, which have several times appeared in the literature[1] refer to *Hypomesus olidus*, as Gilbert's brief description and a reexamination of the material both show.

This species is very abundant in San Francisco Bay, from which it ascends the Sacramento River to spawn (as Mr. N. B. Scofield has determined). From this locality it ranges northward to near Cape Flattery, Washington.

Genus 5. Hypomesus Gill.

The generic name *Hypomesus* Gill under the present rules should be adopted in preference to *Mesopus* Gill, given to the same group on the preceding page, but left as a typographical error (failure to correct proof carefully).

7. *Hypomesus olidus* Pallas.

It is not clear that *Salmo inghaghitsch* Walbaum can be identified with this species, for which Pallas' name *olidus* should apparently be retained. *Osmerus oligodon* Kner is a synonym of this species, not of *japonicus*, as currently claimed.[2]

Hypomesus olidus has very generally been confused with *H. pretiosus*, *H. japonicus* and even with *Spirinchus thaleichthys* (which see). It differs sharply from *pretiosus* in the larger size of the scales, there being 54 to 62 rather than 66 to 76 in the course of the lateral line; usually in the more anterior position of the pelvic fins in reference to the dorsal, the pelvic insertion being in most cases in advance of, instead of a little behind, the vertical from the dorsal origin; in the much larger size of all the fins, the pectoral reaching more, instead of less, than half-way to the pelvic insertion; in the darker color; in the smaller size attained, and in the habit of spawning in fresh-water rather than in the surf of ocean beaches. It

[1] Gilbert, Rept. U. S. Fish Comm., 1893 (1895), p. 400; Jordan and Evermann. Bull, U. S. Nat. Mus., 47, pt. 1, 1896, p. 522; Jordan and Gilbert, Rept. Fur Seal Invest., 3, 1898, p. 440; Evermann and Goldsborough, Bull. U. S. Bur. Fish., 26, 1906 (1907), p. 40 (not figure).

[2] Denksch. Akad. Wiss. Wien. 24, 1865, p. 9, pl. 4, fig. 1.

differs from *japonicus* in the same respects, with the exception that the latter has an intermediate number of scales (63 to 68), and the breeding habits unrecorded. We have examined more and larger series of these species than have been available to other workers, yet find no good evidence to support the claim, several times asserted, that these forms intergrade, or that they are identical in characters.

Hypomesus olidus ranges from the mountain lakes of central Japan and the shores and coastwise fresh-waters of northern Japan, northward through Kamchatka to the Arctic shores of North America; thence southward along the east side of the North Pacific as far as the upper or brackish portions of San Francisco Bay.

8. *Hypomesus verecundus* Jordan and Metz.

Spirinchus verecundus Jordan and Metz. Mem. Carn. Mus., 6, 1913, p. 11, pl. 1, fig. 2.

We have re-examined the three types of this Korean species (these being the only specimens recorded) and have found that the species is in every respect typical of *Hypomesus*. It is intermediate in its characters between *olidus* and *japonicus*, as indicated in our key.

9. *Hypomesus japonicus* Brevoort.

Osmerus oligodon Kner has been quoted as a synonym of this species, but it was based on a specimen of *olidus*.

Hypomesus japonicus seems to be most closely related to the Korean *verecundus* and the Eastern Pacific *pretiosus*. It represents those species in northern Japan and Kamchatka. Material from the latter region (collected at Petropavlovsk) was erroneously identified by Jordan and Gilbert[1] as *Mesopus olidus*.

10. *Hypomesus pretiosus* Girard.

This species occurs along ocean beaches from southern Alaska to central California. It has been rather extensively confused in the literature with *H. olidus*.

Genus 6. Mallotus Cuvier.

11. *Mallotus villosus* Müller.

We have examined specimens of capelin from many localities extending from northern Japan eastward to Sweden, but have not critically studied the material. Such an investigation might yield results of considerable interest.

[1]Rept. Fur Seal Inv., 3, 1898, p. 440.

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THE ORIGIN OF THE CASTES IN TERMITES.

BY THOMAS E. SNYDER.

Of great interest to the biologist are the two views of the origin of termite castes, both based upon observation and experiment. According to the first view, held by the Italian entomologists, Dr. B. Grassi (*15*), Dr. Carlo Jucci (*18*) and (*19*), and others, the young are all alike and undifferentiated at the time of hatching, but differentiate into the various adult castes through the influence of external factors of immediate environment, such as food, the presence of protozoan parasites, the care received from the older workers, etc.

According to the second view, held by Thompson and Snyder (*24*, *25*, *26*, *27*) and others, the young are not all alike at the time of hatching, but the castes are hereditary; some, if not all of the different castes are distinguishable from the beginning, and the castes are therefore predetermined in the egg or embryo by intrinsic factors.

The late Dr. C. B. Thompson (*25* to *29*) has proved that the ontogenetic origin of the castes of the termite *Reticulitermes flavipes* Kol. is due to intrinsic causes or germinal origin, and not to the extrinsic stimuli, which have long been credited with formative, indeed, almost creative powers. The fertile and sterile types as nymphs are internally differentiated at the time of hatching and very early in their post-embryonic development all the adult castes may be distinguished, disproving the hypothesis of determining or changing the castes by external means. Dr. Thompson believed (*29*) that the castes originated by segregation from a heterozygous parent form!

Dr. Carlo Jucci, in (*18*) and (*19*), in papers supporting the views of Grassi on the creative power of immediate environment, reopened the discussion of the differentiation of the castes

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in termites. Jucci not only disagrees with the results of Thompson's careful work, which proved the embryonic differentiation of the castes and that the "complementary" or "substitute" reproductive forms represent distinct hereditary castes, but also with the support given to this theory by Snyder's biological work (*22* to *24*).

Among termites, aside from the deälated reproductive adult which develops from the winged, colonizing, first form adult, there are both brachypterous and apterous reproductive adults. (Plate I, figs. 6, 7 and 8.) These adults develop, respectively, from nymphs of the second form, with short wing pads, and from apterous nymphs of the third form. In addition there are several abnormal or "intermediate" reproductive adults.

Jucci claims that the deälated reproductive form is the only *true adult* and that these other reproductive forms are merely "complementary" or "substitute neoteinic" forms. His proof is the peculiar, characteristic pigmentation of these forms, which only can be explained by him as an arrested development, i. e. this is not a *specific* character of a caste but the morphological expression, through the accumulation of catabolic products in the skin, of a physiological state to be attributed to a special diet.

Jucci states that he has proven that there is a definite correlation between the food and the peculiar pigmentation of these "neoteinic" forms. However, this theory may be disproved by merely following the development of the nymph of the first form (winged, colonizing adult) through to the post-adult stage. During this development of a *single individual* there is a wide range in the food, but no abnormal pigmentation occurs.

TABLE I.

Development of the first form adult of Reticulitermes flavipes Kollar correlated with Food, Intestinal Protozoa, and Pigmentation.

Nymph with long wing pads.	Young winged adult before flight.	Young winged adult after flight.	Post-adult, jaw muscles degenerate.
Food wood, protozoa present in intestine.	Food little or no wood, most of protozoa have been lost.	Food wood, protozoa present.	Food special diet from workers, no wood eaten, no protozoa.
Pigment lacking.	Pigment mature, dark.	Pigment mature, dark.	Pigment mature, but lighter, less dark.

While there is a definite correlation between the pigmentation of all of the reproductive adults and their exposure to sunlight, there is no correlation between this pigmentation and their food. The post-adults, although fed by the workers on a special diet, do not attain any of the pigmentation characteristic of the neoteinic forms, although there is a marked post-adult growth; the new tissue remains colorless, as in the nymphs from which they develop.

Furthermore, Snyder has shown (*22, 23, 24*) that the second form (brachypterous) nymphs develop in large numbers in certain colonies every spring; they occur in association with nymphs of the first form (with long wing pads) in the outer layers of the wood in which the colony is located; here conditions of temperature and humidity are most favorable for rapid development. Finally, these nymphs of the second form pass through a quiescent stage, similar to that through which the nymphs of the first form pass in developing to the winged adult, and develop to adults of the second form. Nymphs of the third form (apterous) have a similar development from apterous nymphs, but owing to the strong superficial resemblance between these nymphs and young adults and the worker caste, while they occur, they are difficult to detect in colonies.

If these brachypterous and apterous types of reproductive forms are not *true adult castes*, why do they normally develop in large numbers each year in colonies? Also why is there such variation in the composition of colonies each spring, with regard to the relative abundance of nymphs of these three forms? There is no need for them in the parent colony and hence it must be assumed that they are a colonizing form. These unnecessary reproductive adults then must either migrate to form new colonies, die, or be killed by the workers. If taken and placed with workers in artificial colonies, these forms will reproduce and live for years, establishing large colonies and breeding true to type. Unless workers are present to feed them, however, they will die, since they contain (as adults) no intestinal protozoa to digest the cellulose of wood for them.

However, how are new colonies founded in nature by brachypterous (second form) adults? What becomes of the large numbers present each year in parent colonies at the time of the swarm? They disappear at this time. While these brachyp-

terous adults appear to be able to endure full sunlight (as in the "pseudoflight"), it is quite probable that with workers and soldiers they normally have a subterranean colonizing migration. The workers and soldiers are attracted to the reproductive forms by their exudate.

With these facts, showing the normal progeny of colonies of *R. flavipes*, why should there be any need for the workers to "manufacture" complementary or substitute reproductive forms by arresting or checking by means of special feeding the development of nymphs of the first form to the normal winged adult. When or how this development is checked, neither Grassi nor Jucci elucidate.

Again, adults of the first, second and third forms display marked structural differences in head, eyes, and thorax (and legs in *Termopsis*)! It has never yet been proven that qualitative feeding can produce *marked structural changes;* such is not the case even in the case of the honeybee.

While Dr. W. M. Wheeler states (*31*) that qualitative feeding can not produce morphological differences in the worker, he also states that quantitative feeding may produce diminution of stature and some of the atypical phases found in ants. This is also true in the case of the termites. Wheeler (*33*) also grants that even if the caste of an ant be determined in the egg, special feeding of the larva may be necessary to bring it to maturity.

But since the work of Dr. J. Feytaud (*13*), Thompson, etc., shows that the castes of termites are already determined at the time of hatching, food can not determine the castes.

In the case of the "orphaned" colonies, where the parent reproductive forms have been lost, young forms, capable of reproduction, are already present in the colony, as nymphs in various stages of development to the typical adult, winged, brachypterous or apterous. These forms are utilized, but not created. Doubtless, however, their development is hastened by special care and feeding. If young nymphs are lacking at this time, older forms in various stages of development may be utilized—even partially developed winged adults.

Furthermore, if food could determine the castes, and at a late stage in the development of individuals to materity, why are not fertile workers and soldiers "produced"?

Of course the care of and feeding of the young and repro-

ductive forms of termites by the workers is explained by "trophallaxis" (Wheeler (*32*)), or an exchange of nourishment, a purely selfish relationship. Snyder (*23*).

While the sex organs of soldiers of species in certain genera are well-developed none has been found that actually has laid eggs. Although soldiers with wing pads occur in species of several genera of the Kalotermitidae, this is not an indication of the maturity or functioning of the sexual organs. Heath's data (*16*) on fertile "soldiers" in *Termopsis* may admit of another interpretation when further studies of these forms have been conducted. Dr. Heath in a statement to the writer in December, 1924, stated that he has seen soldier-like forms laying eggs. These individuals have shorter heads than the normal soldier and the hairs on the abdomens are as in the reproductive form. This form is probably an "intermediate" reproductive form.

In the case of the non-social insects, various brachypterous and apterous reproductive forms occur within the species in the Zoraptera, Orthoptera and Hemiptera; notably among the aphids, where, according to Dr. A. C. Baker, there are "intermediates" with a loss of eyes and wings or loss in the length of the wings. The factors influencing the origin of these forms are apparently different than in termites; these non-social insects are not comparable to the social insects.

Dr. E. D. Ball (*1*) states:

"Migration is an adaptation that enables species to occupy regions which would otherwise be uninhabitable. * * *

"There is another type of migration in which only certain specially modified individuals take part. Many modifications of this kind are found in the arid regions of the western country. Most of the leafhoppers that feed on the short grasses have abbreviated wings, an adaptation which enables them to move about freely in these tangles. The areas they inhabit are subject to periodic droughts in which animal life, including even the insects, may be destroyed. These insects have a special migratory form with slender body and long wings that is capable of flying long distances. These migratory forms always appear very early in the season from the first nymphs that mature. Within a few days of emergence they fly away to other regions and thus distribute the species, leaving only the normal short-winged forms in the original location.

"The Rocky Mountain Locust which was so destructive in the western regions from 1872 to 1876, was considered to be a distinct migratory species of grasshopper (*Melanoplus spretus*). Studies made during the recent

outbreak have shown that this grasshopper is not a true species but only a specially modified long-winged migratory form of the common injurious grasshopper of the northern part of the United States (*Melanoplus atlanis*). Production of excessive numbers of the migratory form is probably correlated with periodic droughts. It is probable that migratory forms are present in many species in which they have not as yet been recognized."

In Italy, Grassi and Jucci find that the sexes swarm at different times from the same colony, and that no "true kings or queens" (developing from winged, migratory, first form adults) heading termite colonies (*Reticulitermes lucifugus* Rossi) occur in nature; the parent reproductive forms are those with short wing pads (developing from nymphs of the second form), and in case of these forms, the males do not live long after mating. These abnormal conditions in the biology of this termite seem to be unique and are peculiar to Italy.

It may indeed be, as Silvestri states (*21*), that climate determines which reproductive form can *survive*—but each type develops yearly, even in Italy, and even if conditions are unsuitable for the establishment of new colonies. Jucci explains that "true queens" are unnecessary in Italy because of the presence of "neoteinic" forms. However, the latter forms are present in the United States and elsewhere, where "true queens" (first form) also occur. It is peculiar that, if the climate is a factor of such importance, while "true queens" do not occur in nature in colonies of *Reticulitermes* (according to Grassi and Jucci), they do occur in colonies of *Kalotermes* in Italy. Of course there is some difference in the habitat.

The careful work of Dr. L. R. Cleveland (*11*) and (*12*) has proved that the intestinal protozoa have nothing to do with sterility or caste production in any of the three families (Kalotermitidae, Rhinotermitidae and Termitidae) of termites. For when wood is eaten by an individual of any caste, except normally in the Termitidae, protozoa are present and in the more highly specialized family Termitidae, many species of which do not feed on wood and which do not harbor protozoa in the intestines, sterility and caste differentiation occur as in the other termites. Protozoa occur in the intestines in a symbiotic, not in a commensual or parasitic, relationship and digest the cellulose which is the principal food of most termites. When the post-adult reproductive adults of certain species of the

Kalotermitidae feed on wood, protozoa are present. Grassi, in his hypothesis, did not correlate wood diet and the presence of protozoa!

With regard to the role of nutrition, Prof. E. Bugnion's (*3* to *9*) careful studies of certain termites (Termitidae) of Ceylon prove that there is no evidence of special feeding, since all the young forms receive the same food and the same care or lack of care. Dr. H. Heath's work (*16*) in California led him to conclude that food was not a factor in caste determination.

Dr. C. B. Thompson's work with *thirteen* species, in *nine* genera, of American termites has proven that although newly hatched young are exactly alike externally, there are marked internal differences; all the fertile forms can be recognized from the sterile ones especially by the larger brains, eyes and sex organs. In a very short time all of the castes can be distinguished. (Plate I, figs. 3, 4 and 5.) Thus we may say that the castes of termites are due to heredity and not to their immediate environment, as is claimed by Grassi and Jucci, working with two species of termites. Dr. Thompson's work has since been confirmed by Claude Fuller (*14*) working on South African termites and Dr. A. D. Imms (*17*) working on a termite from Thibet.

Another aspect of the question of the castes of termites, of vital interest to biologists ever since Darwin, is the problem of how they have arisen in the evolutionary process. To-day it is most logical to consider the termite castes, not as mutants, but rather as "segregants," which arise generation after generation by the splitting and recombination of the genes of a heterozygous parent form.

A caste, like sex, may depend upon one factor and since the second and third reproductive forms apparently breed true to type (Snyder, *23*), lethal factors must be considered. Caste may also depend upon the quality or quantity of egg material. In either case, determination of the caste is made before the hatching of the young, or predetermined in the egg.

The writer believes that the development of castes can best be explained by genetics and believes that the hereditary material (germ plasm) of the whole complex of the first-form termite queen is very heterogeneous in nature. The eggs are formed by the division of the complex so that each egg received a

different set of hereditary units, some eggs developing into first, second or third-form fertile individuals, others into the sterile workers and soldiers. The first-form queen produces five to seven kinds (varying with the species) of offspring, one to three fertile and two to five sterile types—only one type being like itself (the parent), the others all different in structure and behavior. Various less common, abnormal or "intermediate" reproductive adults are merely other segregants.

There is a parallelism between termites and Mendelian segregants, where there is a splitting up of a complex parental hereditary material into many simpler types of offspring or segregants.

To summarize, in conclusion, it would seem that, since it has been proved that the fertile and sterile castes are differentiated at the time of hatching and since there is no positive proof that special qualitative feeding can determine the castes —(and indeed there is much evidence to disprove this)—and that intestinal protozoa do not cause sterility in the neuters, the burden of proof of the origin of the castes due to immediate environment still lies with those advocating this hypothesis! The castes in termites are undoubtedly blastogenic in origin! To regard them as segregants appears to be the most inclusive and plausible explanation!

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Explanation of Plate III.

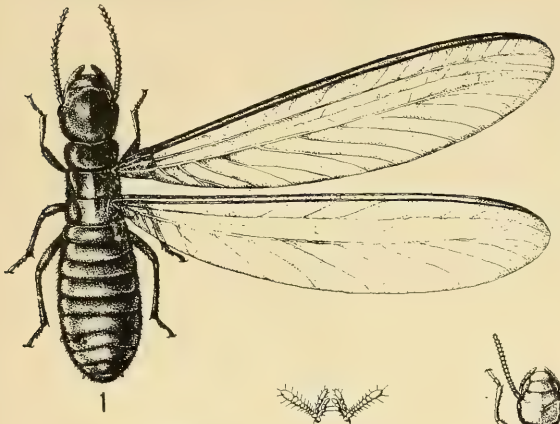
The Development of Termites (*Reticulitermes* spp.) from Parent Adults to Post Adults.

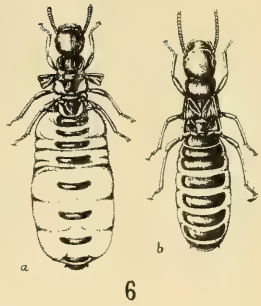
Fig. 1.—*Reticulitermes tibialis* Banks.
Sexual, winged, colonizing adult.

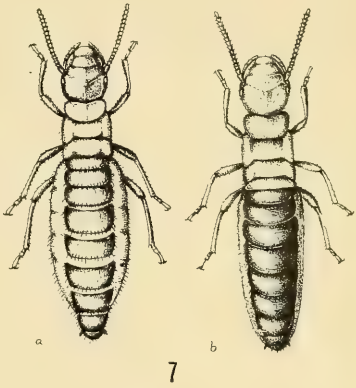
Fig. 2.—*Reticulitermes flavipes* Kollar.
(*a*) The egg. After Marlatt;
(*b*) Newly hatched young (nymphs).

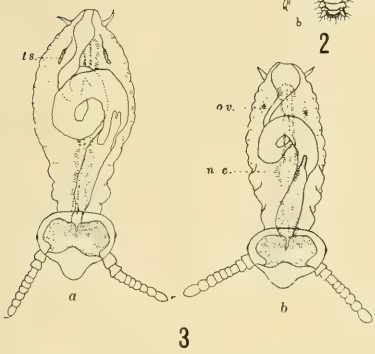
Fig. 3.—*Reticulitermes flavipes* Kollar.
Newly hatched nymphs.
a, reproductive type, male;
b, worker-soldier type, female;
ts, testis; *ov*, ovary; *nc*, nerve cord.
After Thompson.

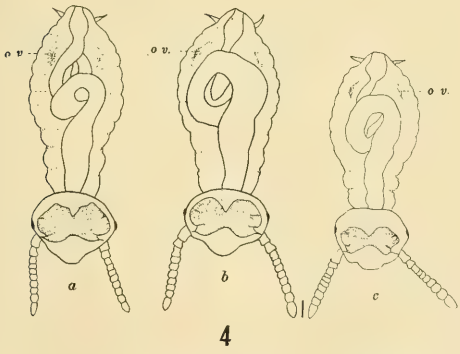
Fig. 4.—*Reticulitermes flavipes* Kollar.
Female nymphs, with ten antennary segments, body length 1.3 mm.
a, reproductive type of the first form, with large brain and large ovaries;

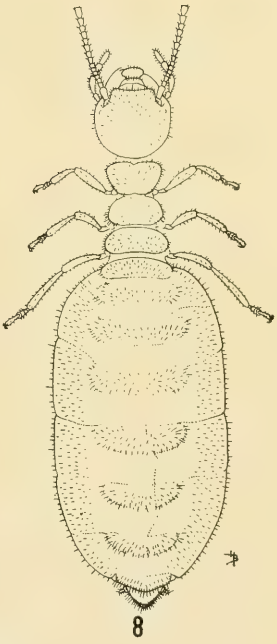












Development of Termites.

b, reproductive type of the second form, with slightly smaller brain and smaller ovaries;
c, worker-soldier type, with very small ovaries;
ov, ovary. After Thompson.

Fig. 5.—*Reticulitermes flavipes* Kollar.
Superimposed outlines of the brains of the two types, the reproductive type in heavy outline, the worker-soldier type in broken line.
a, brains of the newly hatched nymphs, body length 1.1 mm.;
b, brains of nymphs of eleven antennary segments, body length 1.4 mm.;
c, brains of nymphs with twelve antennary segments, body length 2 mm.;
mb, mushroom bodies; *ol*, optic lobes; *al*, antennary lobes. After Thompson.

Fig. 6.—*Reticulitermes flavipes* Kollar.
a, deälated, post adult queen of the first form.
b, deälated male or king of the first form.

Fig. 7.—*Reticulitermes* tibialis Banks.
a, brachypterous queen of the second form;
b, brachypterous male or king of the second form.

Fig. 8.—*Reticulitermes flavipes* Kollar.
Apterous or third form queen.

Vol. 38, pp. 69–74 May 26, 1925

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

SMITHSONIAN INSTITUTION
SEP 4 - 1925
NATIONAL MUSEUM

FIVE NEW SPECIES AND A NEW VARIETY OF WATER-STRIDERS FROM NORTH AMERICA (HEMIPTERA-GERRIDAE).

BY CARL J. DRAKE AND F. C. HOTTES.

Since the publication of "Four Undescribed Species of Water-striders (Hemip.-Gerridae)" in the Ohio Journal of Science, Volume 25, 1925, pages 46–50, the writers have received numerous specimens of Gerridae for determination from the United States and Canada. Among this material are five undescribed species and a new variety which are described herein.

Gerris (Aquarius) uhleri, n. sp.

Allied to *G. conformis* Uhler, but easily distinguished from it by (male) narrower, shorter and differently formed genital segments, much longer terminal spines of the connexiva, shorter antennae; (female) by shorter genital segments and longer and more slender spines of the connexiva. In *G. nebularis* the last segment of the male is distinctly sulcate. Length, 14.5 mm.; width, 2.26 mm.

Moderately robust, elongate, brownish black. Head, pronotum and nervures of hemelytra rather densely clothed with very short, somewhat flattened, recurved, grayish pubescence. Head on each side with silvery gray pubescence, the basal stripe varying in color from yellowish brown to russet brown. Antennae brownish black; first segment slightly curved, longest, subequal to second and fourth conjoined; second segment very slightly shorter than the fourth and distinctly longer than the third. Body beneath densely clothed with moderately long, silvery pubescence, the prosternum golden yellow. Rostrum brownish black, clothed with silvery hairs, reaching to the middle of anterior coxae. The apical segment smooth, shining and black. Hemelytra covering or only extending to the last genital segment. Pronotum with median carina distinct, the lateral margins beneath (humerus to anterior lobe) golden yellow, posterior margin rounded and distinctly depressed in the middle; anterior lobe, except front, broadly depressed in the middle and with a yellowish brown, median stripe, the pubescence on the sides of the anterior lobe inter-

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spersed with grayish hairs. Apterous or brachypterous forms unknown. Connexiva bordered with yellowish brown, the spines dark brown and extending a little beyond the tip of last genital segment. Legs a little shorter than in *conformis* or *nebularis*.

Male.—Venter broad and somewhat raised along the median line; last segment deeply, broadly and somewhat roundly excavated behind, distinctly depressed on each side in front of the posterior margin; posterior margin yellowish brown, beset with numerous silvery hairs, and truncate in the middle; first genital segment with keel much shorter and triangular in shape, also nearer the base and much more raised than in *nebularis;* sides of keel and depressed area on each side clothed with silvery pubescence; posterior margin of first and last segments clothed with numerous silvery hairs.

Female: Genital segments smaller and more plump than in *nebularis*, only faintly depressed on each side. Terminal spines of connexiva long, slightly curved and extending distinctly beyond the apex of last genital segment.

Holotype, male, and *allotype*, female, from Arizona in the Uhler collection, United States National Museum, Washington, D. C. Two male *paratypes*, also from Arizona, in the authors' collections. This insect is named in honor of the late P. Z. Uhler. It is very distinct from *conformis* Uhl. and *nebularis* D. & H.

Gerris nebularis, n. sp.

Akin to *G. conformis* Uhler and *G. uhleri*, n. sp., but readily separated from them by its larger size, longer legs, and the deeply sulcated last segment (male) of the venter. General color, markings, and proportional lengths of the antennal segments very similar to *G. conformis*. In the long winged form the first pair of wings reach almost to or a little beyond the base of the first genital segment. In the short winged form the hemelytra extend from the middle of the second to the middle of the third segments. Length, 15.4–16 mm.; width, 2.35 mm.

Male: Terminal spines of connexiva reaching a little beyond the first genital segment. Venter, except terminal segment, with a narrow median ridge; last segment deeply, broadly and roundly excavated on the posterior margin, the median furrow broad and deep. Genital segments distinctly broader than in *conformis;* median ridge long and prominent, with a large, strongly depressed area on each side.

Female: Venter with a narrow, median ridge. Apical spines of connexiva almost reaching to the tip of last genital segment. In both male and female the median ridge of venter varies from yellowish to russet brown in color.

Holotype, macropterous male, and *allotype*, macropterous female, Gainesville, Florida, July 14, 1918, collected by C. J. Drake, in Drake collection. *Morphotypes*, short winged male, Florida (Uhler collection) in U. S. National Museum, and short winged female, taken with *holotype*, in Drake collection.

Paratypes, taken with *holotype* and *morphotypes*, and also from Sugar

Grove, Ohio, C. J. Drake; Cuyahoga County, Ohio, July 6, 1914, C. J. Drake; Madison, New Jersey, 1898, H. G. Barber; Waltenville, Illinois, July 20, 1913; in the collections of Iowa State College, University of Illinois, U. S. National Museum, H. G. Barber and writers.

In the long winged form the hemelytra show considerable variation in length. This species has been confused in collections with *G. conformis*. The specimens from Gainsville, Florida, were taken on a small stream about two miles west of the university. A damaged specimen from A. & M. College, Mississippi, seems to belong to this species. The wings of the *holotype* and *allotype* are broken off.

Gerris (Gerris) insperatus, n. sp.

Color markings, form and size very similar to *G. marginatus* Say. Hemelytra reaching almost to or a little beyond the base of the first genital segment. Antennae slightly variable in color, proportional length of segments about the same as in *G. marginatus*. Wingless and short winged forms unknown.

Male: The median carina of venter more prominent on the last two segments than in *G. marginatus*. Omphalium not prominent. Posterior margin of last segment of venter deeply and roundly notched. First genital segment very plump, without a distinct median keel, roundly projecting in the middle. Connexiva, except outer margins, also the median portion and the posterior margin of the last segment of the venter, golden yellow. The median stripe of venter varies from golden yellow to brown.

Female: Spines of the connexiva a little shorter, broader and thicker than in *marginatus*. Coloration of connexiva as in male. Genital segments beneath and outer margin of first genital segments above golden yellow. Length, 7.4–8.6 mm.; width, 2.3–2.5 mm.

Holotype, male, and *allotype*, female, Mexico (2308) collected by F. C. Baker, in the U. S. National Museum. *Paratypes* collected with *holotype* and also from the following localities: Delaware, Ohio, July 12, 1916, C. J. Drake; Cranberry Lake, New York, July 22, 1919, A. E. Fivaz; Ottawa, Ontario, June 11, 1912, Miss G. Beaulieu; Hog's Back, Ontario, June 9, 1923, R. Ozburn and June 25, 1922, C. H. Curran; Abitibi region North Quebec, June, 1915, Doctor Cook; Sudbury, Ontario, Canada, May 5, 1889; Cheticamp, C. B. I., August 7, 1917, F. Johansen; Homer, Illinois, April 27, 1907; Cold Spring Harbor, L. I., August 10, 1900, H. G. Barber; Bear Swamp, Ramapo Mts., New Jersey, July 25, 1911, H. G. Barber; Vienna, Va., July 7, 1913, H. G. Barber; in collections of Iowa State College, U. S. National Museum, National Museum of Canada, University of Illinois, H. G. Barber, and authors.

The notch of the last segment of the venter and the plump genital segments without a keel readily distinguish the males of this species from the males of *marginatus*. The females of the two species are rather hard to separate. *G. insperatus*, n. sp., ranges from Ottawa (Canada), and New York to Ohio and Illinois, and then south into Mexico.

Gerris incurvatus, n. sp.

Form, size and color similar to *G. marginatus* Say, but differing from it in having the terminal spines of the connexiva (female) very strongly curved inwardly. The notch on the posterior margin of the last ventral segment of the male is deeper, narrower at the base, and more rounded than in marginatus. The apex of the connexivum is also shorter and slightly more inwardly curved. Markings on the head and thorax, and proportional lengths of the antennal segments as in *marginatus*. Hemelytra reaching almost to or a little beyond the base of the first genital segment. Omphalium not strongly developed. Venter with the median line and posterior margin of last segment yellowish brown. Length, 7.6–8.7 mm.; width, 2.3–2.5 mm.

Holotype, male, Bozeman, Montana, Aug. 26, 1913, and *allotype*, female, Bozeman, Montana, June 8, 1914, in Drake collection. Twenty-four *paratypes:* Gallatin Canon, Montana, elevation 6000 ft., June 11, 1902, elevation 4800 ft., and June 4, 1902, R. A. Cooley; Gallatin County, Montana, May 14, 1922; Bozeman, Montana, June 4 and 9, 1906, Aug. 26, 1913, and May 17 and 19, 1924; Stanford, Oct., 1897, Johanson; Paha, Washington, June 7, 1920, M. C. Lane; Saanich District, Sept. 5, 1924, W. Downes; Kaslo, 1903, B. C., Currie; Ewan, Washington, June 13, 1920, M. C. Lane; Spanish District, B. C., Sept. 15, 1924, W. Downes; Yellow Bay, Montana, July 22, 1912; in collections of Iowa State College, U. S. National Museum, National Museum of Canada, W. Downes; University of Illinois, Montana Agricultural College, and authors. Although very closely related to *marginatus*, the genitalia and spines of the connexiva readily separate the two forms. The wingless and short winged forms are unknown.

Gerris comatus var. **mickeli,** n. var.

This variety is represented by five specimens, short winged females. It may be distinguished from typical *G. comatus* D. & H. by the russet-brown marginal stripe on each side of the anterior lobe of the pronotum. Other characteristics are almost identical with females of *comatus*. However, male specimens may prove this variety to be a distinct species. The hairs on spines of the connexiva are very long as in the short winged forms of *comatus*. In two of the *paratypes*, the marginal stripes of the pronotum are not very distinct.

Holotype, female, Rochester, Minn., June 15, 1922, collected by C. E. Mickel (from Montana collection) in Drake collection. *Paratypes:* North Branch, Minnesota, June 17, 1922, C. E. Mickel; Alexandria, Minnesota (on pond east of town), W. E. Hoffmann; St. Peter, Minnesota, German Lake, July 28, 1922, W. E. Hoffmann; in collections of Montana Agricultural College, University of Minnesota and authors.

In addition to the type localities the writers have examined specimens of *G. comatus* D. & H. from Canada, Montana, New York (Cranberry Lake and Syracuse), New Jersey, Illinois, Montreal, Wyoming (Big Horn Mountains) and Minnesota.

Gerris incognitus, n. sp.

Size and form somewhat similar to *G. pingreensis* D. & H., but with the color pattern and antennae more like *G. gillettei*. Pronotum with a distinct longitudinal carina, the anterior lobe with a short, median and the marginal stripes yellowish or russet-brown. Antennae reddish brown, the basal segment, except the tips, brownish black; first segment slightly curved, a little longer than the fourth and shorter than the second and third conjoined; second and third segments almost equal in length. Wings varying considerably in length, reaching to the middle of the last abdominal segment or a little beyond the first genital segment. Wingless female with a large, tumid area near the base of the abdomen. In *G. pingreensis* the first abdominal segment of the female has only a moderately large tubercle. Short winged forms unknown.

Male: Venter strongly depressed posteriorly, especially the last segment; last three segments with a median, yellowish brown or russet line and with a faint median carina. Posterior margin of the last segment yellowish brown, deeply, widely and roundly notched; connexiva margined with yellowish brown, and terminating in short spines. First genital segment long, becoming smaller posteriorly, beneath strongly depressed on each side, with a raised median ridge, basal half (on each side) margined with long hairs.

Female: In the wingless form the connexiva terminates in moderately stout, obliquely and upward projecting spines, the tips of which are blunt. The first genital segment becoming narrower posteriorly, truncate at the apex. Genital segments yellowish brown to brownish. In the winged form the terminal spines of the connexiva do not project quite so strongly upward. Length, 8.6–9.5 mm.; width, 2.6–2.82 mm.

Holotype, winged female, Kaslo, B. C., June 29, 1903, R. P. Currie, collector, and *allotype*, female, Kaslo, B. C., 1903, R. P. Currie collector, in the Uhler collection, U. S. National Museum. *Morphotypes, paramorphotypes* and *paratypes* collected with *holotype* and *allotype*. These were collected from the following localities: Arcata, California, July, 1923, R. B. Falkenstein; Kaslo Creek, B. C., June 18, A. N. Caudell; Langgan, B. C., R. P. Currie, Goldstream, B. C., May 17, 1922, Audren; Kalispell, Montana, June 13, 1920, Wickham; in the collections of Iowa State College, U. S. National Museum, National Museum of Canada, University of Minnesota and authors.

Gerris notabilis D. & H.

The specific name of this insect (typographical error) was wrongly printed in the original description. (Ohio Jrnl. Sci., Vol. XXV, 1925, p. 46) and should be written "notabilis." This species ranges from British Columbia to California and west to Iowa.

Vol. 38, pp. 75–78 May 26, 1925

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

SMITHSONIAN INSTITUTION SEP 1 - 1930 NATIONAL MUSEUM

THE AMERICAN SPECIES OF THE GENUS GRIPHONEURA SCHINER (DIPTERA, SAPROMYZIDAE).

BY J. R. MALLOCH.

This genus is distinguished from its allies by the very pronounced forward rounded curvature of the fourth vein at its apex which approaches rather closely to fourth vein at tip, causing the first posterior cell of wing to be only narrowly open or almost closed at apex. The head is similar to that of Minettia, and the posterior intra-alar bristle is present as in that genus.

Hendel gives a very full description of the genus and a good figure of the genotype, *imbuta* Wiedemann, in Genera Insectorum (Fasc. 58, page 51, and Plate 2, fig. 22).

A careful examination of a large series of specimens of this genus from South America discloses the fact that the males of the species available have a few fine hairs at apex of fore tibia on posterior side which project forward over the surface of a shining flattened area on the same side of basal segment of tarsus that is more or less marked off by a slight edging and occupies from one-third to four-fifths of the length of the segment. This area is not shown in the figure by Hendel, nor is it present in the females nor in the male of the only Oriental species I have before me. There are two described species occurring in South and Central America.

I have not seen *ferruginea* Schiner from South America but *imbuta* is present in my material and with it specimens closely related to it but evidently belonging to undescribed species. Like *imbuta* these species are black, with the wings marked with fuscous apically. I append a diagnosis to facilitate identification.

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KEY TO SPECIES.

1. Extreme apex of wing whitish hyaline from apex of second vein round margin posteriorly; frons ochreous; femora yellowish basally to a greater or lesser extent, sometimes fuscous only at apices; fore tarsi of male slender, distinctly longer than tibia, flattened area not half the length of segment; the entire length of latter equal to fully two-thirds that of tibia; first posterior cell of wing almost closed at tip, the third and fourth veins almost touching at apices..... **alboapicata,** sp. n.

— Extreme apex of wing fuscous, sometimes hyaline on margin from behind apex of first posterior cell; frons largely black; femora black; fore tarsi of male stout, not longer than tibiae, the flattened area at least two-thirds the length of segment, the entire length of latter about half that of tibia; first posterior cell of wing distinctly though narrowly open at apex..... 2.

2. Dark apical cloud on wing commencing at or before apex of first vein, more than apical half of wing blackened on costa..... 3.

— Dark apical cloud on wing commencing considerably beyond apex of first vein, a little less than half of the wing blackened on costa.... 4.

3. Wing dark brown except basad of a line drawn from apex of basal cell to apex of first vein, the basal outline of dark part irregular, apical posterior margin not so dark as anterior section; third antennal segment black..... **atricornis,** sp. n.

— Wing dark brown from below apex of first vein to tip, the dark color forming a costal band anteriorly, but spreading over disc of wing from a little before vertical line of outer cross-vein, the suffusion covering apex of wing from a little beyond outer cross-vein, less intense posteriorly; third antennal segment reddish brown..... **suffusa,** sp. n.

4. Flattened area of fore metatarsus occupying not over two-thirds of length of segment ..... *imbuta* Weid.

— Flattened area of fore metatarsus occupying four-fifths of length of segment..... **affinis,** sp. n.

From all of the species in the above key *ferruginea* Schiner may be distinguished by the ferruginous color of thorax and abdomen, all the others being entirely or almost entirely black.

Griphoneura alboapicata, sp. n.

The frons and antennae are generally ochreous and there is sometimes a hyaline streak in center of each cell of wing connecting with the clear apical margin. The flattened area on fore metatarsus is more widened than in the other species.

Length, 5 mm.

Type, male, allotype, 4 male and 1 ♀ paratypes, Higuito, San Mateo, Costa Rica (P. Schild).

Type in U. S. National Museum.

Griphoneura atricornis, sp. n.

Female.—The head is black, with the face becoming paler, yellowish, below. The palpi are yellow. First posterior cell of wing narrowly open at apex.

Length, 5 mm.

Type, Para, Brazil (Baker).

Type in author's collection.

Griphoneura suffusa, sp. n.

Female.—Frons rufous in front; face black; third antennal segment and apices of palpi reddish yellow. First posterior cell open.

Length, 5 mm.

Type, Para, Brazil (Baker).

Type in author's collection.

Griphoneura imbuta Wiedemann.

The commonest American species of the genus, represented by many specimens in U. S. National Museum collection, mostly from Costa Rica.

Griphoneura affinis, sp. n.

Male and female.—In addition to the structural difference between this species and *imbuta* mentioned in the key the wings are more yellowish basally, owing to the clear yellow veins, than they are in *imbuta.*

Length, 5 mm.

Type, male, allotype, 2 male and 1 ♀ paratypes, Juan Vinas, Costa Rica (P. Schild).

Type in U. S. National Museum.

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Vol. 38, pp. 79–82 May 26, 1925

PROCEEDINGS
OF THE
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SMITHSONIAN INSTITUTION
JUN 12 1930
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DESCRIPTIONS OF NEW FURNARIIDÆ AND DENDROCOLAPTIDÆ.

BY W. E. CLYDE TODD.

The impending appearance of that part of Messrs. Cory and Hellmayr's "Birds of the Americas" covering the Families Furnariidæ and Dendrocolaptidæ makes it desirable to bring out descriptions of certain new forms of these groups which have turned up in the collection of the Carnegie Museum. In the case of several of these I am greatly indebted to Dr. C. E. Hellmayr for pointing out their distinctness, and for giving me the use of his MS. notes on their comparative characters, also for the loan of pertinent material. The present paper is the eleventh of the series to appear in these Proceedings, and follows previous usage in so far as measurements and the names of colors are concerned (cf. Volume 36, 1923, p. 36).

Xenops rutilus purusianus, subsp. nov.

Similar to *X. rutilus rutilus* Lichtenstein of eastern Brazil, but the streaks on the pileum more buffy, less rufescent, and the tail with more black, this color occupying the inner web of the third as well as the fourth pair of rectrices (from the outside). Similar to *X. rutilus heterurus* Cabanis and Heine of Colombia, Venezuela, etc., so far as tail-pattern is concerned, but under parts darker (Saccardo's olive), less buffy, and streaking on upper and under parts rather heavier.

As might be expected from its intermediate geographical position, the characters of this form are a partial combination of those of *rutilus* and of *heterurus*, but it is sufficiently distinct from either to be worthy of a name. Its range, when finally worked out, will probably be found to cover a vast extent of territory in the middle and upper parts of the Amazonian region. To the southward it probably intergrades with the Bolivian race, *X. rutilus connectens* Chapman, from which it differs in the greater extent of black on the tail, *connectens* resembling *rutilus* in this respect. Eight specimens have been examined in this connection.

Type, No. 88,019, Collection Carnegie Museum, adult male; Hyutanahan, Rio Purús, Brazil, February 18, 1922; Samuel M. Klages.

Xenops tenuirostris hellmayri, subsp. nov.

Similar to *Xenops tenuirostris tenuirostris* von Pelzeln of central Brazil, but more decidedly suffused with buffy below, with the streaking rather less distinct; superciliaries also buffy instead of whitish.

The late Count von Berlepsch (Novitates Zoologicae, XV, 1908, 147) referred Cayenne specimens of *Xenops* to *X. rutilus heterurus* without hesitation, remarking that "they have much more black on the tails than Brazilian birds." As a matter of fact, they have much more even than Colombian birds, *heterurus*, from which they also differ in the much less conspicuous streaking below, the weaker bill, etc. They agree, in short, with a series of *X. tenuirostris* in the Carnegie Museum from the Rio Tapajoz and Rio Purús, except in the respects noted above, and evidently constitute an excellent subspecies of the latter, as shown by a series of nine specimens examined. Messrs. Hartert and Goodson (Novitates Zoologicae, XXIV, 1917, 418) were the first to suspect such an affinity, but were unable to compare specimens at the time. Both Dr. Hellmayr and the present writer had also independently reached the same conclusion, and I am pleased to name the new form in honor of one who has done so much to clear up the confusion in this group.

Type, No. 63,408, Collection Carnegie Museum, adult male; Mana, French Guiana, September 14, 1917; Samuel M. Klages.

Thripophaga fusciceps obidensis, subsp. nov.

Similar to *Thripophaga fusciceps fusciceps* Sclater of Bolivia and Peru, but general coloration decidedly deeper and more rufescent, the upper parts rich Brussels brown, with the head but little paler, the under surface dull clay-color, deepest posteriorly, the inner secondaries more rufescent, less shaded with brown.

T. fusciceps fusciceps, of which I have been privileged to examine one specimen from Peru in the collection of the American Museum of Natural History, is altogether a duller and browner bird, with the pileum appreciably different from the back, buffy or grayish brown. "The genus *Thripophaga* is quite new to the lower Amazonian section, though a species (*T. cherriei*) occurs on the Orinoco" (C. E. Hellmayr, in letter). The new form is represented by a series of six specimens, one of which is a young bird.

Type, No. 84,489, Collection Carnegie Museum, adult female; Islands, Obidos, Brazil, April 30, 1921; Samuel M. Klages. (Wing, 71; tail, 68; bill, 15; tarsus, 20.)

Hylexetastes undulatus, sp. nov.

Above Brussels brown, more rufescent on the rump, more olivaceous on the head; tail auburn; wings also auburn, the primaries dusky toward their tips, and shaded externally with sepia towards their bases; lesser wing-

coverts like the back; under aspect of wings ochraceous tawny, and under wing-coverts and axillaries buffy, with prominent black bars; sides of head dull sepia brown like the pileum, and lores dull white, continuous with an indicated line of the same color extending under the eye; throat marked with dull buffy white shaft-streaks, coalescing on the chin, and spreading out and narrowing on the lower throat and breast, which is otherwise light brownish olive; rest of under parts (including tibiae and under tail-coverts) buffy, regularly but narrowly barred with blackish; bill dull reddish brown (in skin); feet dusky. Wing (type), 122; tail, 109; bill, 39; tarsus, 29.

This form is a very distinct one, differing at a glance from *H. perrotii* by its streaked throat and strongly barred under surface, from the breast down. In *perrotii* the throat is uniform and only the lower abdomen is with faint indications of bars. With the still more plainly colored *H. uniformis* it requires no comparison, although its range probably approximates the range of that form. From the recently described *H. stresemanni* Snethlage (Journal für Ornithologie, LXXIII, 1925, 269) it differs in its more olivaceous, less rufescent color below, and in lacking any pale shaft-stripes on the forehead. It may, however, be conspecific.

Type, No. 96,366, Collection Carnegie Museum, adult male; Sao Paulo de Olivença, Brazil, April 10, 1923; Samuel M. Klages.

Dendrocolaptes transfasciatus, sp. nov.

Pileum brownish black, each feather with a conspicuous buffy shaft-streak, these streaks continued over the upper back, where they become broader, and margined with blackish; upper back Prout's brown, streaked as aforesaid, passing into rich auburn on the lower back, rump, and upper tail-coverts; tail deep bay, with darker shafts; wings bay, with a slight brownish wash on the upper coverts, and on the inner webs of the primaries toward their tips; under wing-coverts rich buff, spotted with black; a superciliary line of buffy-tipped feathers; lores and sides of head and neck blackish, streaked with buffy; throat and breast with broad buffy shaft-streaks, coalescing anteriorly, and posteriorly having narrow borders of blackish and brownish; rest of under parts rich buffy, more brownish (Saccardo's umber) anteriorly, more rufescent posteriorly, irregularly barred with brownish black, each feather with three broken bars or opposite spots of darker color, separated by a pale shaft-streak; bill dusky black above, paler below (in skin); feet horn-color. Wing (type), 143; tail, 120; bill, 43; tarsus, 29.

Two younger individuals from Colonia do Mojuy, near Santarem, are essentially similar to the type, but the shaft-streaks above and below are broader, and the cross-barring of the under parts is more prominent. The type is in fresh plumage, the outermost primaries not yet fully grown. One of the young birds shows traces of dark cross-bars on the lower back.

This new species approaches the forms commonly known as *D. plagosus plagosus* of the north bank of the Amazon, and *D. plagosus tardus* von Ihering of the Rio Purús, but is perfectly distinct, differing in having the head, upper back, and breast much more heavily streaked, the pileum much

darker, nearly black, and the barring on the posterior under parts more irregular and broken, as well as narrower. The streaking on the throat and breast is more as in *tardus*, while the color of the bill is dark, as in *plagosus*.

Type, No. 77,547, Collection Carnegie Museum, adult male; Miriti-tuba, Tapajoz River, Brazil, March 20, 1920; Samuel M. Klages.

Dendrocincla merula remota, subsp. nov.

Similar to *Dendrocincla merula castanoptera* Ridgway of the lower Amazon (south bank), but general coloration paler and duller.

The pair of birds to which this description is applied, coming from a region beyond the ordinarily accepted range of this specific type, appear to be recognizably distinct. They differ from *castanoptera* in their paler, duller coloration, noticeable on both the dorsal and ventral surfaces. They are of course still more different from true *merula* of French Guinaa, which is the darkest form of the three. Dr. Hellmayr writes me that "a specimen of *Dendrocincla bartletti* Chubb from the type-locality [eastern Peru] (in the Museum of Comparative Zoology) is inseparable from *D. merula castanoptera* of lower Amazonia, hence your Bolivian race is undescribed."

Type, No. 50,712, Collection Carnegie Museum (not sexed, but almost certainly an adult male); Rio Yapacani (near Buenavista), Bolivia, September 5, 1914; José Steinbach.

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NATIONAL MUSEUM

TWO NEW KANGAROO RATS OF THE GENUS DIPODOMYS FROM LOWER CALIFORNIA.

BY LAURENCE M. HUEY.

In diagnosing a collection of *Dipodomys* obtained by collectors for the San Diego Society of Natural History during the past two years in the Northern District of Lower California, several interesting specimens have been discovered. These represent one species and one subspecies as yet undescribed, which are characterized as follows:

Dipodomys gravipes, sp. nov.

SAN QUINTIN KANGAROO RAT.

Type.—From 2 miles west of Santo Domingo Mission, Lower California, Mexico, lat. 30° 45′ north, long. 115° 58′ west—or, precisely, on the cactus-covered slopes south of the huge red cliff that marks the entrance of the Santo Domingo River canyon from the coastal plain. No. 4703, ♂ adult, San Diego Society of Natural History collection, collected by Laurence M. Huey, February 28, 1925.

General characters.—A large-sized, heavy-bodied, small-eared animal, with thick tail of medium length, belonging to the *heermanni* group. Tip of tail dark and five toes on hind foot, which is extremely large-boned. Pelage medium coarse dorsally but seems by the "feel" and springiness of the hair to the touch to be much coarser on the underparts.

Color.—Lower surface of body, entire forelegs and feet, upper surface of hind feet, hip stripe pure white. Upperparts, including hip spot, pinkish buff (Ridgway, 1912), more or less interspersed with black hairs or black tips on the hairs. The purest pinkish buff is on the cheeks and sides and the darkest area is over the rump. Arietiform black and well defined. Spot over eye small and pure white. Area about ear white, which extends below rather than back or between the ears. White tail stripe very narrow, running almost to the tip, where it disappears in the long dark hairs which form the tuft. The black is purer on top of the tail than underneath. Soles of hind feet, from base of toes to ankle, nearly pure black.

Measurements.—Type: Total length, 310; tail, 180; hind foot, 44; ear,

10. Averages and extremes of 6 adults, including type: 300.1 (286–310); 171.6 (157–180); 43.3 (43–44); 10.5 (10–12). *Skull* (type): Greatest length, 41.8; breadth across bullae, 26.5; spread of maxillary arches, 24.0; greatest length of nasals, 14.7; greatest width of rostrum near end, 4.1; width of maxillary arch near middle, 5.9.

Specimens examined.—Seven, all from the type locality.

Dipodomys agilis latimaxillaris, subsp. nov.

COASTAL KANGAROO RAT.

Type.—From 2 miles west of Santo Domingo Mission, Lower California, Mexico, lat. 30° 45′ north, long. 115° 58′ west—or, precisely, alluvial river bottom near the huge red cliff that marks the entrance of the Santo Domingo River canyon from the coastal plain. No. 4696, ♂ adult, San Diego Society of Natural History collection, collected by Laurence M. Huey, February 27, 1925.

General characters.—Similar to *Dipodomys agilis simulans*, but face is grayer, ears appear rounder and tail averages shorter. Skull averages larger, especially the spread of maxillary arches. Hind foot is medium size, with five toes. Pelage more silky dorsally than *D. a. simulans*.

Color.—Upperparts of a general dark appearance, the ground color being pale pinkish cinnamon (Ridgway, 1912). As compared with *D. a. simulans* the light area on face gives this form a grayer appearance—a feature that is especially noticeable in series. The darker parts dorsally are more evenly spread, extending well down over the sides. This feature is due to the bluish underfur reaching to the limits of the pale pinkish cinnamon area of the sides; and in a few specimens of the series examined a bluish cast was found to extend even into the white of the underparts. The white spots above the eye are almost lacking in some of the specimens and the auricular patches are extremely small and exposed mainly beneath the ear. Arietiform very heavily marked, with heavy black center above nose. Tail sharply marked by contrasting black and white stripes, the dorsal and ventral black stripes being about the same width, and the ventral stripe extending to the end of the tail. The white side stripes run well out on the tail until lost near the end in the dark tuft. On the upper side of the tail the tuft covers about two-fifths of its length.

Measurements.—Type: Total length, 283; tail, 164; hind foot, 40; ear, 13. Averages and extremes of 12 adults, including type: 280.3 (271–286); 166.4 (157-172); 40.4 (40–42); 12.8 (12–13). *Skull* (type): Greatest length, 40.0; breadth across bullae, 25.1; spread of maxillary arches, 21.6; greatest length of nasals, 14.0; greatest width of rostrum near end, 3.4; width of maxillary arch near middle, 5.0.

Specimens examined.—Seventeen—12 from the type locality, 1 from Las Cabras and 4 from San Jose. Both of the latter places are in Lower California about 20 miles inland from the type locality. The specimens from them show intergradation toward *D. a. cabezonae*, whose range turns obliquely coastwise from the international border near Jacumba, San Diego County, California.

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PROCEEDINGS

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GENERAL NOTES.

NEW NAMES FOR FIVE SOUTH AMERICAN ASTERACEAE.

The following new combinations for five South American Asteraceae have been found necessary in the course of recent work.

Chevreulia sarmentosa (Pers.) Blake.

Tussilago ? sarmentosa Pers. Syn. **2**:456. 1807.
Chevreulia stolonifera Cass. Dict. Sci. Nat. **8**:516. 1817; Baker in Mart. Fl. Bras. **6**^{3}:120. 1882 (synonymy).

A rather common South American species, extending from Paraguay to Bolivia; found also, according to authors, on Tristan d'Acunha.

Blainvillea brasiliensis (Nees & Mart.) Blake.

Galophthalmum brasiliense Nees & Mart. in Wied, Nov. Act. Acad. Leop.-Carol. Nat. Cur. **12**:8. *pl. 2.* 1824.
Oligogyne bahiensis DC. Prodr. **5**:629. 1836.
Calyptocarpus bahiensis Schultz Bip. Bot. Zeit. **24**:165. 1866.
Blainvillea bahiensis Baker in Mart. Fl. Bras. **6**^{3}:177. *pl. 57, f. 2.* 1884.

A specimen labelled *Blainvillea bahiensis* Baker, collected in Brazil by Sello (no. 563) and received by the National Herbarium among duplicates from the Klatt Herbarium, agrees well enough with the description and figure of Nees and Martius and also with those of Baker. Baker cites specimens collected by Maximilian, Prince of Wied-Neuwied, from which the species was described by Nees and Martius, but not the collection (*Blanchet* 1706) on which De Candolle's name was based. The disk corollas in the specimen examined are 4-toothed (and with 4 stamens), not 5-toothed as described by Nees and Martius. Baker figures the stamens as 4, but does not indicate the number of corolla teeth.

Onoseris purpurea (L. f.) Blake.

Atractylis purpurea L. f. Suppl. 349. 1781.
Onoseris purpurata Willd. Sp. Pl. **3**^{3}: 1702. 1804; DC. Ann. Mus. Hist. Nat. **19**:65. *pl. 3, f. 4.* 1812.
Isotypus rosiflorus Triana, L'Hort. Franç. III. **6**:138. *pl. 10.* 1864.

Although the name *Onoseris purpurea* has appeared in print at least twice, it has apparently never been properly proposed. De Candolle

(Prodr. **7**:34. 1838) uses the name *O. purpurata* Willd., but cites "*Onoseris purpurea* Less. syn. 119" in synonymy. He also wrongly cites the original name of Linnaeus filius as *Atractylis purpurata*. Lessing at the page cited used the name "*O. purpurata* Willd.," as he had done earlier in his review of the genus in Linnaea (**5**:339. 1830). In the Index Kewensis (2^1:350. 1894), "*Onoseris purpurea* DC. Prod. vii. 34" is cited as a synonym and referred to *O. purpurata*. As pointed out above, this occurs in De Candolle only as a synonymous name, wrongly attributed to Lessing.

Barnadesia caryophylla (Vell.) Blake.

Xenophontia caryophyla Vell. Fl. Flum. 346. 1825; Icon. **8**: *pl. 85*. 1827, as *X. caryophylla*.
Barnadesia rosea Lindl. Bot. Reg. 39: *pl. 29*. 1843; Baker in Mart. Fl. Bras. 6^3:364. *pl. 98*. 1884 (synonymy).

The application of Vellozo's name to this species is clear. The earlier spelling of the specific name (*X. caryophyla*) is to be taken as a typographical error; it is corrected to *X. caryophylla* on the plate in the Icones.

Trichocline radiata (Vell.) Blake.

Ingenhusia radiata Vell. Fl. Flum. 351. 1825.
Ingen'houzia radiata Vell. Fl. Flum. Icon. **8**: *pl. 93*. 1827.
Seris polymorpha Less. Linnaea **5**:254. 1830.
Onoseris brevifolia D. Don, Trans. Linn. Soc. **16**:246. 1830.
Trichocline polymorpha Baker in Mart. Fl. Bras. 6^3:373. 1884 (synonymy).

—*S. F. Blake.*

TERMITE SYNONYMY—ULMERIELLA BAUCKHORNI MEUNIER AND MACROHODOTERMES FULLER.

Since publishing our paper on "A Fossil Termite from Germany," Proc Biol. Soc. Wash., Vol. 38, pp. 21–22, Mar. 12, 1925, we have seen winged adults of *Macrohodotermes mossambicus* subspecies *transvaalensis* Fuller from South Africa and find that the wings of this species of *Macrohodotermes* differ in no generic character from that of *Ulmeriella*. The fossil genus has priority but, as many characters of termite genera are derived from other characters than the wings, we are not prepared to definitely state that *Macrohodotermes* is a synonym of *Ulmeriella*. Until more is known of the fossil form it will be advisable to retain the name *Macrohodotermes*, although it is probably the same genus as *Ulmeriella*, and no generic characters can be mentioned in which they are known to differ. The relatively small size of *Ulmeriella* compared to species of *Macrohodotermes* is not significant.

—*T. D. A. Cockerell,*
T. E. Snyder.

AN OLDER NAME FOR PIPRA OPALIZANS PELZELN.

On page 91 of H. R. Schinz's "Naturgeschichte der Vögel," 1854 (1846–53), appears an unquestionable description of the bird described by Pelzeln in 1868[1] as *Pipra opalizans*. Schinz's description is headed, "Taf. 39. Der Manakin mit glänzendem Federbusch. Pipra Iris. Schinz." Plate 39 contains, among other figures, a recognizable portrait agreeing with the description of *P. iris* but labeled "*Pipra strigilata,*" a totally distinct species not mentioned in the text. The new form is said, erroneously, to be from "Guyana." The exact date of publication of page 91 is in doubt, but I have ascertained, from an original wrapper, that 42 plates, presumably pll. A-F and 1–36 with accompanying text, were issued by April, 1851, while Lieferung 8 with six more plates was promised for the end of April. *Pipra iris*, therefore, may be taken as of May, 1851, with little doubt.

The discovery of this reference may throw some light on the disappearance of the type of *P. opalizans*, secured by Natterer near Pará in December, 1834. Natterer's collection lay in Vienna from 1836, and earlier, to 1855 before Pelzeln began work upon it. In the meantime Schinz's description and figure of *P. iris* appeared and Natterer's specimen disappeared. Pelzeln found an account of the bird in Natterer's field-book and, in the absence of the specimen, drew up his description from Natterer's notes. Both types (of *iris* and *opalizans*) were males. No other specimens are known to have reached Europe or elsewhere until the late '70s when Steere brought, from near Pará, a female which lay unidentified until 1903 when it was recognized and described by Hellmayr.[2] In 1894, Albert Schulz secured a male near Pará which Berlepsch described and figured.[3] The species has since become more common in collections, but up to the dates given, these are all the known specimens. Schinz gives no indication as to the source of his specimen and no other new species are described in his book from which evidence might be secured. It seems probable that Natterer's specimen came into Schinz's hands, but it is curious that the description should have lain so long, undetected, in a work so common as the "Naturgeschichte der Vögel."

—*John T. Zimmer.*

A NEW CHINESE PEACH.

Amygdalus kansuensis (Rehder) Skeels.

Prunus kansuensis Rehder, Journ Arn. Arb. 3: 21. 1921.

Seeds of this wild peach were first introduced from China by Mr. Frank N. Meyer in 1914, and the peculiar markings led me to list them as *Amygdalus* sp. It was not until 1921 that identifiable material was grown from these seeds and was described by Mr. Rehder, who also quotes Mr. Meyer's notes. —*H. C. Skeels.*

1 Zur Ornithologie Brasiliens, pt. II, pp. 128, 186-187, Sept. 1868.

2 Verh. k. k. zool.-bot. Ges. Wien, 1903, p. 201.

3 Ibis, ser. 7, 4, pp. 60-62, pl. II, 1898.

LOONS AND HORNED GREBES IN POUND NETS.

While spending a few days in July, 1924, at the Charity Islands in Saginaw Bay, Michigan, I was interested to discover on a short stretch of beach the remains of three loons (*Gavia immer*). Judging from appearances they had been dead for three or four months, and while it was impossible to determine the cause of death, my suspicions were naturally directed toward the nets of the commercial fishermen operating in the vicinity. I accordingly availed myself on every opportunity to converse with these men and obtained the following reports:

The nets most extensively used are "pound" nets, consisting of a series of leads and funnels that terminate in the chamber, or pound, that gives to the trap its name. I was told that during the seasons of migration, and particularly in fall, both loons and grebes (*Colymbus auritus*) are frequently captured in these nets. The effect of the entrance of these two species in the traps is very different. The loon is regarded by the fisherman as a great nuisance, as they state that fish will not enter a pound in which there is a loon. These birds accordingly are killed at every opportunity. On the other hand the presence of the much smaller grebes does not appear to affect the catch of fish, and these birds are generally liberated. One fisherman informed me that in addition to removing a large quantity of whitefish and trout from a certain net, he once filled two fish boxes with grebes.

—*Frederick C. Lincoln.*

A CHINESE POTATOBEAN.

Glycine fortunei (Maxim.) J. B. Norton.

Apios fortunei Maxim., Bull. Acad. Petersb. 18: 396. 1873.

This potatobean was introduced from China by Mr. J. B. Norton with the following note,—"This relative of *Glycine apios* and *G. priceana* is very important as a possible means of producing hybrids. It differs from both our American species but may cross with one or both. It has a large fleshy root suggesting *A. priceana* in type. If, through it, the type of either one of our native plants can be broken up and a range of variation started to use in selection work, a new crop will be assured."

—*H. C. Skeels.*

A NEW INTRODUCTION OF A CHINESE TORREYA.

Tumion fargesii (Franch.) Skeels.

(*Torreya fargesii* Franch., Journ. de Bot. 13: 264. 1899.)

Mr. J. F. Rock has recently sent from the forests on the Mekong-Salwin Divide in Yunnan, China, some seeds of a torreya which are globose and with the albumen ruminated nearly to the center of the seed. This is characteristic of the species usually known as *Torreya fargesii* Franch., which has hitherto been confused by some botanists with *Tumion grande* (Fortune) Greene. The seeds of the latter species are ellipsoidal or oblong and the albumen is only slightly ruminated.

—*H. C. Skeels.*

BIFORMIS A PREOCCUPIED NAME.

Nasutitermes (*Obtusitermes*) *biforma* Snyder was described in 1924 (Proc. Ent. Soc. Wash., Vol. 26, no. 1) from Panama. The species name was later corrected to *biformis* (Proc. Ent. Soc. Wash., Vol. 26, no. 7). However, there already is a *Nasutitermes* (*Trinervitermes*) *biformis* Wasmann from Ceylon, described in 1902 (Zool. Jahrb. Abt. Syst. Bd. 17, Heft 1). Hence I shall change *Nasutitermes* (*Obtusitermes*) *biformis* Snyder to *Nasutitermes* (*Obtusitermes*) **panamae** Snyder. —*Thomas E. Snyder.*

NOTE ON ARREMONOPS SUPERCILIOSUS CHIAPENSIS NELSON.

Through an inexcusable oversight this form was omitted from consideration in preparing my paper on *Arremonops* (in these Proceedings, Volume 36, 1923, pp. 35–44), and has apparently been relegated to synonymy even by the original describer himself, since I find the type-series all labeled *superciliosus*. It is a good race, however, readily separable from *superciliosus* by the grayish suffusion of the upper parts, the median crown-stripe and sides of the head in particular being decidedly grayish by comparison, instead of buffy, while the lateral crown-stripes are paler brown. The under parts have much more buffy suffusion on the breast and sides. It is still more different from *sumichrasti*. Its known range is confined to the valley of the Chiapas River in the Mexican State of the same name.

For the privilege of examining the specimens on which the above remarks are based I am indebted to the authorities of the Bureau of Biological Survey. —*W. E. Clyde Todd.*

THE "PSEUDO-FLIGHT" OF TERMITES.

In 1919, the writer observed maturely pigmented, brachypterous, colonizing adults of the termite *Reticulitermes virginicus* Banks emerging from a stump during the "swarm" of the winged sexual adults. These brachypterous adults, it was believed, had inherited the instinct to fly or swarm from the period when all termites were winged; having no wings they can only run about, and it was thought possible that this was the manner in which they emerged from the parent colony to establish new colonies!

It is now regarded more probable that brachypterous adults normally leave, with workers and soldiers by subterranean passages, since these forms must be fed by the workers, in order to survive.

On April 25, 1925, this "pseudo-flight" of a few, mature, brachypterous adults of the same species of termite, was again observed. These forms came from an infested building in Washington, D. C., during the swarm of winged adults at 3 P. M. This was the third swarm of winged adults from this building during the spring of 1925; previous swarms had occurred on April 11 and 14.

This "pseudo-flight" then occasionally occurs in colonies and probably is a reversion manifested only by a few adults.

—*Thomas E. Snyder.*

A NEW NAME FOR THE GENUS ACTOPHILUS OBERHOLSER.

Dr. Charles W. Richmond has kindly called my attention to the fact that the generic name *Actophilus* is untenable. This generic term was proposed (Oberholser, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 202) to replace *Phyllopezus* Sharpe, preoccupied, for a genus of African Jacanidae. It is, however, invalidated by *Actophilus* Agassiz (Index Universalis, 1846, p. 7), an emendation of *Actephelus* Stephens (Coleoptera). It may be replaced by **Actophilornis** (ἀκτή, beach; φιλέω, I love; ὄρνις, bird); and *Parra africana* Gmelin is designated as the type.

The species are.

Actophilornis africanus (Gmelin).

Actophilornis albinuchus (Is. Geoffroy).

—*Harry C. Oberholser.*

NOTE ON THE ATLANTIC COAST SPECIES OF PLICATULA.

Since the institution of the genus by Lamarck in 1801, the earlier writers have confused different species under one name, and seventy-two years later Reeve added to the confusion by giving names to mere mutations of a single species. The examination of a large series of Atlantic Coast specimens leads to the following conclusions:

1. *Plicatula spondyloidea* Meuschen (as *Ostrea*) 1781.

Synonyms are *P. reniformis* Lamarck, 1819, and, in part, *P. barbadensis* Orbigny, 1846, and *P. imbricata* Reeve, 1873.

The shell is grayish white, sometimes with a touch of brown on the hinge-teeth. The ribs are high, carinate-imbricate, and few in number. Range, Florida to Texas.

2. *Plicatula gibbosa* Lamarck, 1801.

Synonyms: *P. ramosa* and *depressa* Lamarck, 1819.

Shell white with ramose brown or reddish lines. Valves more compressed, ribs low, feebly imbricate, more or less rounded and more numerous. Range, North Carolina to Florida and the Antilles.

3. *Plicatula* **mesembrina,** n. sp.

Synonym: *P. barbadensis* Orbigny, *ex parte*, 1846.

Shell whitish or with suffused reddish brown; valves compressed with low rounded ribs (6–10) and shallow interspaces, and narrow, usually pointed umbones. Width of shell, 27; length, 30; diameter about 12 mm. U. S. Nat. Mus. Cat. No. 343260, Uruguay. Range, Coasts of Brazil, Uruguay and Argentina. —*W. H. Dall.*

NOTE ON THE SPECIES OF PETRICOLARIA OF THE EASTERN COAST OF THE UNITED STATES.

A study of a large collection of this genus shows that the form long known as *P. dactylus* Sowerby is only a variety of the *P. pholadiformis* Lamarck, which may be called variety **lata.** Type in U. S. N. Mus. No. 95645, Quahog Bay, Maine. The true *dactylus* is a native of the West coast of South America. —*W. H. Dall.*

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

SIXTEEN NEW BIRDS FROM BRAZIL AND GUIANA.

BY W. E. CLYDE TODD.

Preliminary studies of the rich material received by the Carnegie Museum from French Guiana and the Amazon Valley in Brazil continue to disclose the existence of new species and races of birds in these parts. In the present paper, which is the twelfth of the series to appear in these Proceedings, sixteen new forms, belonging to the Families Troglodytidæ, Turdidæ, Tyrannidæ, and Pipridæ, are named and described, all from the collections made by Mr. Samuel M. Klages. Measurements are in millimeters, as heretofore, and the names of colors are adapted from Mr. Robert Ridgway's "Color Standards and Color Nomenclature." Acknowledgments are due to Dr. Frank M. Chapman, Mr. Ludlow Griscom, and Dr. C. E. Hellmayr for aid in placing certain of these new forms.

Thryophilus griseus, sp. nov.

Adult (sexes alike): above, including pileum, uniform light Chætura drab, the wings externally the same color, with faint traces of dusky bars or spots; tail neutral gray, irregularly barred with black, the lateral rectrice with the inner webs mostly black; slight superciliaries dull whitish; under parts smoke gray, slightly paler on the throat, slightly darker (light grayish olive) on the flanks; longer under tail-coverts with faint dusky bars; "iris grayish white; feet slate-color; bill blackish above, grayish below." Wing (type), 56; tail, 36; bill, 15.5; tarsus, 20.5.

This remarkable new species, while agreeing in structural characters with *Thryophilus* (save for its rather shorter tail), apparently has no close relatives in that genus. In its plain grayish coloration it bears a strong superficial resemblance to *Odontorhynchus cinereus*, but in size and proportions is very different. The description is based on a series of fourteen specimens, all from the same locality, Hyutanahan, on the upper Rio Purús, where Mr. Klages says it occurs sparingly, and spends much of its time on the ground.

Type, No. 88,339, Collection Carnegie Museum, adult male; Hyutanahan, Rio Purús, Brazil, March 25, 1922; Samuel M. Klages.

Turdus altiloquus, sp. nov.

Adult male: above dark brownish olive, slightly more brownish on the pileum and more olive on the upper tail-coverts; wings and tail dusky, externally like the back; under wing-coverts and axillaries ochraceous tawny; sides of head like the pileum; under parts pale buffy brown, paler on the throat, which is streaked with dusky, and passing into white on the under tail-coverts; "iris dark vinaceous red; bill uniform light ochraceous yellow; feet pale olivaceous brown." Adult female and immature male: similar to the adult male, but bill wholly black. Wing (type), 112; tail, 91; bill 20; tarsus, 29.

This fine new thrush is quite distinct from any other species from tropical America in its combination of characters. In the coloration of its under parts and under wing-coverts it suggests *T. obsoletus* and *T. hauxwelli*, but is not quite so brownish as those species, while the streaks on the throat are much more distinct. The bill, too, is yellow, not black, at least in the adult male. The upper parts are perhaps more like those of *T. olivater olivater* than of any other species, but the general color is less olivaceous, more brownish, with the head uniform with the back. In worn plumage all the colors are of course duller.

Mr. Klages has sent nine specimens of this form from the Rio Purús (Arimã) and Rio Solimoës (São Paulo de Olivença, Tonantins, and Caviana). He writes that it is "an inhabitant of the virgin forest, where it lives in the taller trees, usually perching in thick branches, so as to be very difficult to descry from the ground. It is a splendid songster and also a mimic of certain other species, whose notes are reproduced with such accuracy as readily to mislead one in quest of it. It is decidedly uncommon in the localities where we did manage to find it."

Type, No. 92,908, Collection Carnegie Museum, adult male; Arimã, Rio Purús, Brazil, September 14, 1922; Samuel M. Klages.

Lophotriccus congener, sp. nov.

Adult (sexes alike): above light olive green; tail dusky with yellowish citrine edgings; wings dusky, the remiges with narrow outer edgings of olive citrine, becoming wider, paler, and more yellowish on the inner secondaries; lesser wing-coverts like the back, middle and greater series black, edged and tipped with chalcedony yellow, forming two bands across the wing; elongated crest-feathers centrally black, margined with strontian yellow, passing into yellowish citrine on the forehead; sides of head dull yellowish citrine; under surface whitish, more or less washed with pale yellowish green, especially on the flanks and crissum, and streaked with dusky, especially on the throat and breast, leaving the middle of the abdomen and crissum unmarked; under wing-coverts and edge of wing picric yellow; bill dark above, paler at base below; feet pale (in skin). Wing (type), 54; tail, 39; bill, 9.5; tarsus, 15.

Compared with *Lophotriccus squamæcrista*, the present species has less greenish yellow suffusion below, while the crest feathers, which are broadly margined and tipped with ochraceous tawny in that form, are similarly

marked with a shade of yellow instead. This character serves to separate it as well from *"Cometornis" vitiosus* Bangs and Penard (Bulletin Museum Comparative Zoology, LXIV, 1921, 373), described from a single specimen supposed to have come from Peru. The new species is based on a series of fifteen specimens, all from São Paulo de Olivença on the upper Amazon. Females are markedly smaller than males, as in *L. squamæcrista.*

Type, No. 95,226, Collection Carnegie Museum, adult male; São Paulo de Olivença, Rio Solimoës, Brazil, February 5, 1923; Samuel M. Klages.

Lophotriccus eulophotes, sp. nov.

Adult (sexes alike): above light olive green; wings and tail dusky, with narrow outer margins of light olive green, becoming paler and more yellowish on the inner secondaries; elongated crest-feathers black centrally, margined with neutral gray, passing into buffy olive on the forehead; sides of head likewise buffy olive; under parts white, streaked with dusky grayish, especially on the throat, breast, and sides, the abdomen unstreaked medially, the sides, flanks, and crissum washed with reed yellow; under wing-coverts reed yellow; bill horn brown above, paler below; feet pale (in skin). Wing (type), 50; tail, 40; bill, 11; tarsus, 15.

This species differs from *Lophotriccus "spicifer"* in its larger size, whitish under parts, unbanded wings, and in particular by the decidedly larger crest, the longer feathers of which measure nearly 20 mm. from base to tip, being thus much more linear than in any other known species of this generic group—a circumstance which may eventually render its separation desirable. It does not require comparison with any other species of *Lophotriccus,* but bears a remarkable resemblance to *Colopteryx galeatus.* Five specimens, only one of which is a female, have been available for examination, all from the type-locality.

Type, No. 86,653, Collection Carnegie Museum, adult male; Hyutanahan, Rio Purús, Brazil; December 23, 1921; Samuel M. Klages.

Euscarthmus striaticollis griseiceps, subsp. nov.

Similar to *Euscarthmus striaticollis striaticollis* (Lafresnaye), but upper parts duller green, and pileum more grayish, less brownish.

Comparison of a series of twenty-four specimens of *Euscarthmus striaticollis* from the Tapajos River with five from Bahia, the type-locality, kindly loaned by the American Museum of Natural History, shows that the former belong to a well marked race, characterized by the duller coloration of the upper parts. In true *striaticollis* the back is dull warbler green, while in the new form it is between serpentine green and yellowish olive; the pileum and sides of the head are dark olive gray instead of light brownish olive; and the under parts are a trifle paler yellow.

I am indebted to Mr. Ludlow Griscom for calling my attention to the distinctness of this new form.

Type, No. 73,369, Collection Carnegie Museum, adult male; Santarem, Rio Tapajos, Brazil, June 30, 1919; Samuel M. Klages.

Snethlagea minima, sp. nov.

Adult (sexes alike): above olive green; tail dusky, the rectrices margined externally with olive green; wings dusky black, with narrow outer margins of olive green, becoming paler, yellower, and more prominent on the inner secondaries; greater and middle wing-coverts tipped with sulphur yellow, forming two conspicuous bands across the wing; sides of head Roman green, the loral region paler; under parts dull sulphur yellow, pure on the abdomen and crissum, but elsewhere indistinctly streaked or flammulated with yellowish olive, the chin whitish; under wing-coverts sulphur yellow; bill dark brown above, paler at base below; feet brownish (in skin). Wing (type), 44; tail, 32; bill, 11; tarsus, 13.

This new species agrees with *Snethlagea minor* (Snethlage) in respect to form, proportion, shape of bill, open nostrils, etc., but differs conspicuously in size and color. It is decidedly less in all dimensions, while the under parts are more yellowish, less olivaceous; the upper parts, too, are brighter olive green, and the wing-bands much more distinct. Since it occurs in the same localities as *S. minor,* it is obviously a distinct species. No less than twelve specimens, from various localities on the Rio Tapajos, were sent in by Mr. Klages, together with eleven examples of *S. minor* from the same region.

Type, No. 77,080, Collection Carnegie Museum, adult male; Itaituba, Rio Tapajos, Brazil, February 26, 1920; Samuel M. Klages.

Snethlagea minima pallens, subsp. nov.

Similar to *Snethlagea minima minima* as just described, but under parts paler, more whitish, with less yellowish suffusion.

Five specimens from localities on the Rio Purús and Manacapurú on the Rio Solimoës indicate the existence of a well marked race of the species just described in the region in question, easily told by its paler, nearly whitish under parts, showing a yellowish wash mainly on the sides and crissum.

Type, No. 92,045, Collection Carnegie Museum, adult male; Nova Olinda, Rio Purús, Brazil, July 19, 1922; Samuel M. Klages.

Tæniotriccus klagesi, sp. nov.

Adult female: above dark medal bronze (between medal bronze and brownish olive), this color also extending to the exposed parts of the lesser wing-coverts; tail brownish dusky with paler, snuff brown edges; wings black, with a band at the base of the outer webs of the remiges cream-color, and the outer webs of the innermost secondaries also cream-color; the remaining remiges with slight brownish edgings, paler (seashell pink) terminally on the inner pair; under wing-coverts naphthalene yellow, and inner margins of the primaries below more or less buffy; pileum Kaiser brown, with median crest black; sides of head tawny, and throat paler, ochraceous buff; breast grayish (nearest olive gray), passing into whitish on the abdomen, the crissum with a faint yellowish tinge; "iris seal brown; feet dark purplish gray; bill black." Wing, 57; tail, 43; bill, 11.5; tarsus, 15.

Dr. C. E. Hellmayr, to whom the sole example of the present bird was shown at one time, pronounced it a *Tœniotriccus*, heretofore known only from the type-specimen of *T. andrei* von Berlepsch and Hartert, described from the Caura River in Venezuela. Their type-example was admittedly immature, while the specimen on which the present description is based is an adult female. Allowing for the difference in age, it would appear that while the color of the head, upper parts, and wings is virtually the same in both species, *T. andrei* is colored differently below, whether or not it turns out, as von Berlepsch and Hartert suggest, that in the adult dress this part is black. It is of course possible that the adult male might be black, although such a color-difference between the sexes would be unique in the Platyrhynchinæ. I feel fairly safe, therefore, in giving a name to the present bird, and propose to christen it in honor of its discoverer.

Type, No. 77,435, Collection Carnegie Museum, adult female; Itaituba, Rio Tapajos, Brazil, March 13, 1920; Samuel M. Klages.

Phylloscartes virescens, sp. nov.

Adult (sexes alike): above dull green (nearest hellebore green), the pileum duller; tail dusky, with margins of mignonette green; wings dusky black, margined externally with mignonette green, these margins widening and passing into sea-foam green on the inner secondaries; lesser wing-coverts like the back; middle and greater coverts dusky, broadly tipped with light chalcedony yellow, forming two bands across the wing; eye-ring pale yellowish white; under parts light chalcedony yellow, anteriorly shaded with serpentine green; under wing-coverts naphthalene yellow; "iris dull ochraceous yellow; feet plumbeous; bill black above, white below, with dark tip." Wing (type), 58; tail, 53; bill, 11.5; tarsus, 15.5.

"This interesting new species differs from *P. ventralis* (Temminck) of southeast Brazil by decidedly longer wings, much darker (less yellowish) green upper parts, broader as well as paler yellow wing-bands, more extensive yellow wash on the inner secondaries, more whitish lores and ocular region, and much paler yellow under parts. In structure, the two species agree very well together, the tarsus of the new bird being slightly shorter, if anything" (C. E. Hellmayr, in letter). I have confirmed these observations by actual comparison of specimens kindly forwarded by Dr. Hellmayr. The species is based upon four specimens in the Klages collection, all from the same locality.

Type, No. 65,327, Collection Carnegie Museum, adult male; Pied Saut, Oyapock River, French Guiana. December 12, 1917; Samuel M. Klages.

Myiozetetes granadensis obscurior, subsp. nov.

Similar to *Myiozetetes granadensis granadensis* Lawrence of Panama, Costa Rica, etc., but somewhat larger, and upper parts darker, the white area on the forehead almost obsolete.

Myiozetetes granadensis, described from Panama, has long been known to range southward to Peru, but scarcity of material from this part has thus far prevented the making of critical comparisons. Dr. Hellmayr

(Archiv für Naturgeschichte, LXXXV, 1919, 56), however, remarked on the large size of an example from Yurimaguas, Peru, and suggested the desirability of examining a larger series from the upper Amazon. With three specimens in fresh plumage from this region before me, I find no difficulty in telling them from a series of Costa Rican birds in similar condition by the characters above given. The upper parts are nearer olive green, instead of yellowish olive, as in the northern birds, and the gray of the crown is a shade darker, while the pale forehead, so conspicuous in true *granadensis*, is barely indicated. The type measures: wing, 92; tail, 74; bill, 14.5; tarsus, 17. The other two specimens come from Tonantins, on the Rio Solimoës.

Type, No. 96,489, Collection Carnegie Museum, adult male; São Paulo de Olivença, Rio Solimoës, Brazil, April 17, 1923; Samuel M. Klages.

Myiobius barbatus amazonicus, subsp. nov.

Similar to *Myiobius barbatus barbatus* (Gmelin) of Guiana, etc., but under parts purer and more uniform yellow, with less dark shading on the throat and breast; the crissum also paler.

With seven specimens in good condition from the Rio Purús and Rio Solimoës now before me, I am prepared to recognize the birds of this region as a geographical race of *barbatus*, from which they differ as above indicated, the characters standing out well when series are compared. The records for Bom Lugar, Rio Purús, and for Manacapurú, Rio Solimoës, and Avojutuba, Rio Negro, referred to in my revision of this genus (cf. these Proceedings, Volume 35, 1922, 17–38), belong to the new form. Measurements of type: wing, 65; tail, 55; bill, 10.5; tarsus, 16.

Type, No. 87,946, Collection Carnegie Museum, adult male; Hyutanahan, Rio Purús, Brazil, February 13, 1922; Samuel M. Klages.

Pipra aureola aurantiicollis, subsp. nov.

Adult male similar to the same sex of *Pipra aureola aureola* Linnæus, but red of under parts less "solid" and more restricted, not invading the throat, which is cadmium yellow, almost uniform. Female apparently not different from that of *aureola*.

Although Dr. Hellmayr (Ibis, 1906, 6–8) claims that specimens from the Amazon are not to be distinguished from Guiana birds, our series of males from Santarem (nineteen specimens) are clearly subspecifically distinct from another series (twenty-nine specimens) from French Guiana, assumed to represent true *aureola*, for which Surinam is the accepted type-locality. The paler, more orange throat and less amount of red on the under parts are conspicuous as the two series lie side by side, although certain individual specimens might be hard to distinguish, considered alone. From *P. aureola flavicollis* the new race differs in having the throat decidedly more orange, instead of yellow, *not* abruptly defined from the red. It is interesting to note that its range is separated from that of *aureola* by the interposition of *flavicollis*, which is the form that occurs at Obidos, on the north bank of the Amazon, nearly opposite Santarem. Apparently,

there is no name available for the new race, since *Pipra aureola flaviceps* of Riker and Chapman (Auk, VIII, 1891, 24) was merely a *lapsus* for *flavicollis*.

Type, No. 72,767, Collection Carnegie Museum, adult male; Santarem, Amazon River, Brazil, May 13, 1919; Samuel M. Klages.

Pipra anomala, sp. nov.

Adult male: above olive green, shaded with glossy black, most decided anteriorly; wing-coverts centrally black, externally like the back; wings dull black, the secondaries with olive green outer edgings, becoming broader on the inner ones; tail black, with outer edgings olive green; pileum and nape deep orange chrome; auricular and circumorbital region black, which is carried forward in a narrow line above the lores to the extreme forehead; throat light orange yellow medially, cadmium yellow laterally, continuous with a narrow band of the same color which connects with the orange of the nape, behind the ear-coverts; breast washed with cadmium orange, forming a brightly colored band, which fades posteriorly into maize yellow, becoming nearly white on the middle of the abdomen; flanks washed with olive gray; under tail-coverts olivaceous black; edge of wing raw sienna; under wing-coverts and axillaries white; "iris yellowish ivory, faintly tinged with pinkish; feet dark plum purple; bill black above, dark pearl gray with black edges below." Wing (type), 74; tail, 38; bill, 12; tarsus, 15.

This remarkable new species is based on a single specimen, which at first sight looks as if it were a young bird, but upon closer examination seems to be fully adult. The peculiar combination of characters it exhibits is paralleled by no other species of *Pipra*. In the coloration of the under parts it somewhat resembles *Pipra fasciicauda* Hellmayr, but the pattern above is very different, and the pattern of the sides of the head is unique in the group, I believe. The outer pair of rectrices are 6 mm. shorter than the central pair. Mr. Klages writes that it is "found on the low *mesa* back of Santarem in the dense forest. Apparently of extremely rare occurrence."

Type, No. 72,471, Collection Carnegie Museum, adult male; Santarem, Amazon River, Brazil, May 1, 1919; Samuel M. Klages.

Pipra chloromelæna, sp. nov.

Adult male: above varying from dusky green to greenish slate black, darkest anteriorly, more greenish posteriorly; wings black, margined externally with Danube green; tail dusky, with edgings of Danube green; crown salvia blue, produced to the nape medially, where it is tinged with light violet blue; forehead, superciliary region, sides of head, and throat black, usually with a faint greenish tinge, increasing on the breast into dull blackish green, passing into primrose yellow on the abdomen, shaded laterally with dark greenish; under wing-coverts dusky with a greenish shade; "iris carmine; feet dark brownish gray; bill black above, grayish white below, with edges light gray." Adult female: above, including wings and tail externally, spinach green, almost uniform; throat and breast

spinach green, with paler streaking; abdomen barium yellow, shaded with greenish on the sides. Wing (type), 60; tail, 29; bill, 10.5; tarsus, 13.5.

Our series of this species consists of nine specimens, all from the same locality, Nova Olinda. Compared with *P. cælesti-pileata*, of which we have a good series from Hyutanahan, farther up the Rio Purús, the present species differs conspicuously in its much darker coloration. The upper parts in the male of the new form are dark-colored, almost blackish, with a greenish blue shade, not uniform spinach green, as in *P. cælesti-pileata;* the throat and breast are also almost black, not dark cress green to cress green; and the yellow of the posterior under parts is duller, more restricted, and more shaded with greenish. The blue cap, too, is appreciably deeper blue, with the bases of the feathers dark-colored, instead of light methyl blue, with the bases of the feathers distinctly greenish like the back. Females of the two species are very much alike, but in *P. chloromelæna* the yellow of the under parts averages duller and more restricted.

Type, No. 92,314, Collection Carnegie Museum, adult male; Nova Olinda, Rio Purús, Brazil, August 1, 1922; Samuel M. Klages.

Pipra chloromelæna arimensis, subsp. nov.

Similar to *Pipra chloromelæna chloromelæna* nobis, above described, but general coloration less intense, the adult male with the upper parts not so dark, more Danube green, darkest anteriorly, becoming deep dull yellow green (No. 1) on the upper tail-coverts; pileum much paler, light cerulean blue, with a darker lateral and posterior edge; under parts with more greenish suffusion, the throat dull blackish green or dusky dull green, brightening on the breast into empire green, and passing into barium yellow posteriorly, shaded with dull greenish.

This is most probably the same bird as that from Humaytha, Rio Madeira, which Dr. Hellmayr (Novitates Zoologicæ, XIV, 1907, 359) refers to under the head of *Pipra cælesti-pileata*, since he remarks on its darker coloration as compared with the type of that species, but thinks the differences will prove to be not significant. With a good series of both *P. cælesti-pileata* and the present form before me, it is obvious that they represent two distinct species, but the latter is clearly only a subspecies of the form just described as *Pipra chloromelæna*. It is curious, however, that although farthest removed geographically from *P. cælesti-pileata*, it should nevertheless approach that form in its characters much more than typical *chloromelæna*. Females of all three forms are very similar. *P. chloromelæna arimensis* is represented by forty-six specimens from the type-locality.

Type, No. 92,997, Collection Carnegie Museum, adult male; Arimã, Rio Purús, Brazil, September 16, 1922; Samuel M. Klages.

Pipra carbonata, sp. nov.

Adult male: above glossy black, the rump and upper tail-coverts washed with dusky blue; tail dusky, washed externally with dusky blue (inclining to dark greenish in some specimens); wings deep glossy black like the back,

with a slight purplish sheen in some lights; pileum salvia blue, with a darker (phenyl blue) lateral and posterior edge, extending in a point over the nape; forehead narrowly black; lores, sides of head, and under parts in general black, washed posteriorly with dull blue; under tail-coverts grayish olive; under wing-coverts dusky; bill blackish above, horn-color below; feet brownish (in skin). Adult female: above spinach green, the wings externally dull citrine; below barium yellow, throat paler, the breast and sides clouded and washed with spinach green; under wing-coverts dull yellowish. Wing (type), 61; tail, 29; bill, 9; tarsus, 14.

This species differs from *Pipra coronata* Spix in its deeper, blacker coloration, very obvious upon comparison in series, and it may eventually become necessary to reduce it to a subspecies of that form. It is close also to *Pipra velutina* von Berlepsch, from which it may readily be told by its decidedly bluish rump and upper tail-coverts, and by its much narrower and not sharply defined black forehead. From *Pipra hoffmannsi* Hellmayr, from the south bank of the Amazon, it differs in lacking any greenish on the wings and in its almost uniform under parts. There is a possibility that the *Pipra cyanocapilla* of Hahn (Vögel aus Asien, etc., XV, 1826, pl. 3, fig. 2) may belong here, although Dr. Hellmayr cites it as a synonym of *P. coronata* (Ibis, 1906, 32). *Pipra herbacea* Spix, based on a female, is indeterminable unless the exact locality could be ascertained.

Type, No. 96,723, Collection Carnegie Museum, adult male; Tonantins, Rio Solimoës, Brazil, June 13, 1923; Samuel M. Klages.

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PROCEEDINGS

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JUL 1 1935

NEW NEOTROPICAL LIZARDS.

BY THOMAS BARBOUR.

In 1919 Dr. Glover M. Allen visited Haiti and Gonaive Island in the interest of the Museum of Comparative Zoology. The latter locality was little known herpetologically and yielded several novelties already described by Dr. E. R. Dunn. It remains now to point out that a considerable series of Anoles differ markedly and constantly from their allies upon the Haitian mainland. I am naming this lizard for Miss Doris Cochran of the U. S. National Museum, well known for her work on Haitian herpetology.

Anolis doris, sp. nov.

Type, M. C. Z., 13739, adult male from Gonave or Gonaive Island, off the west coast of Haiti; Dr. G. M. Allen, collector, Aug., 1919. There are eight paratypes.

Diagnosis.—Closely related to *Anolis cybotes* Cope, with the types of which it has been compared. The Gonaive form differs in having a longer and narrower head and in having the scales about the occipital plate, especially those behind the plate, conspicuously larger and rougher than in Haitian specimens.

Since his return to Brazil after several years at Harvard University, Dr. Afranio do Amaral has continued to enrich the University collection with the results of his extensive investigations of Brazilian herpetology. It is fitting, therefore, that a peculiar new gecko should bear his name.

Gymnodactylus amarali, sp. nov.

Type, M. C. Z., 20,682, a single somewhat mutilated specimen from Engenheiro Dodt, Santa Philomena, Upper Rio Parnahyba, Brazil. Collected by Dr. A. Amaral in 1925.

Diagnosis.—A richly colored gecko with rows of dorsal ocelli and many more or less irregular series of very large tubercles. It differs from *G. geckoides* (Spix) in having larger and more irregularly arranged dorsal tubercles, in having more longitudinal series of ventral scales and conspicuously in coloration.

Description.—Head little depressed, oviform; snout between 1½ and 1⅓ longer than the orbital diameter; a little longer than the distance between eye and ear opening; forehead slightly convex; ear opening roughly oblong and about ⅓ the diameter of the eye. Body and limbs normal; digits slightly depressed at the base with transverse plates below. Snout covered with rather large and more or less round granules, the largest on the anterior portion of the snout; smaller granules interspersed with slightly larger ones covering all other portions of the head; rostral slightly broader than high, with medium cleft above; nostril between the rostral, a supranasal, two postnasals, and on one side, the anterior upper corner of the first supralabial; 7 upper labials, the last very small, 6 lower labials, first by far the largest; mental very large, rounded posteriorly; a pair of chin shields behind the mental widely separated on the median line. Body covered with small scales, which incline to be imbricate, and irregular rows of large tubercles, those along the middorsal line being large, flat and keeled, while the rows along the sides of the body are composed of keeled but much more projecting tubercles altogether about 15 longitudinal series; abdominal scales cycloid imbricate in about 21 longitudinal series. The tail is missing.

Color.—Head reddish brown; body slaty gray; neck and back with 7 irregular rows of conspicuous ocelli now white centered, probably yellow in life; one of the large tubercles forms the center for each of the dorsal spots; no conspicuous markings on nape or axilla; a short white stripe running back from eye over the temporal region but not reaching the area over the tympanum; limbs dark, irregularly barred with white; belly pale brown, the scales finely punctate.

Length.—Snout to vent 37 mm.; head 9.5 mm.; width of head 8.5 mm.; forelimb 11.5 mm.; hind limb 16 mm.

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PROCEEDINGS

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THREE NEW GENERA AND THREE NEW SPECIES OF CIMICIDAE FROM NORTH AMERICA.[1]

BY GEO. M. LIST.

In the preparation of this paper the writer has had an opportunity to carefully study the Cimicidae collection of the United States National Museum, Washington, D. C., the University of Nebraska, Lincoln, Nebraska, the Colorado Agricultural College, Fort Collins, Colorado, the Montana State College, Bozeman, Montana, and the Iowa State College. All the new material here described is from the National Museum and the University of Nebraska collections. The descriptions were made with only the National Museum material before me, but just after the manuscript had been sent to press it became known to Professor Myron H. Swenk, University of Nebraska, Lincoln, Nebraska, that some material in the University of Nebraska collection which had just been described under the name of *Cimex micropodidorum* by Messrs. Everett E. Wehr and Leonard G. Worley of his department, was probably identical with one of the species just described by me. Desiring to prevent the creation of a synonym, Professor Swenk wrote me of their work and sent a copy of the paper by Wehr and Worley and one of their drawings. It seemed quite certain from these that the material was the same so the publication of both papers was temporarily suspended and an exchange and comparison of material made, with the result that the Nebraska collection was found to contain excellent specimens of two of the species I had just described from the National Museum. The paper by Wehr and Worley was withdrawn from publication and the Nebraska material made paratypes of the new species, *Cimexopsis nyctalis*, and *Synxenoderus comosus* herein described. The

[1]Contributed from the Department of Entomology, Iowa State College, Ames, Iowa.

valuable biological notes on the Nebraska specimens are quoted from the unpublished paper of Wehr and Worley.

The new genera have not been placed in the sub-family grouping of the Cimicidae as established by Jordan and Rothschild, "Notes on Clinocoridae, a Family of Rhynchota, with the Description of a New Genus and Species, Novitates Zoologicae, Vol. XIX, 1912, pp. 352-356." The rostral character, especially, makes such a placing difficult if not impossible. It is planned to take up this point in a subsequent paper. As the writer is preparing a monograph and key to the North American species, he would be glad to receive, at the Colorado Agricultural College, Fort Collins, Colorado, material for study and determination.

All holotypes and allotypes are deposited in the United States National Museum, Washington, D. C.

I wish to express my thanks to Drs. C. J. Drake and H. H. Knight for many suggestions given during this study and to those that made the study possible through the loan of material, especially W. L. McAtee of the United States National Museum, and F. C. Bishopp of the United States Bureau of Entomology. I am especially grateful to Myron H. Swenk, Everett E. Wehr and Leonard G. Worley of the University of Nebraska for the loan of material that they were describing and for their efforts in avoiding duplication and synonymy in the literature of the Cimicidae. It has been a pleasure to meet with their high scientific ideals and attitude of fairness.

Hesperocimex, new genus.

Coxae subcontiguous. Mesosternum subtriangular, and produced forward as a sharp keel almost to posterior point of the prosterum; metasternum compressed between the middle coxae, widening posteriorly into a short rounded point two-thirds as wide as a hind femur; pronotum broad, lateral margins almost uniformly reflexed and broadly rounded; scutellum transverse and broadly rounded posteriorly; rostrum extending to middle of anterior coxae; bristles variable in length, some as long as two times the width of an eye; form broadly ovate, male copulatory organ short and almost straight.

Genotype: *Hesperocimex coloradensis*, new species.

Hesperocimex coloradensis, new species.

Suggestive of *Oeciacus vicarius* Horv. but differing from it by the metosternum being sharply compressed between the middle coxae; the meso-

sternum subtriangular; the hairs of the head, thorax and abdomen being less dense, more variable in length, and dentate only on the tip; the broadly rounded scutellum; the much broader and more reflexed pronotum; the unemarginate fourth abdominal sternite of female; the absence of the tibal brush from all tibia of female; the differently proportioned antennae, hemelytra and male copulatory organ.

Color, yellowish brown. Head, thorax, hemelytra, abdomen and legs covered with medium fine hairs of varying length. Form, broadly ovate. Length 3.3–3.8 mm.; width 2.1–2.6 mm.

Head broad and deeply set into pronotum; greatest length .74 mm.; width through eyes 1.02 mm.; width of vertex between dorsal margin of eyes .81 mm.; irregularly strigate on middle of head and on to the base of tylus. Eyes smaller and not as prominent as in *Haematosiphon inodorus* Duges. Clypeus distinctly broader than in *O. vicarius* Horv. and slightly broader than the distance between the bases of the antennae. Antennae pilose, the pubescence finer than in *O. vicarius* except on second segment where the length of the longer pile equals two and one-half times the thickness of segment. Length of segments: II = .46 mm.; III = .36 mm.; IV = .27 mm. Second segment very slightly but gradually becoming thicker toward the apex, the third and fourth slightly more slender, and thinner than the thickness of the basal portion of second. Epipharynx (labrum with some authors) not prominent from dorsal view of head. Rostrum extends to the middle of the anterior coxae, length from anterior margin of head to apex 1.08 mm.

Coxae subcontiguous; the intermediate pair being separated only by a much compressed anterior point of the metasternum; and the posterior pair by the raised intercoxal process of the abdomen. The metasternum much longer than wide, but widening back of the intermediate coxae into a short rounded point two-thirds as wide as a hind femur. Mesosternum subtriangular and produced anteriorly as a sharp keel almost to the posterior point of the prosternum. Legs stout, hairs on tibiae coarse and spine-like, tarsal claws simple and slender. Apical tuft of hair wanting on all tibia of female.

Pronotum broad, uniformly punctulate; apex moderately, uniformly and concavely arcuate; the anterior angles reaching slightly beyond the posterior margin of eyes; posterior angles rounded; lateral margins almost uniformly reflexed and strongly rounded. Width of pronotum 1.6 mm.; length on median line .57 mm. Scutellum transverse and broadly rounded behind. Length along median line .2 mm.; width .94 mm.

Hemelytra densely punctulate; their entire surface clothed with hairs which are more dense and longer on the lateral margins, the length varying from less than one-half the width of an eye to two times this width; transverse, shortest at the suture and longest at one-fourth the distance from lateral margins, practically covering the metathorax, except at middle; width 1.04 mm.; suture very short, a slight overlapping of the inner margins is the rule; posterior (apical) margin slightly sinuate, inner angles broadly rounded, lateral margins not reflexed.

Abdomen broadly ovate, with the dorsum less densely clothed with

shorter hairs than occur on *O. vicarius*, their length being less than the width of an eye except on the lateral edges of each segment where from two to six occur that may be as much as two times as long as the width of an eye; male genital segments asymmetrical; male copulutory organ short, almost straight and thickened at base; fourth abdominal sternite unemarginate on apex.

Holotype: Female, taken February 16, 1916, Colorado Springs, Colorado, by W. D. Edmonston, host not given. Allotype: March 13, 1916, Colorado Springs, Colorado, W. D. Edmonston, infesting house of W. H. Manning. Paratypes, five of same collection as allotype and one labeled "Mexico" found in nest of the Purple Martin (*Progne purpurea*). The last named paratype was confused by G. Horvath (Revision of the American Cimicidae, Annales Musei Nationalis Hungarici, Vol. 10, 1912, pp. 257–262) with *Oeciacus vicarius* Horvath.

Cimexopsis, new genus.

Resembles *Haematosiphon* in general appearance but has a rostrum reaching only to the middle of anterior coxae; a much more broadly rounded scutellum; a more compressed and less prominent metasternum and unsinuated apical margins to the posterior abdominal segments; form ovate. Other characters quite similar to *Haematosiphon.*

Genotype: *Cimexopsis nyctalis*, new species.

Cimexopsis nyctalis, new species.

This species resembles *H. inodorus* but is readily distinguished from it by the short rostrum; the smaller eyes; the more broadly rounded scutellum; rounded posterior margin of hemelytra; the unsinuated apical margins of the posterior abdominal segments.

Color yellow-amber. Head, thorax, abdomen, and legs covered with very fine and short hairs as in *Haematosiphon inodorus* Duges. Hairs dentate only on tip. Form less ovate and size somewhat smaller than in *H. inodorus.* Length 2.6–3 mm., width 1.5–2 mm.

Head broad, set into pronotum to the eyes, finely punctulate, clothed with very fine short hairs; greatest length .56 mm.; width through eyes .68 mm.; width of vertex, between dorsal margins of eyes, .54 mm. Clypeus scarcely as broad as the space between the base of antennae and with a prominent hair on each apical angle; width .17 mm. or just one-half that of vertex, while in *H. inodorus* the clypeus is more than one-half the width of vertex. Eyes smaller and not as prominent as in *H. inodorus.* Antennal segments almost filiform, the third and fourth somewhat thinner than second; pilose, the pile of the second segment being less in length than the diameter of the segment while the pile of the third and fourth is equal to or longer than the diameter of these segments. Lengths of segments: II = .44 mm.; III = .40 mm.; IV = .36 mm. Rostrum much shorter than in *H. inodorus,* extending to the middle of the anterior coxae, length from anterior margin of head to apex .74 mm. Epipharynx not prominent from dorsal view of head.

Coxae subcontiguous; the intermediate pair being separated only by a

much compressed metasternum which is even less prominent than in *H. inodorus* and only slightly developed posterior to the coxae; the posterior pair separated by the raised intercoxal process of the abdomen which is more compressed between the coxae than in *H. inodorus*. Mesosternum rounded posteriorly. Legs medium stout and clothed with comparatively short hairs, tarsal claws simple and slender; apical tufts of hairs absent from hind tibia of both sexes and inconspicuous on the other tibia.

Pronotum obsoletely punctulate; apex moderately and concavely arcuate with anterior angles more produced than in *H. inodorus* and reaching somewhat beyond posterior margins of eyes; lateral margins uniformly reflexed but less acutely and more narrowly so than in *H. inodorus* and moderately and almost uniformly rounded; posterior margin almost truncate; covered with short hairs, those on the lateral margins only a very little longer than the others and directed posteriorly. There are two hairs on each posterior lateral angle, equal in length to twice the width of an eye. Length on median line .44 mm., width 1.06 mm.

Scutellum transverse, shorter and distinctly more broadly rounded behind than in *H. inodorus;* length .18 mm., width .64 mm. Hemelytra densely punctate, clothed with very short hairs except on the lateral margins where there are a few as long as the width of an eye; lateral margins strongly reflexed; posterior margin rounded, being distinctly more rounded toward the inner angle; commissural margin straight for a distance of .12 mm.

Abdomen narrowly ovate, with the first dorsal suture straight as in *H. inodorus* but the succeeding ones lacking the profound sinuousness that characterizes them in *H. inodorus*. Male genital segments asymmetrical, male copulatory organ of medium length, uniformly curved and fitting into a groove that extends into the apex of the seventh segment.

Holotype: female, taken in the Zoological Park, Washington, D. C., July, 1921. Host and collector not known. Allotype: same data as the type. Paratypes: ten females and five males, bearing same labels as type, in the National Museum and the author's collection; three males, one taken October 8, 1922, and two November 13, 1922, by Mrs. W. Wessel, Nebraska City, Otoe County, Nebraska, from floor of a fireplace leading to a chimney in which chimney swifts had been nesting, in the University of Nebraska collection. Besides the above, there are in the United States National Museum one male and four females mounted in balsam and four immature specimens on points, collected with type.

In regard to the paratypes in the University of Nebraska collection Messrs. Wehr and Worley wrote as follows:

"On October 8, 1922, a woman residing in Nebraska City, Otoe County, Nebraska, made a visit to the Department of Entomology of the University of Nebraska, to learn if something could be done to rid her house of bedbugs. She brought with her in a bottle a specimen of the pest. A casual examination of the insect was sufficient to satisfy the members of the Department that it was not the common bedbug (*Cimex lectularius*). It was much smaller in size and seemed otherwise different. When we

were told by the woman that numerous bedbugs, both alive and dead, had been found in the cracks of the woodwork around the chimney and on the floor of the fireplace, the possibility of these parasites being one of the bird-infesting species immediately occurred to us. It has long been known that a certain species of bedbug (*Oeciacus vicarius*) inhabits the nests of swallows. Upon further inquiry we learned that a few months previously Chimney Swifts (*Chaetura pelagica*) had been noticed flying in and out of the chimney and that the chimney had been closed against them by boarding over the top.

"As a result of this complaint the senior author visited this home a few days later for the purpose of collecting more specimens of the bedbugs, if possible, and to see if something could be done to free the house of the pests. With no certainty as to the exact habits of this particular species of bedbug, a thorough search was made throughout the house to determine if there were other places than the fireplace that might be frequented by these insects. As no additional specimens could be found at the time, it was believed that these bedbugs were practically restricted to the region about the fireplace of the house. This belief was greatly strengthened a few days later when two more specimens of this same species of bedbug were taken from the floor of the fireplace and sent to the Department of Entomology by the woman living in the house. Altogether, the circumstantial evidence is such as to indicate that the Chimney Swifts were the normal hosts of the bugs and that some months after the chimney was closed the insects were forced by hunger to invade the house from the chimney. There they died, or were picked up by the diligent keeper of the house."

Synxenoderus, new genus.

Form narrow; head long, the portion anterior to the anterior margin of eyes equal to one-half length of head; gula arched with prominent tubercle on median line of posterior margin; prosternum greatly arched and short; metasternum compressed but more prominent than in *Haematosiphon;* pronotum narrowed posteriorly with lateral sides sharply reflexed; tip of abdomen clothed with about fifty posteriorly directed, truncate hairs; rostrum extending to posterior margin of anterior coxae.

Genotype: *Synxenoderus comosus*, new species.

Synxenoderus comosus, new species.

This species is darker in color, smaller and much narrower in form, especially through the head and thorax than *Haematosiphon inodorus* Duges or *Oeciacus vicarius* Horv. Head thick, anterior coxal cavities large. Length 2.80–3.60 mm., width 1.60–1.90 mm. Head, thorax, abdomen and legs sparsely clothed with short fine hair. Hairs dentate only at tip.

Head strigate on middle and on to base of tylus, the fine lines forming more acute angles toward the apex than in *Hesperocimex coloradensis* n. sp. Length .68 mm.; width through eyes .70 mm.; width of vertex between dorsal margins of eyes .52 mm. Eyes smaller in size and less prominent

than in *Haematosiphon inodorus* Duges. Clypeus long and narrow, the length of the portion of the head anterior to the anterior margin of the eyes equals one-half of the total length of head, while in *H. inodorus*, *O. vicarius*, and *Cimexopsis nyctalis*, this distance is considerable less than one-half the head length; width slightly less than distance between bases of antennae and sub-equal to one-half the distance between the dorsal margins of eyes. Epiphrynx prominent from dorsal view of head. Antennae filiform and pilose; thickness of the 3d and 4th segments about one-half that of the 2d. Length of segments: II = .5 mm.; III = .42 mm.; IV = .32 mm. Rostrum extending to posterior margin of front coxae, length from anterior margin of head to apex 1.04 mm. Gula more convex than in other American forms and produced into a prominent tubercle on the middle of the posterior margin; thickness of head at this point .56 mm., which is greater than the width of vertex, while in *H. inodorus*, *O. vicarius* and *C. nyctalis* the proportions of the head thickness to width of vertex are as 42 to 56, 40 to 58, and 42 to 54, respectively.

Coxae subcontiguous, intermediate pair separated only by the much compressed anterior point of metasternum; posterior pair somewhat more separated by the inter-coxal process of the abdomen than in *H. inodorus* and *C. nyctalis*. The anterior coxal cavities large, deep, and almost transverse. Prosternum with anterior margin greatly arched to receive gula with its prominent tubercle; much shortened and lacking the horizontal triangular development common to all other American forms. Metasternum more raised and more prominent than in *H. inodorus* and slightly broader posterior to the mid coxae.

Legs moderately long, tarsal claws simple and slender. Apical tuft of hair very prominent and expanded on fore and mid tibia and absent from hind tibia in both sexes.

Pronotum obsoletely punctulate; sparsely clothed with short hairs except on lateral margins where there are a few much longer ones, some of them as long as the 4th segment of antennae; narrowed behind; greatest width .98 mm., width on posterior margin one-fifth less; length on median line .44 mm. Apex, strongly concavely arcuate, anterior angles more acute and more produced than in *H. inodorus* and *Cimexopsis nyctalis;* lateral margins moderately rounded, narrowly and more strongly reflexed than in *H. inodorus* and *C. nyctalis*, the reflexed portion narrowing posteriorly; base truncate, posterior angles rounded.

Scutellum short, transverse and broadly rounded behind; length .10 mm., width .6 mm. Hemelytra small, transverse, punctulate, hairs sparse and only slightly longer than with *H. inodorus*, except on lateral margins, where a few are as long as two times the width of an eye; lateral margins not reflexed, posterior margin straight, inner apical angle evenly rounded making only a very short commissural line.

Abdomen ovate, first segment longer than the pronotum on the median line; tip clothed with about fifty posteriorly directed, stiff, truncate hairs, each hair equal in length to the width of an eye. Male genital segments asymmetrical; male copulatory organ medium in length, moderately curved and fitting into a groove that extends on to the apex of the seventh sternite.

Holotype: female taken in the nest of the White-throated Swift (*Aeronautes melanoleucus*) Colton, California, May 22, 1918, by W. C. Hanna. Allotype: same data as type. Paratypes: three males and eight females collected with type, in the U. S. National Museum and the writer's collection: two males and two females taken in nest of White-throated Swift, Warbonnet Cañon, Sioux County, Nebraska, June 2, 1901, by M. A. Carriker, Jr., in University of Nebraska collection. There are eleven immature specimens in the National Museum which were taken with the type.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

FOUR NEW BIRDS FROM BRAZIL.

BY W. E. CLYDE TODD.

In the present paper, which is the thirteenth of the series to appear in these Proceedings, and which follows the same usage as the others, four new species of Brazilian birds are described, belonging to the families Bucconidæ, Cuculidæ, and Psittacidæ. All are from the collections received by the Carnegie Museum from Mr. Samuel M. Klages.

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Malacoptila semicincta, sp. nov.

Pileum and sides of the head black with white shaft-stripes, separated from the back by a band of Sanford's brown; rest of the upper parts mummy brown with cinnamon buff shaft-stripes, reaching the upper tail-coverts and lesser wing-coverts; tail dull mummy brown, paler beneath; wings dusky, inclining to sepia on the secondaries, which have narrow buffy outer edgings; tufts at the base of the lower mandible on either side whitish; malar region black, passing into sepia on the throat, conspicuously streaked with pinkish buff; large pectoral spot white, followed by an area of broad buffy or whitish streaks on a brownish olive or dusky background; the light streaks gradually merge into the soiled whitish of the abdomen and crissum; under wing-coverts white, shaded with buffy towards the outer edge; "iris clay brown; bill black above, ochraceous yellow at the base, below ochraceous yellow with black tip; feet wax yellow, with greenish shading on the toes." Wing (type), 91; tail, 70; bill, 25; tarsus, 16.

This species requires comparison only with *M. fusca* (Gmelin), of which it is the Rio Purús representative. It differs from that species in its blacker pileum, with white (not buffy) shaft-stripes, in decided contrast to the rest of the upper parts, and in particular by the rusty half-collar which separates the two areas. In the coloration of the under parts the two species are more nearly alike, but in the new form the light stripes are whiter, less buffy, and the dark areas deeper brown, giving a generally darker tone to the plumage.

The new species is based on a series of eighteen specimens from the Rio Purús (Hyutanahan and Nova Olinda). The collector remarks that it is confined to the upland forest.

Type, No. 87,740, Collection Carnegie Museum, adult male; Hyutanahan, Rio Purús, Brazil, February 4, 1922; Samuel M. Klages.

Neomorphus lepidophanes, sp. nov.

Pileum and crest very dark glossy blue, duller and more greenish on the forehead; nape and upper back dark ivy green, the lower back and upper tail-coverts similar, but with a slight purplish tinge; primaries dark violaceous blue; secondaries rich Pressian red externally, dusky violaceous internally; lesser wing-coverts like the back, the greater series washed with violaceous; tail dark green, the outer rectrices more violaceous, the middle rectrices strongly shaded with Hay's maroon in certain lights, the exposed under surface of all dark violaceous; a broad bare space around the eye, with a line of black feathers beneath; throat soiled white; breast strongly shaded with pale clay color, each feather with a black tip and paler subterminal margin, producing a squamate effect; below this a broad black band; rest of the under parts pale clay color, immaculate, passing posteriorly into the brownish and dusky of the flanks, lower abdomen, and under tail-coverts; "iris chocolate; eyelids and temporal arc blood red, the bare area on the sides of the head cerulean blue; bill blood red, the apical third of both mandibles pea green." Wing (type), 159; tail, 263; bill, 49; tarsus, 70.

The female is like the male, but is not quite so richly colored below, and the squamation of the breast is not so heavy. This species finds its nearest ally in *N. pucherani* (Deville) of the upper Amazon, but is readily distinguished by its rich buffy, instead of grayish, under surface, the prominent squamation of the breast above the black band, and by the forehead being almost concolor with the rest of the pileum. In the color of the upper parts in general the two species are virtually alike. The new form is represented by five specimens, from Hyutanahan and Nova Olinda on the Rio Purús and São Paulo de Olivença on the Rio Solimoës, while all our specimens of *N. pucherani* come from the north bank of the latter stream. Mr. Klages writes that it is "met with in the company of the hunting ants. The bird is wary and a swift runner, and in not easily brought to bag. A loud clattering of the mandibles is usually the only audible indication of its proximity."

Type, No. 92,465, Collection Carnegie Museum, adult male; Nova Olinda, Rio Purús, Brazil, August 10, 1922; Samuel M. Klages.

Neomorphus squamiger, sp. nov.

Pileum covered by dark-centered (brownish or dark greenish) feathers with paler (buffy to whitish) margins and tips, the crest-feathers deep violaceous blue in abrupt contrast; upper back olive with more or less bronzy or coppery gloss, this becoming very pronounced on the lower back and upper tail-coverts; primaries externally very dark bluish black, passing into deep greenish on the secondaries, which show coppery and purplish reflections in certain lights; tail deep greenish, the middle rectrices with a strong coppery purplish sheen; feathers enclosing the bare postorbital area black; auricular region cinnamon buff; chin and upper throat soiled white; lower throat, sides of the neck, and breast white with bold dusky squamations, each feather with a central white area, a broad con-

centric band of dusky, and white margins and tips; on the sides of the neck the dark bands tend to dull green, and the light centers are reduced or wanting; an indication of a narrow black band on the lower breast; rest of under parts whitish or buffy, with obsolete dusky barring, deepening into clay color on the abdomen and russet on the flanks, the under tail-coverts Mars brown; axillars and under wing-coverts cinnamon brown; tibiæ dull whitish or buffy with obscure dusky barring; "iris cherry red; bare space behind the eyes cobalt blue; feet slate color; bill dark greenish horn color above, with lighter tip, below light bluish gray basally, becoming greenish and paler towards the tip." Wing (type), 161; tail, defective; bill, 45; tarsus, 66.

This remarkable new species is represented by four specimens, all from the same place, near Santarem. It differs from all other known species of the genus not only in its style of coloration, but also in the restriction of the bare area on the sides of the head, which is much less than in the other forms, involving the lores to only a limited extent. Mr. Klages has this to say concerning it: "It lives on or near the ground in the dense forest, where it accompanies the hunting ants, and is rare so far as my experience goes. It was never met with in the littoral area, nor yet in the contiguous forested *mesa*, but only upon penetrating back into the more elevated Mojuy district. We sought for it in vain along the Tapajos."

Type, No. 74,615, Collection Carnegie Museum, adult male; Colonia do Mojuy, Santarem, Brazil, October 30, 1919; Samuel M. Klages.

Pionites xanthurus, sp. nov.

Pileum, sides of the head (down to and including the auriculars), hind-neck, and sides of the neck dull apricot orange; back, rump, upper tail-coverts, upper wing-coverts, and secondaries externally bright parrot green; tail deep chrome to primuline yellow, some of the rectrices with a basal area of parrot green, concealed except on the middle pair; primaries and their coverts with the inner webs black, and the outer webs Berlin blue with a narrow outer margin of green; under wing-coverts parrot green, the carpal edge mixed with yellow; throat, cheeks, and sides of the neck below empire yellow; breast and abdomen soiled white, with a wash of pale yellow in fresh plumage, the sides shaded with light salmon orange; tibiæ and under tail-coverts empire yellow; "iris cadmium yellow; eyelids white; feet flesh white; bill bone white." Wing (type), 141; tail, 79; bill, 25; tarsus, 16.

This species is obviously the Rio Purús representative of *P. xanthomeria* (Sclater), which it closely resembles in all respects except for the color of the tail, which is mostly yellow instead of green, the shafts of the feathers being white. We have three specimens, a pair in worn plumage from Hyutanahan, and a single female in fresh feather from Nova Olinda, which latter has been selected as the type. The single male shows even less green on the basal part of the tail than either of the females.

Type, No. 92,000, Collection Carnegie Museum, adult female; Nova Olinda, Rio Purús, Brazil, July 18, 1922; Samuel M. Klages.

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PROCEEDINGS

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A NEW THRUSH FROM THE PROVINCE OF KWEICHOU, CHINA.

BY J. H. RILEY.[1]

The National Geographic Society during the past year has presented the U. S. National Museum with the material accumulated by Mr. F. R. Wulsin on his journeys in China and the Laos States. Among the birds were three specimens of the genus *Turdus*, quite different, so far as known, from any of the mainland forms. They are from Hwangtsaopo (also given as Singyi in the China Inland Mission Atlas, 2nd edition), a district city, just over the border in Kweichow Province near the Yunnan-Kwangsi boundary. These specimens were taken September 5-10, which would suggest a probability of their being on migration, as eastern Yunnan has been fairly well worked ornithologically in recent years and birds of this genus in the tropics or sub-tropical regions are mountain forms.

It gives me great pleasure to name this fine species after its discoverer:

Turdus wulsini, sp. nov.

Type, adult male, U. S. National Museum, No. 305,466, Hwangtsaopo, Kweichow, China, September 10, 1924. Collected by F. R. Wulsin (original No. 2142).

Head all around, neck, chin, and throat, fuscous, darker on the pileum and much lighter on the throat; remainder of upper-parts, sooty black; lower-parts sooty black, tinged with a slight brownish wash; thighs, drab; upper mandible, dusky; lower mandible, dusky at the base, yellowish toward the tip; feet blackish (in the skin). Wing, 142; tail, 107; culmen, 26; tarsus, 36; middle-toe, 23.5 mm.

Female.—Similar to the male, but the head concolor with the back and the lower-parts with more of a brownish tinge; bill and tarsi, blackish.

Remarks.—A young male has the top of the head and hind-neck drab; sides of the face, chin, and throat white, with sparse drab spots; ear-

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coverts drab with white shaft-streaks; remainder of the plumage like the adult female but more tinged with brownish below.

The present species has a superficial resemblance in color to *Turdus thomassoni* of the mountains of Luzon, but the brown of the pileum is darker, the black more sooty, the thighs drab, the size is considerably greater, and the bill and feet are dusky, not yellow.

Turdus thomassoni is somewhat aberrant. Two young birds in the U. S. National Museum barely able to fly, are uniformly black, unspotted, only a few feathers on the belly being fringed with brownish. Thus it would appear as if the spotted character of the immature is not even of generic value, or the species is wrongly placed.

The immature *Turdus wulsini* described above, superficially somewhat resembles *Microscelis leucocephalus*.

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A NEW VIOLET FROM CHINA.

BY WILHELM BECKER.

Among the plants collected in Kansu Province by R. C. Ching, upon a recent expedition conducted for the National Geographic Society by Mr. F. R. Wulsin, there were a few numbers of *Viola*, which were submitted to the writer by the U. S. National Museum for identification. One of them proves to represent a new species, which may be described as follows:

Viola chingiana, sp. nov.

Ad sect. *Dischidium* Ging. pertinens, ex affin. *V. biflorae* L.

Planta glaberrima, in stat. fruct. ad 15 cm. usque alta, in habitu *V. biflorae* similis. *Rhizoma* obliquum, breviter articulatum, circ. 2 cm. longum, dense radicellatum. *Folia basilaria* longissime petiolata, altitudinem plantae interdum adaequantia, rotundato-reniformia, obtusa, basi plane cordata, marginibus plane serrato-crenata; petioli ad 10 cm. usque longi; lamina 2.5 cm. lata, 2 cm. longa. *Folia caulina* minora, longe petiolata, in summa rotundiuscula, nonnulla rotundato-ovata, obtusa vel subacutiuscula, marginibus plane crenata, basi plane cordata, 1–2 cm. longa et aequilata. *Folia omnia* glaberrima, crassiuscula, nervis subtus non praecipue prominentibus. *Stipulae* circ. 5 mm. longae, 2 mm. latae, ovato-lanceolatae, integrae, obtusiusculae, glabrae. *Flores* ± longe pedunculati; sepala oblonga, obtusa, enervia, circ. 5 mm. longa, in appendices abbreviatas tamen distinctas angustata; petala (?); *capsula* globosa, circ. 6 mm. longa, carpellis incrassatis.

Hab.: China occidentalis, prov. Kansu; Dar Pan, prope Sining, alt. 3000–3350 m., in declivitatibus humidis graminosis.

Exs.: R. C. Ching, Plants of Kansu Province, China, no. 648, July 26, 1923 (Nat. Geogr. Soc. Centr. China Exped., under the direction of F. R. Wulsin).

Planta in stat. fruct. collecta est.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

NOTES ON NORTH AMERICAN SPIDERS HERETOFORE REFERRED TO COELOTES.

BY RALPH V. CHAMBERLIN.

A study of the genotype of *Coelotes, C. atropos* (Walckenaer), shows that it posesses characters of generic rank separating it from the American species heretofore placed with it. I find that no known North American species is a true *Coelotes*. Simon rightly made a new genus for the *Tegenaria medicinalis* of Hentz, but the genus includes as well several other species that have commonly been referred to *Coelotes*. The other species referred to *Coelotes* constitute a clearly defined genus for which a name is proposed below. There has been considerable confusion of species. The following list indicates the names regarded as valid and the place assigned to those found to be synonyms. All species previously referred to *Coelotes* and *Coras* are included, but only the single species of *Cicurina* which is known to have been confused with *Coelotes*.

Genus **Wadotes,** gen. nov.

Wadotes dixiensis, sp. nov.
Wadotes carolinus, sp. nov.
Wadotes bimucronatus (Simon).
Wadotes calcaratus (Keyserling).
Coelotes longitarsus Emerton (in part).
Coelotes nigriceps Banks.
Wadotes hybridus (Emerton).
Coelotes altilis Banks.

Genus **Coras** Simon.

Coras medicinalis (Hentz).
Coelotes urbanus Keyserling.
Coelotes lamellosus Keyserling.

Coras juvenilis (Keyserling).
Coelotes longitarsus Emerton (in part).
Coelotes fidelis Banks.
Coelotes lineatus Banks.
Coras montanus Emerton.
Coras taugynus, sp. nov.

Genus **Cicurina** Menge.

Cicurina arcuata Keyserling.
Cicurina complicata Emerton.
Coelotes longitarsus Emerton (in part).
Coelotes gnavus Banks.

Wadotes, gen. nov.

The species of this genus may be readily distinguished from the other American species heretofore referred to *Coelotes* and *Coras* in having the lower margin of the furrow of the chelicera armed with two teeth instead of three and in having the anterior median eyes much smaller than the laterals. Differences perhaps more important than these exist in the copulatory organs. In the epigynum there is a median piece attached anteriorly but projecting freely as a tongue or scape posteriorly, this being distinctive of the genus. In the palpus of the male, aside from structural differences in the bulb which will not be entered into here, the species may be recognized by the presence on the caudal end of the tarsus of two caudally projecting horns or processes, both of which may be well developed, as in *W. bimucronatus* and *W. dixiensis*, or one of which may greatly exceed the other, as in *W. calcaratus*. The legs are shorter than in *Coras* and in consequence the spines, e. g., of the anterior tibiae are closer together.

Genotype.—*Wadotes dixiensis,* sp. nov.

Wadotes dixiensis, sp. nov.

Related rather closely to *W. bimucronatus* (Simon). Simon in his original description says of the male palpus: "tarso magno ovato, supra ad basim tuberculis validis geminatis binis retro directis (exteriore obtuso, interiore acuto) insigniter instructo." He gives a figure of the right palpus in ectal view in agreement with this description in his Hist. Nat. Araign. II, p. 249. The present species differs in having the tarsal processes shorter and, when seen in view corresponding to that of Simon's figure, broader at the base; the outer process distally bluntly rounded, the inner one more narrowly rounded; viewed from dorsomesal side the inner process is of nearly the same breadth throughout and is distally more bluntly rounded, while the outer process appears strongly narrowed distad, with its apex bent a little mesad. The patellar apophysis is straight, its distal edge oblique, the process not curved as it is in *bimucronatus*.

The length of the holotype, a male, is 9.5 mm. as against 6 mm. for *bimucronatus*.

Holotype.—M. C. Z. 1355.

Locality.—Alabama: Auburn. One male.

Wadotes carolinus, sp. nov.

The tarsus of the male palpus in this species has the processes both strongly developed as in the preceding species and *bimucronatus*. These processes are longer and proportionately narrower at base than in *dixiensis*. In ectal view both processes are distally rounded, the mesal one more narrowly so than the outer; the outer process appearing a little curved with dorsal edge more convex than the ventral. In mesodorsal view the outer process is much broader than the inner one, a little curved outward, its apex rounded; the inner process also a little curved outward but less evenly, being weakly bisinuous. The patellar process small and straight.

This is also a larger species than *bimucronatus*, the type being 8 mm. long.

Holotype.—M. C. Z. 1356.

Locality.—North Carolina: Tryon. One male taken by W. M. Wheeler in Nov., 1913.

Wadotes bimucronatus (Simon).

Coelotes bimucronatus Simon, Ann. Soc. Ent. Belg., 1898, 42, p. 6; Hist. Nat. Araign., 1898, II, p. 249, f. 246.

Locality.—North Carolina.

Known only from the type, which is a male.

Wadotes calcaratus (Keyserling).

Coelotes calcaratus Keyserling, Verh. zool. bot. Ges. Wien. 1887, 37, p. 470, pl. 6, f. 32.

Coelotes longitarsus Emerton (male, but not female, figures), Trans. Conn. Acad. Sci., 1889, 7, p. 192, pl. 7, fig. 2.

Coelotes nigriceps Banks, Journ. New York Ent. Soc., 1895, 3, p. 82.

Examination of the types of *C. longitarsus* of Emerton shows that they include specimens of three species. There are a male and female of *Cicurina arcuata*, the female having been figured as that of *longitarsus*. The male figured by Emerton is *calcaratus* and may be regarded as the holotype, since Emerton himself places his species as a synonym of Keyserling's. Thirdly, there is a female of *Coras juvenilis* Keyserling.

The types of *C. nigriceps* Banks are females of the present species.

Coelotes gnavus Banks is not the present species but *Cicurina arcuata*, the same as the female figured by Emerton for his *longitarsus*.

Localities.—D. C.: Washington.
Md.: Meyersville.
Me.
N. H.: Intervale; Fitzwilliam; Squam Lake; North Chatham.
Mass.: Newton; Waltham; Blue Hill.
Conn.: Hamden; New Haven.
New York: Ithaca; Sea Cliff; Poughkeepsie; Valcour Id.; Pearl Point.
N. C.: Black Mts.; Mt. Graybeard.
Indiana: New Harmony.

Ky.: Mammoth Cave.
Ill.: Cook Co.

Wadotes hybridus Emerton.

Coelotes hybridus Emerton, Trans. Conn. Acad. Ac., 1889, 8, p. 193, pl. 7, f. 4.
Coelotes altilis Banks, Proc. Acad. Sci. Phil., 1892, p. 25, pl. 1, f. 74; pl. 4, f. 74 a.

Localities.—New York: Chateaugay Lake, Adirondacks; Ithaca; Rensselaer; Altamont; Bronx Park; Rochester; Glen Haven; New Salem; East Onandaga; Lake George; Gloversville.
N. H.: Hanover.
Mass.: Magnolia.

Genus **Coras** Simon.

Hist. Nat. Araign., 1898, 2, p. 258.

Only the genotype, *Tegenaria medicinalis* of Hentz, has heretofore been referred to *Coras;* but a study of species referred to *Coelotes* shows that the forms listed below are plainly congeneric with *medicinalis,* while not one of the known American species is truly congeneric with *atropos,* the type of the genus *Coelotes.* Species of *Coras* in the female sex, aside from the differences in eyes, such as the large size of the anterior medians, differ from *Wadotes* in the form of the epigynum. This presents a variously developed median septum or plate but never a free tongue as present in *Wadotes;* it also uniformly presents at each anterolateral corner a spine or tooth which ordinarily projects mesocaudad, more rarely caudad or mesad. A somewhat similar tubercle is present in species of *Coelotes* of Europe, but the tubercle occurs laterally rather than anteriorly or at anterolateral corner. The males of *Coras* differ from those of *Wadotes* in not having the tarsus of palpus with two caudal processes as well as in the form of patellar and tibial apophyses and particularly in the structure of the bulb which can not be entered into at this time. In both sexes the anterior median eyes are as large as or larger than the anterior laterals rather than much smaller as is the case in *Wadotes.*

Coras medicinalis (Hentz).

Tegenaria medicinalis Hentz, Jour. Acad. Sci. Phil., 1821, 2, p. 53, pl. 5, f. 1; Jour. Boston Soc. Nat. Hist., 1847.
Coelotes urbanus Keyserling, Verh. zool. bot. Ges. Wien, 1887, 37, p. 467, pl. 6, f. 31.
Coelotes lamellosus Keyserling, op. cit., 1887, 37, p. 469, pl. 6, f. 30.

Localities.—Mass.: Boston; Newton; Sharon; Swampscott.
Rhode Id.: Providence; Kingston.
New York: Ithaca; Poughkeepsie; Chateaugay Lake; Sea Cliff; Hemlock Lake.

Kans.: Manhattan.
Ill.: Cook Co.
Md.: Bay Ridge.
D. C.: Washington.
Va.: Falls Church.
Ala.: Auburn; Mobile Co.

Coras juvenilis (Keyserling).

Coelotes juvenilis Keyserling, Verh. zool. bot. Ges. Wien, 1881, 31, p. 288, pl. 11, f. 13.
Coelotes longitarsus Emerton (in part, one of female types, not illustrated), Trans. Conn. Acad. Sci., 1889, 8, p. 192.
Coelotes fidelis Banks, Proc. Acad. Sci. Phil., 1892, p. 24, pl. 41, f. 72, pl. 5, f. 72; op. cit., 1916, p. 70, pl. 10, f. 8.
Coelotes lineatus Banks, op. cit., 1892, p. 25. (Immature.)

The holotype of *C. juvenilis* is in the M. C. Z. collection. It is an immature female to be placed at once in *Coras* rather than *Wadotes* because of the presence of three teeth on the lower margin of chelicera and the large size of the anterior median eyes. Close comparison with material of corresponding age leaves no doubt that it is the same form as that indicated by the synonymy above.

Localities.—New York: Poughkeepsie; Valcour Id.; Ithaca; Binghampton; Rochester; Bath; Albany; Cayuga; Chateaugay Lake; New Middlebury; Delmar; Averil Park; Orange Co.; Crown Point; Meadowdale; Lake Bluff; Lake George; Greenville; West Berne; Rider's Mills; Voorheesville; East Onondaga.
N. H.: Intervale; Hanover.
Maine: Long Id.
Ill.: Cook Co.
Indiana.
Ky.: Mammoth Cave.

Coras montanus (Emerton).

Coelotes montanus Emerton, Trans. Conn. Acad. Sci., 1889, 8, p. 192, pl. 7, f. 3, 4.

Localities.—Canada: Ottawa; Newfoundland, Deer Lake, also Humber River and Old Perlican.
New York: Chateaugay Lake, Adirondacks; Ithaca.
Lake Superior.

Emerton's original figure of the epigynum of this species does not show the anterior spines characteristic of species of this genus; but a close examination of the female cotype from which the figure was made shows distinct scars where such spines had been broken off, possibly by scraping of the epigynum to free it of hairs as it is completely denuded of such. They are present as usual in specimens from Newfoundland and Ottawa.

Coras taugynus, sp. nov.

A species in general structure and appearance similar to *C. medicinalis* but conspicuously different in the form of the epigynum. In this there is a septum which is inversely T-shaped; the median piece is narrow behind and strongly expanded anteriorly, smooth and even throughout, not depressed anteriorly; the cross-piece extends entirely across caudal border and curves forward about each lateral end where it is thickest, and on anterior margin toward each end presents a forwardly directed tooth. There is a conspicuous spine at each antero-lateral corner which projects obliquely caudomesad over the fovea and is acutely acuminate from base to apex, this spine proportionately much larger than the corresponding one of *medicinalis*.

Holotype.—M. C. Z. 1257.

Localities.—N. C.: Black Mts. (type loc.), four females; Tryon, one female.

Genus **Cicurina** Menge.

Preuss. Spinn., 1869, 3, p. 271.

Cicurina arcuata Keyserling.

Cicurina arcuata Keyserling, Verh. zool. bot. Ges. Wien, 1887, 37, p. 460, pl. 6, f. 25.

Cicurina complicata Emerton, Trans. Conn. Acad. Sci., 1889, 8, p. 195, pl. 7, f. 7, 7a, 7b.

Coelotes longitarsus Emerton (in part), Trans. Conn. Acad. Sci., 1889, 8, p. 192, pl. 7, f. 2a.

Coelotes gnavus Banks, Proc. Acad. Sci. Phil., 1892, p. 26.

In addition to the female of this species which Emerton figures as that of his *Coelotes longitarsus* as indicated above, there is a male of the species among Emerton's type specimens.

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PROCEEDINGS

OF THE

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TWO NEW PIGMY SHREWS OF THE GENUS MICROSOREX.

BY HARTLEY H. T. JACKSON.

A study of the pigmy shrews of the genus *Microsorex* in the collections of the U. S. Biological Survey and the U. S. National Museum, supplemented by specimens from several other museums, discloses two new forms which may be recognized by the following descriptions:

Microsorex hoyi intervectus, subsp. nov.

Type-specimen.—No. 226979, U. S. National Museum, Biological Survey collection; ♀ adult, skin and skull; collected August 17, 1917, by Hartley H. T. Jackson. Original number 820.

Type-locality.—Lakewood, Oconto County, Wisconsin.

Diagnostic characters.—Similar externally to *Microsorex hoyi hoyi*, averaging slightly more grayish in summer pelage; skull more angular than that of *M. h. hoyi*, with distinctly broader and higher braincase. Smaller, darker and more grayish than *Microsorex hoyi eximius*, the skull smaller and with relatively shorter rostrum and palate, and weaker dentition.

Measurements.—Type-specimen: Total length, 92; tail vertebrae, 31; hind foot, 10, *Skull* of type-specimen: Condylobasal length, 14.8; palatal length, 5.3; breadth of cranium, 7.1; interorbital constriction, 3.1; maxillary breadth, 4.4; maxillary tooth row, 4.9.

Remarks.—This subspecies is in many respects an intermediate between *Microsorex hoyi hoyi* and *M. h. eximius*. Its geographic range extends from Quebec to northern Michigan and northern Wisconsin, thence northwest to northern Alberta, northwest Territories, and northern British Columbia.

Microsorex hoyi washingtoni, subsp. nov.

Type-specimen.—No. 91007, U. S. National Museum, Biological Survey collection; ♀ adult, skin and skull (posterior and basal part of cranium broken); collected September 26, 1897, by Vernon Bailey. Original number 6293.

Type-locality.—Loon Lake, Stevens County, Washington.

Diagnostic characters.—Size small; about the size of *Microsorex hoyi thompsoni*, slightly larger than *Microsorex hoyi winnemana;* color more *reddish* brown (less grayish) than in any other member of the genus; skull about the size of that of *M. h. thompsoni* with slightly broader cranium.

Measurements.—Type-specimen: Total length, 89; tail vertebrae, 27; hind foot, 9. *Skull* of type-specimen: Condylobasal length, 13.9; palatal length, 5.2; breadth of cranium, 6.6; interorbital breadth, 3.0; maxillary breadth, 4.1; maxillary tooth row, 4.6.

Remarks.—A single specimen, the type, has been examined of this form of *Microsorex* which is well differentiated from other subspecies in its reddish brown color.

The study of all available material of this genus, consisting of about 135 specimens, has resulted in the recognition of the following forms:

Microsorex hoyi hoyi (Baird)
Microsorex hoyi thompsoni (Baird)
Microsorex hoyi winnemana Preble
Microsorex hoyi intervectus Jackson
Microsorex hoyi alnorum (Preble)
Microsorex hoyi eximius (Osgood)
Microsorex hoyi washingtoni Jackson.

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PROCEEDINGS

OF THE

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PRELIMINARY DESCRIPTIONS OF SEVEN SHREWS OF THE GENUS SOREX.

BY HARTLEY H. T. JACKSON.

In bringing near to completion my taxonomic studies upon North American shrews of the genus *Sorex*, it becomes necessary to describe seven new forms. Six of these are from Mexico and are represented only in the collection of the U. S. Biological Survey; the other is from the north central United States and is represented in several American museums, the type-specimen being selected from the Merriam collection, U. S. National Museum. These shrews, more detailed descriptions of which will appear in the final monograph, may be recognized by the following diagnoses.

Sorex arcticus laricorum, subsp. nov.

Type-specimen.—No. 186837, U. S. National Museum, Merriam collection (old number $\frac{2019}{2552}$); ♂ adult, skin and skull; collected February 19, 1886, by Vernon Bailey. Original number 75.

Type-locality.—Elk River, Sherburne County, Minnesota.

Diagnostic characters.—Similar to *Sorex arcticus arcticus* Kerr, possibly averaging paler on underparts and sides in winter pelage. Skull decidedly flatter and shallower than that of *S. a. arcticus*, less constricted interorbitally, palate somewhat longer.

Measurements.—Type-specimen (measured from dry skin by writer): Total length, 117; tail vertebrae, 42; hind foot, 14. *Skull* of type-specimen: Condylobasal length, 19.0; palatal length, 7.6; breadth of cranium, 9.3; interorbital breadth, 3.8; maxillary breadth, 5.3; maxillary tooth row, 6.8.

Remarks.—The geographic range of *Sorex arcticus laricorum* includes the northern parts of Michigan, Wisconsin, Minnesota, and North Dakota. The subspecies represents a southern form of the *Sorex arcticus* Kerr, the species until recently known under the name *Sorex richardsonii* Bachman.

Sorex durangae, sp. nov.

Type-specimen.—No. 94540, U. S. National Museum, Biological Survey collection; ♂ adult, skin and skull; collected July 19, 1898, by E. W. Nelson and E. A. Goldman. Original number 12774.

Type-locality.—El Salto, Durango, Mexico.

Diagnostic characters.—A member of the *vagrans-obscurus* group, but differs from any other species in the group in its peculiarly high and broad lachrymal region. Posterior borders of molars relatively narrowly and deeply emarginate.

Measurements.—Type-specimen: Total length, 112; tail vertebrae, 50; hind foot, 13 (measured from dry skin by the writer). *Skull* of type-specimen: *Condylobasal length*, 17.1; palatal length, 6.7; breadth of cranium, 8.4; interorbital breadth, 3.7; maxillary breadth, 5.0; maxillary tooth row, 6.3.

Remarks.—Unfortunately there are only two specimens of this new shrew available for study, both from the type-locality, and these give insufficient material for an exact determination of the relation of the species to either *Sorex vagrans* or *Sorex obscurus*. The teeth of both specimens are worn, but indications suggest that the species is probably nearer related to *vagrans* than to *obscurus*.

Sorex saussurei veraecrucis, subsp. nov.

Type-specimen.—No. 55106, U. S. National Museum, Biological Survey collection; ♀ adult, skin and skull; collected July 14, 1893, by E. W. Nelson. Original number 5235.

Type-locality.—Xico, altitude 6,000 feet, State of Vera Cruz, Mexico.

Diagnostic characters.—Essentially like *Sorex saussurei saussurei* in color; tail longer; skull relatively longer and narrower in interorbital region. Paler than *Sorex saussurei oaxacae* or than any subspecies of *saussurei* ranging to the south or east.

Measurements.—Type-specimen: Total length, 118; tail vertebrae, 52; hind foot, 15. *Skull* of type-specimen: Condylobasal length, 18.3; palatal length, 7.4; breadth of cranium, 8.7; interorbital breadth, 4.1; maxillary breadth, 5.3; maxillary tooth row, 6.6.

Remarks.—The geographic range of this long-tailed form of *saussurei* is confined principally to the higher parts of the Atlantic drainage from central Vera Cruz south to northeastern Oaxaca.

Sorex saussurei oaxacae, subsp. nov.

Type-specimen.—Number 71467, U. S. National Museum, Biological Survey collection; ♀ adult, skin and skull; collected March 27, 1895, by E. W. Nelson and E. A. Goldman. Original number 7748.

Type-locality.—Mountains near Ozolotepec, altitude 10,000 feet, State of Oaxaca, Mexico.

Diagnostic characters.—Skull short, broad and depressed, compared with other forms of the species. Color distinctly darker than in *Sorex saussurei saussurei* or *Sorex saussurei veraecrucis*.

Measurements.—Type-specimen: Total length, 114; tail vertebrae, 48; hind foot, 15. *Skull* of type-specimen: Condylobasal length, 18.2; palatal length, 7.3; breadth of cranium, 9.0; interorbital breadth, 4.2; maxillary breadth, 5.6; maxillary tooth row, 6.7.

Remarks.—The description of this representative of *saussurei* is based upon a single specimen. The characteristic skull of the subspecies separates it sharply from other forms of the group.

Sorex saussurei cristobalensis, subsp. nov.

Type-specimen.—Number 75883, U. S. National Museum, Biological Survey collection; ♀ adult, skin and skull; collected September 19, 1895, by E. W. Nelson and E. A. Goldman. Original number 8429.

Type-locality.—San Cristobal, altitude 8,400 feet, State of Chiapas, Mexico.

Diagnostic characters.—Similar in cranial characters to *Sorex saussurei veraecrucis,* but with apparently heavier dentition; color darker than in *veraecrucis* and tail shorter. Color much as in *Sorex saussurei oaxacae,* but skull distinctly longer and narrower.

Measurements.—Type-specimen: Total length, 116; tail vertebrae, 46.5; hind foot, 13.5. *Skull* of type-specimen: Condylobasal length, 18.5; palatal length, 7.6; breadth of cranium, 8.5; interorbital breadth, 4.0; maxillary breadth, 5.4; maxillary tooth row, 6.7.

Remarks.—As with *Sorex saussurei oaxacae,* this form is represented in collections only by a single specimen, and its variation and distribution are unknown. The single specimen, however, is so different from either *Sorex saussurei veraecrucis* or *S. s. oaxacae* as to clearly separate it.

Sorex emarginatus, sp. nov.

Type-specimen.—Number 90847, U. S. National Museum, Biological Survey collection; ♀ young adult, skin and skull; collected September 17, 1897, by E. W. Nelson and E. A. Goldman. Original number 11765.

Type-locality.—Sierra Madre near Bolanos, altitude 7,600 feet, State of Jalisco, Mexico.

Diagnostic characters.—Similar externally to *Sorex saussurei saussurei* but with shorter hind foot. Differs from *Sorex ventralis, Sorex oreopolus,* and from all other forms of the species *saussurei* in its narrow and deeply emarginate m^1, and in having the fourth upper unicuspid distinctly smaller than the third.

Measurements.—Type-specimen: Total length, 100; tail vertebrae, 42; hind foot, 12.5. *Skull* of type-specimen: Condylobasal length, 16.9; palatal length, 7.0; breadth of cranium, 8.0; interorbital breadth, 4.0; maxillary breadth, 5.0; maxillary tooth row, 6.2.

Remarks.—This is a small species of the *saussurei* group of shrews. It is as small as *Sorex ventralis,* but in cranial characters is more like *saussurei;* and with the advent of more material it may prove to be a subspecies of the latter.

Sorex veraepacis chiapensis, subsp. nov.

Type-specimen.—No. 75877, U. S. National Museum, Biological Survey Collection; ♀ adult, skin and skull; collected October 1, 1895, by E. W. Nelson and E. A. Goldman. Original number 8528.

Type-locality.—San Cristobal, altitude 9,500 feet, State of Chiapas, Mexico.

Diagnostic characters.—Intermediate in many respects between *Sorex veraepacis veraepacis* and *Sorex veraepacis mutabilis.* Smaller than *S. v. veraepacis*, about the size of *mutabilis* with longer tail; color in winter about as in *S. v. veraepacis*, more grayish than *mutabilis.* Skull somewhat similar to that of *mutabilis*, but broader and with wider mesopterygoid space.

Measurements.—Type-specimen: Total length, 120; tail vertebrae, 48; hind foot, 14.5. *Skull* of type-specimen: Condylobasal length, 18.3; palatal length, 7.3; breadth of cranium, 9.5; interorbital breadth, 4.2; maxillary breadth, 5.3; maxillary tooth row, 7.0.

Remarks.—Externally *Sorex veraepacis chiapensis* resembles *Sorex veraepacis veraepacis*, but cranially it is nearer to *Sorex veraepacis mutabilis.* Skulls of *S. v. chiapensis* can be separated from those of *S. v. veraepacis* by their smaller size, and from those of *S. v. mutabilis* by their wide mesopterygoid space.

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PROCEEDINGS

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BIOLOGICAL SOCIETY OF WASHINGTON

A NEW RED-WINGED BLACKBIRD FROM WESTERN MEXICO.

BY DONALD R. DICKEY AND A. J. VAN ROSSEM.

A series of Redwings from the State of Nyarit, Mexico, which we have lately examined, seems clearly to indicate the desirability of recognizing the birds of that region as subspecifically distinct from their west-coast congeners to the north. The apparently undescribed form which is here proposed may be known as follows:

Agelaius phoeniceus nyaritensis, subsp. nov.

NYARIT RED-WINGED BLACKBIRD.

Type.—Male adult, No. 157,471, Collection of the Bureau of Biological Survey, U. S. Department of Agriculture; Santiago, Nyarit [= Tepic], Mexico; June 14, 1897; collected by E. W. Nelson and E. A. Goldman.

Subspecific characters.—This is one of the series of red-and-buff-shouldered races of *Agelaius.* Bill heavy at base, in this respect approximating *Agelaius phoeniceus fortis,* but longer than in that form. Compared with *Agelaius phoeniceus neutralis,* the outline of the culmen is straighter and the bill is larger in all measurements. Compared with *Agelaius phoeniceus sonoriensis,* the bill is slightly longer and very much heavier.

Measurements of type.—Wing, 129.0; tail, 96.5; culmen from base, 25.9; depth at base, 13.6; tarsus, 30.3; middle toe minus claw, 23.3.

Comparative measurements.—

Agelaius phoeniceus nyaritensis.

Seven adult males from Santiago and Tepic, Nyarit, Mexico.

Wing.	*Tail.*	*Culmen from base.*	*Depth at base.*	*Tarsus*	*Middle toe minus claw.*
126.0–129.0	93.0–100.5	24.6–26.4	12.5–13.6	30.1–31.4	20.6–23.5
(127.6)	(96.5)	(25.5)	(13.0)	(30.7)	(22.7)

Agelaius phoeniceus sonoriensis.

Forty-five adult males from the Colorado River Valley, California and Arizona.

Wing.	*Tail.*	*Culmen from base.*	*Depth at base.*	*Tarsus*	*Middle toe minus claw.*
120.0–130.5	86.3–97.5	22.5–26.9	10.3–12.4	27.5–30.6	20.5–22.5
(125.4)	(92.8)	(24.8)	(11.3)	(29.5)	(21.9)

Agelaius phoeniceus neutralis.

Thirteen adult males from San Diego and Orange Counties, California.

Wing.	*Tail.*	*Culmen from base.*	*Depth at base.*	*Tarsus*	*Middle toe minus claw.*
121.0–130.5	86.5–98.5	22.3–24.1	11.4–13.3	28.4–31.2	21.0–23.6
(125.5)	(92.0)	(23.2)	(12.5)	(30.1)	(21.9)

Range.—The State of Nyarit, Mexico.

Remarks.—No females of this form have been examined. The males show occasional traces of black on the middle coverts, as do most of the males of far-western subspecies, but the race is essentially of the "*phoeniceus*" or buff-winged type. Mr. Ridgway (Birds of North and Mid. Amer., pt. 2, 1902, p. 337) comments at length on birds from Tepic. He remarks on their similarity to *fortis* in certain features, but finally assigns them to *sonoriensis* with some misgivings. An infinitely larger series of *sonoriensis* than was available to Mr. Ridgway at that time now makes it clear that the Tepic birds are not referrable to that race. Instead, their affinities lie decidedly with the heavy-billed group, which includes *arctolegus*, *fortis*, *neutralis*, etc.

For many courtesies in furnishing comparative material of critical value in connection with our studies of the *Agelaius* group, and for the privilege of naming this form, we are doubly indebted to Dr. E. W. Nelson, Chief, Bureau of Biological Survey, Washington, D. C.

Vol. 38, pp. 133-136 November 13, 1925

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

FOUR NEW BIRDS FROM SALVADOR.

BY DONALD R. DICKEY AND A. J. VAN ROSSEM.

A small collection of birds made by the junior author in Salvador in 1912, has recently become available for study. It includes specimens of the following four apparently unnamed forms. They are here described as follows:

Pipromorpha assimilis obscura, subsp. nov.

SALVADOR PIPROMORPHA.

Type.—Female adult, No. 8022, Collection of Donald R. Dickey; San Salvador, Salvador; April 1, 1912; collected by A. J. van Rossem.

Subspecific characters.—Intermediate in size between *Pipromorpha assimilis assimilis* and *Pipromorpha assimilis dyscola.* Compared with *assimilis*, the color of the chin, throat and pectoral region is greener, decidedly darker, and extends further down the breast and sides. Dorsal coloration darker than in *dyscola*, with the green of underparts also darker than in that form. The buffy ochraceous yellow of the abdominal region is less suffused with greenish than in *dyscola*, contrasting more sharply with the dull green of breast and sides.

Measurements of type.—Length in flesh, 140 mm.; wing, 62.5; tail, 48.0; culmen from base, 14.1; tarsus, 15.2; middle toe minus claw, 9.0.

Range.—Foothill regions of Salvador.

Remarks.—We have not examined birds from western Nicaragua or western Guatemala, hence the limits of the range of this form are at present unknown. However, specimen No. 64,302, Museum of Comparative Zoology, from "Guatemala," without specific locality, displays the characters assigned to the present form. It is obviously distinct from the type found in eastern Central America and Mexico, and was probably collected in western Guatemala.

Myadestes obscurus oberholseri, subsp. nov.

OBERHOLSER SOLITAIRE.

Type.—Male adult, No. 8278, Collection of Donald R. Dickey; Volcan de San Rafael, Salvador; May 30, 1912; collected by A. J. van Rossem.

Subspecific characters.—Smallest of the races of *Myadestes obscurus.* Coloration not appreciably different from that of *Myadestes obscurus ob-*

scurus, except that the underparts of the two specimens examined are clearer gray, lacking the brownish wash often present in *obscurus* and *occidentalis*.

Measurements of type.—Length in flesh, 218; wing, 97.0; tail, 93.0; culmen from base, 16.0; tarsus, 19.3; middle toe minus claw, 15.3.

Range.—Highlands of Salvador, north probably through western Guatemala to Chiapas, Mexico.

Remarks.—The authors have not examined specimens from the Pacific Slope immediately north of Salvador, but in view of Mr. Ridgway's remarks (Birds of North and Middle America, pt. 4, 1907, p. 167) it seems probable that birds from western Guatemala and Chiapas should be referred to the present small race. Birds one year old, or less, average considerably smaller than adults. These younger birds are easily distinguished by their buff-tipped greater coverts, as well as by their smaller size. To avoid confusion they have been excluded from the following table.

Comparative measurements.—

Myadestes obscurus obscurus.

Three adult males from Vera Cruz and Hidalgo, Mexico.

Wing.	*Tail.*	*Culmen from base.*	*Tarsus.*	*Middle toe minus claw.*
103.0–105.5	97.0(1)–105.5	15.6–16.8	20.5–20.7	15.9–17.0
(104.2)	(100.3)	(16.0)	(20.6)	(16.3)

Myadestes obscurus occidentalis.

Three adult males from Guerrero, Jalisco and Michoacan, Mexico.

Wing.	*Tail.*	*Culmen from base.*	*Tarsus.*	*Middle toe minus claw.*
100.0–104.0	101.0–103.0	15.5–16.7	20.5–21.1	15.3–16.2
(101.0)	(101.8)	(16.1)	(20.7)	(15.7)

Myadestes obscurus insularis.

Three adult males from the Tres Marias Islands, Mexico.

Wing.	*Tail.*	*Culmen from base.*	*Tarsus.*	*Middle toe minus claw.*
101.5–102.5	102.5–103.5	15.1–15.8	21.1–23.0	16.1–17.0
(102.0)	(103.0)	(15.5)	(22.2)	(16.7)

Myadestes obscurus oberholseri.

Two adult males from Salvador, Central America.

Wing.	*Tail.*	*Culmen from base.*	*Tarsus.*	*Middle toe minus claw.*
97.0–99.0	92.0–93.0	15.3–16.0	19.3–21.6	15.3–16.6
(98.0)	(92.5)	(15.7)	(20.5)	(16.0)

1 In excessively worn July plumage.

Catharus melpomene bangsi, subsp. nov.

BANGS NIGHTINGALE THRUSH.

Type.—Male adult, No. 8239, Collection of Donald R. Dickey; Volcan de San Salvador, Salvador; April 22, 1912; collected by A. J. van Rossem.

Subspecific characters.—Dorsal coloration scarcely if at all distinguishable from that of *Catharus melpomene melpomene.* Ventral coloration not only darker than in *melpomene,* but even darker than in *costaricensis,* the darkest of the previously described forms. This dark coloration is particularly noticeable on flanks and throat. White area of belly much reduced in extent. The decidedly darker coloration of *bangsi* obviates the necessity of comparison with *clarus,* the palest race of the species.

Measurements of type.—Length in flesh, 191 mm.; wing, 83.5; tail, 68.5; culmen from base, 19.3; tarsus, 30.0; middle toe minus claw, 18.5.

Range.—The slopes of Volcan de San Salvador and Volcan de San Rafael, near the city of San Salvador, Salvador.

Remarks.—The three specimens of the present race which we have examined are darker than any of the previously described races of *Catharus melpomene.* This species is paler in worn plumage than in fresh. Despite this fact, our specimens of *bangsi,* though in worn plumage, are darker than examples of *costaricensis* in much fresher plumage. Our small series averages slightly larger than *melpomene,* but size is so variable in the species that we prefer to discount its value as a character at this time.

Cyclarhis flaviventris mesoleucus, subsp. nov.

SALVADOR PEPPER SHRIKE.

Type.—Male adult, No. 8111, Collection of Donald R. Dickey; San Salvador, Salvador; April 19, 1912; collected by A. J. van Rossem.

Subspecific characters.—Differs from *Cyclarhis flaviventris flaviventris* in having the central portions of the abdominal and anal regions white, and the olive green of the interscapular region duller, in contrast to the brighter green of rump and upper tail coverts. Compared with *Cyclarhis flaviventris yucatanensis,* the upper tail coverts and rump are brighter green, the abdominal region more extensively white, and the rest of the under parts more strongly yellow.

Measurements of type.—Length in flesh, 174; wing, 75.5; tail, 61.0; culmen from base, 20.0; tarsus, 22.3; middle toe minus claw, 14.5.

Range.—Foothill regions of Salvador.

Remarks.—This new race seems to constitute a step in the direction of the "flavipectus" type, and it is easily possible that further material from stations on the west coast between Salvador and Costa Rica may ultimately bridge the gap between *Cyclarhis flaviventris* and *Cyclarhis flavipectus.*

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PROCEEDINGS

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NEW MITES OF THE PARASITIC GENUS HAEMOGAMASUS BERLESE.

BY H. E. EWING.

The genus *Haemogamasus* Berlese belongs to an ill-defined group of genera of the family Gamasidae, all of which are blood-sucking parasites of vertebrates. The genus is so nearly related to *Laelaps* Koch on the one hand and *Pachylaelaps* Berlese on the other that only with difficulty can a definition of it be given which will properly distinguish it from these two relatives. The following description of *Haemogamasus* is here offered: The genus includes those members of the family Gamasidae in which the dorsal shield is large and undivided in both sexes. In the female there are three ventral plates, the sternal, genito-epigastric and anal. The genito-epigastric plate never extends to or partially surrounds the anal plate. The anal plate is usually more or less triangular and nearly always bears but three setae, the two anterior of which are paired. The skin of the body is distensible and well clothed with rather short and almost uniform setae. The epistome is usually large and fringed with many chitinous projections. The chelicerae are stout and heavily toothed.

Members of this genus parasitize small mammals, and are particularly abundant on moles. Up to the present time only a single species truly representative of the genus has been described from North America. In the present paper six new species are described, all from North America.

By way of introduction and summary a key is here presented to all the North American species of *Haemogamasus* and also three exotic species which the writer has examined.

KEY TO SPECIES OF HAEMOGAMASUS EXAMINED BY THE WRITER.

1. Sternal plate of female provided with many setae, some of which are not arranged in definite pairs.....2.
   Sternal plate of female provided with only four or six setae which are arranged in pairs.....3.
2. Number of sternal setae about 30; epistome irregular in outline..... *H. hirsutus* Berlese.
   Number of sternal setae less than 20; epistome large, regular in outline.....*H. alaskensis*, new species.
3. Sternal plate of female rectangular and with only four setae; anal plate egg-shaped in outline.....*H. americanus* Banks.
   Sternal plate of female not rectangular and provided with six setae.....4.
4. Sternal plate of female inverted U-shape, each process of the "U" being longer than the width of the sternal plate itself..... *H. oudemansi* Hirst.
   Sternal plate of female not inverted U-shaped.....5.
5. Chelicerae with long, piercing arms, as in the genus *Liponyssus*..... *H. liponyssoides*, new species.
   Chelicerae with stout, toothed, biting arms.....6.
6. Length considerably over 1 mm.; arms of chelicerae of female very short, stout, furrowed and heavily toothed.....*H. horridus* Michael.
   Length about 1 mm. or less; arms of chelicerae not furrowed and heavily toothed.....7.
7. Fixed arm of chelicera of female longer than the movable arm..... *H. reidi*, new species.
   Fixed arm of chelicera of female either shorter or subequal to movable arm.....8.
8. Epistome oval in general outline; marginal teeth for the most part simple.....*H. barberi*, new species.
   Epistome not oval in outline; most of the marginal teeth branched, those on front margin with two or more branches.....9.
9. Genito-epigastric plate broader than the distance between the posterior coxae.....*H. microti*, new species.
   Genito-epigastric plate not equal in width to the distance between the posterior coxae.....*H. twitchelli*, new species.

Haemogamasus alaskensis, new species.

Female.—Epistome triangular in outline, with long marginal teeth, most of which are bifurcate. Chelicerae short and toothed. Dorsal plate covering the anterior part of the body entirely but leaving a rather narrow margin around the abdomen uncovered. Body moderately well clothed with subequal setae. Sternal plate broader than long with both the anterior and posterior margins incurved. Two pairs of sternal pores present; anterior pair slit-like, near the anterior margin of the sternal plate and parallel to it; posterior pair consisting of two oblique slits situated slightly behind the middle of the sternal plate and near its lateral margin. Sternal setae of two sizes. The six lateral ones, which are larger than the others,

are arranged in two parallel rows. The remaining smaller setae, which number about fourteen, are not arranged in definite pairs. Genito-epigastric plate small, but at its broadest place broader than the distance between the posterior coxae. Anal plate broadly and evenly rounded in front and strongly pointed behind. Anus situated its greatest diameter from front margin of anal plate. Paired anal setae about equal to the unpaired anal setae and situated opposite the middle of the anus. First pair of legs slightly shorter than the last pair. Second pair of legs equal to the third pair in length, but slightly stouter. None of the coxae provided with a tooth-like spine.

Length, 1.12 mm.; width, 0.70 mm.

Male.—Not known.

Type host and *type locality.*—From *Microtus* sp. taken on Crater Mt., Ophir, Alaska.

Type.—Cat. No. 947, U. S. N. M.

Described from a single female taken from *Microtus* sp. at Crater Mountain, Ophir, Alaska, July 23, 1924, by A. H. Twitchell. This species is nearest *H. hirsutus* Berlese, but is much smaller than Berlese's species and has only about one-half as many sternal setae. The epistome also is different from that of *H. hirsutus* Berlese.

Haemogamasus liponyssoides, new species.

Female.—Palpi rather small, reaching to the middle of anterior femora; last segment with a large, deeply forked spine on inside. This spine is almost straight and not swollen. Epistome slender, with long simple teeth. Chelicerae very slender and adapted for piercing; fixed arm needle-like but curved; movable arm stouter, straight and blunt-pointed. Dorsal plate not completely covering the body even in the region of cephalothorax and leaving a wide margin between it and the edge of the abdomen. Body densely clothed with short, subequal setae. Sternal plate broader than long and broadest at the posterior end; anterior margin straight, posterior margin deeply notched. Sternal pores oblique slits situated midway between the second and third pairs of sternal setae. Sternal setae long, straight, subequal; first pair situated almost on the anterior margin of the sternal plate; second pair situated outside of lines drawn from first to third pairs; third pair situated farther from the second pair than the second pair is from the first pair. Genito-epigastric plate small, not equal in width to the distance between the posterior coxae and not extending to the middle of the abdomen. Anal plate egg-shaped in outline, broadly and evenly rounded in front and very narrow toward the tip. Anus moderate, rim thickest in front; it is situated more than its greatest diameter from the anterior margin. Paired anal setae scarcely as long as unpaired seta; situated opposite the middle of the anus; unpaired anal seta situated about half way from the anus to the tip of anal plate and extending beyond it for over one-half its length. Legs long; first pair longer than the total length of the body and about equal to the last pair; second pair equal in length to the third pair but slightly stouter.

Length, 1.08 mm.; width, 0.72 mm.

Male.—Somewhat smaller than female. Fixed arm of chelicera shorter, stouter and not needle-like. First three pairs of sternal setae very long and slender.

Length, 0.85 mm.; width, 0.50 mm.

Type host and *type locality.*—From *Scalops argentatus* taken at Ames, Iowa.

Type slide.—Cat. No. 948, U. S. N. M.

Described from one male and several females taken from a mole, *Scalops argentatus*, at Ames, Iowa, July, 1916, by J. E. Guthrie. This species has strong affinities with the genus *Liponyssus* which are shown in the piercing mouth-parts, the small genito-epigastric shield, the shape of the anal plate and the reduced dorsal plate.

Haemogamasus reidi, new species.

Female.—Chelicerae strongly toothed; movable finger slightly shorter than the fixed one. Seta on chelicera simple, not inflated and strongly incurved. Dorsal plate covering all the body dorsally except for a narrow lateral margin. Body moderately well clothed with short, subequal setae. Sternal plate broader than long, front margin almost straight, but hind margin strongly arched. In front of coxa I and between coxae I and II there are spike-like chitinous projections from the sternal plate which extend from it to the walls of the coxal cavities. First pair of sternal pores slit-like, situated slightly behind and inward from the first pair of sternal setae; second pair of sternal pores curved slits, situated half way from the second to third pair of sternal setae and slightly inside a line drawn from one to the other pairs of these setae. Sternal setae subequal and arranged in two divergent longitudinal rows. Genito-epigastric plate scarcely as broad as the sternal region between the last pair of coxae, and extending about half way to the anal plate. Anal plate almost circular except for the posterior scobinate region which extends as a broad median projection about as long as the greatest diameter of the anus. Anus situated centrally. Paired anal setae situated opposite the center of anus, half way from the anal rim to the lateral margin of anal plate; unpaired anal seta longer than paired ones and situated entirely in front of scobinate area. First and last pairs of legs about equal and longer than the other two pairs. The antero-ventral margin of each coxa bears a comb of minute teeth, one of which in the case of coxae II and IV is larger than the rest.

Length, 0.83 mm.; width, 0.48 mm.

Male.—Not known.

Type host and *type locality.*—Host (?). Type locality, Forestville, Maryland.

Type slide.—Cat. No. 949, U. S. N. M.

Described from seven females taken from a squirrel's nest, April 21, 1924, by E. D. Reid. The relationships of this species are indicated in the key to species given in this paper.

Haemogamasus barberi, new species.

Female.—Epistome large, oval, longer than broad; marginal teeth simple on the sides of epistome but branched on the front margin of the same.

Dorsal shield very large, practically covering the dorsal surface of the body. Body setae short and numerous, subequal. Peritreme very long, extending almost to rostrum and about straight except for the shoulder bend. Sternal plate broader than long and broadest near posterior margin; sternal pores oblique slits situated very near the first pair of setae, but inside and posterior to them. Six sternal setae, arranged in two posteriorly divergent rows near the lateral margins of sternal plate; first pair slightly smaller than the other two pairs. Genito-epigastric plate large, extending backward to about the middle of the abdomen; at its widest place this plate is wider than the distance between the posterior coxae. Anal plate small; anus large, situated about four-fifths its greatest diameter from the front margin of the anal plate; paired anal setae smaller than the unpaired anal setae and situated slightly posterior to the level of the front margin of anus; unpaired anal seta extending for fully half its length beyond the tip of anal plate. Legs moderate; first pair much longer than the second but hardly as stout.

Length, 1.07 mm.; width, 0.78 mm.

Male.—Unknown.

Type host and *type locality.*—From "nest of small mammal," Maryland shore of Potomac River, near Plummer Island.

Type slide.—Cat. No. 950, U. S. N. M.

Described from two females, which together with one nymph and three Gamasid mites of a different genus were mounted on the same microscope slide. This species is quite different from any of the described ones of its genus but is rather closely related to a new species taken from *Microtus* sp. In this latter species from *Microtus* the epistome is not oval in outline, and most of its marginal teeth are large and branched, whereas in *H. barberi* most of them are small and simple.

Haemogamasus microti, new species.

Female.—Epistome large and long, almost as broad at its tip as at its base; teeth branched, those on the front margin several times branched. Chelicerae short with curved tips to the arms. Dorsal shield completely covering the body in front and almost covering it behind. Body well clothed with short setae which increase somewhat in length toward the posterior end. Sternal plate broader than long and broadest between the second and third coxae. Sternal pores a pair of straight, oblique slits approximate to the anterior sternal setae. Sternal setae six in number, subequal and arranged almost in two rows. Genito-epigastric plate large, broader than the distance between the posterior coxae. Anal plate rather small, anterior margin broadly and evenly rounded. Anus large, situated about one-half its greatest diameter from the anterior margin of the anal plate. Paired anal setae situated on a level with the center of the anus; unpaired seta situated at about one-half the distance from the posterior margin of anus to the tip of anal plate. Legs rather stout; posterior pair slightly longer than the anterior pair; second the stoutest and shortest. The femora of second pair of legs are about three-fourths as broad as long.

Length, 1.05 mm.; width, 0.72 mm.

Male.—Not known.

Type host and *type locality.*—From *Microtus pennsylvanicus,* Bronxville, New York.

Type slide.—Cat. No. 951, U. S. N. M.

Described from two females taken by Dr. R. C. Murphy, February 19, 1924, from *Microtus pennsylvanicus* at Bronxville, New York. This species is related to *H. barberi,* new species, but differs from that species in the shape and character of the epistome, in the shape of the anal plate and in a few other characters.

Haemogamasus twitchelli, new species.

Female.—Epistome large, much longer than broad, with conspicuous marginal dentations, most of which are two or three pronged. Chelicerae stout, almost straight and strongly toothed. Dorsal plate almost covering the entire body and well clothed with subequal setae. Sternal plate broader than long; front margin slightly incurved and posterior margin strongly so. Front pair of sternal pores straight slits situated inward and behind the first pair of sternal setae; second pair of sternal pores diagonal slits about midway between the second and third pairs of sternal setae, but not directly between these two pairs of setae. Sternal setae long, slightly curved and arranged in two slightly divergent longitudinal rows. Genito-epigastric plate reaching about half way to anal plate, not as broad as the distance between the posterior coxae, bearing a large number of irregularly placed setae. Anal plate almost circular except for a posterior, median projection which is triangular. Anus with six paired and two unpaired setae; almost at the front margin on the median line is situated the first unpaired seta and slightly in front of the scobinate area on the median line is situated the second unpaired seta; the first paired setae are situated slightly behind the first unpaired one, the second paired setae behind and lateral to the first pair, while the third paired setae are situated laterally from the center of the anus. Last pair of legs the longest and slenderest; second pair somewhat enlarged. The anterior distal margin of each coxa has a minute comb of teeth, but none of them is provided with a toothed spine.

Length, 0.89 mm.; width, 0.51 mm.

Male.—Smaller than the female. Ventral arm of chelicera greatly modified. It consists of an inner and outer process. Inner process a stout, strongly curved, distally bifurcate claw-like structure; outer process much longer than the inner, strongly incurved and ending in a knob. Dorsal arm of chelicera of the usual type, strongly curved at the tip with a slight indication of two or three minute teeth. Galea ending in two subequal knob-like lobes. Third segment of palpus with a stout, simple, curved spine on the inside. Inner spine of last segment of palpus slightly curved and split to its base. Posterior pair of legs not so stout as in the female and decidedly the longest and slenderest of the four pairs.

Length, 0.68 mm.; width, 0.48 mm.

Type host and *type locality.*—From Dawson red-back mouse, *Evotomys dawsoni,* taken at Crater Mountain, Ophir, Alaska.

Type slide.—Cat. No. 952, U. S. N. M.

Described from six females and one male taken by A. H. Twitchell in Alaska; one female and one male (holotype) taken from Dawson red-back mouse at Crater Mountain, Ophir, Alaska, and five females taken from a vole (exact locality?).

This species is very distinct in the peculiar shape of the chelicerae of the male and in having more than three anal setae on the female anal plate.

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PROCEEDINGS

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ANOTHER ANNECTANT GENUS (HEMIPTERA; CIMICOIDEA).

BY W. L. McATEE AND J. R. MALLOCH.

Recently the authors described[1] in the genus *Idiotropus* Fieber, a species intermediate between the families Anthocoridae and Microphysidae as currently defined. The present paper brings to notice another genus which serves still further to show the intermeshing relationships of these groups. Study of the new genus and allied forms shows that the character given considerable weight by Reuter in his "*Heteropterensystem*" (1912, pp. 52, 53) as to whether the meso- and meta- sterna are "composite," that is with a longitudinal "suture," varies with the development of wings in the individual. The character is therefore useless for family groupings. The sterna are not "composite" in wingless forms of the families to which Reuter assigns this character, and we are able to trace the mesofurca, or analogues of it, in most of the families in which he states that it is lacking (e.g. Fig. 7). We are impelled to remark therefore, that insect descriptions would be clarified if the term "suture" were used in a more definite manner. It now covers everything from the fundamental divisions between segments of the insect body to the slightest impressed lines on the segments, especially on those of the thorax. When the chitin is translucent the basal edges of the interior sheet-like attachments for muscles can be seen through it, showing as paler or darker lines, and even these have been called sutures. Over a strong muscle attachment the outer surface may show an impressed line, and in more highly developed structures even a deep invagination.[2] Such dividing lines existing in every stage of development and subject to

[1]Bull. Brooklyn Ent. Soc., vol. 19, No. 3, June, 1924, pp. 70–71, pl. 1, figs. 1–3.

[2]Carinae also arise from related mechanical causes.

modification in the meso- and meta-thoraces correlated with the degree of wing development in individuals of the same species, do not have the importance of the far more stable divisions between segments, and should not bear the same designation. Failure to understand their nature and variability has led to giving them too much weight in taxonomic papers.

In the lack of a pronounced central impressed line on mesosternum and metasternum, and in habitus, the new genus herein described is similar to apterous Microphysids. It agrees, however, with Anthocorids in having 3-segmented tarsi.

The best character amongst those so far advanced for separating Microphysids as a group is the 2-segmented tarsi, but even this, in the light of intergradation of other characters does not seem important enough to warrant recognition of the insects possessing it as a valid family.

Among Anthocorids the new genus may be recognized by the microphysid habitus, and it may be distinguished from the conventional Microphysid by the 3-segmented tarsi.

Coccivora, new genus.

Ventral surface of thorax as in *Myrmedobia,* but the hind margins of mesosternum and metasternum are transverse and flat, without prominent elevations (Fig. 2). The pseudosuture so evident in winged Miridae and Anthocoridae, in the form of a longitudinal impressed line, is almost absent in apterous Microphysids and in the new genus, but is evident at the anterior extremity in cleared examples (Figs. 2, 5). In the structure of the beak we can not distinguish differences in the number of segments in *Myrmedobia*, *Orius* (*Triphleps*), and the new genus. All are 3-segmented if the basal attachment be omitted in counting the segments, or 4-segmented if this is included (Figs. 1, 1a, 1b). The evident differences lie in the lengths of the segments only.

The tarsi are 3-segmented in *Orius* and the new genus, and 2-segmented in *Myrmedobia;* the claws are simple in all three. Antennae in all with four segments, but with additional basal ring segments. Abdomen with seven pairs of spiracles. The male hypopygium in *Coccivora* with a hook bent to one side (Fig. 1), but no long hairs present. Legs without long hairs or bristles. Fore wing as in Figure 4, no distinct membrane evident.

Monobasic, the genotype being

Coccivora californica, new species.

Male and female.—Outline viewed from above racquet-like (Fig. 1), more perfectly so in female; head across eyes as wide as or nearly as wide as thorax at middle, gradually tapered behind eyes, more abruptly nar-

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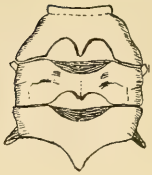

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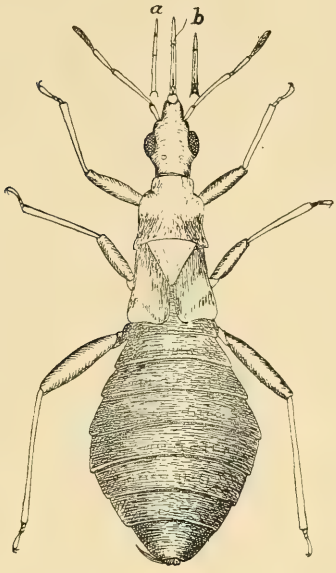

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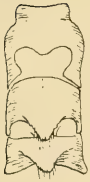

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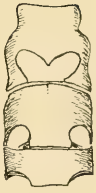

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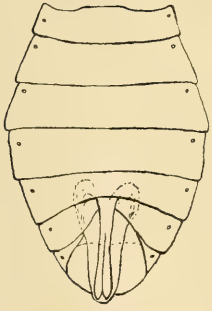

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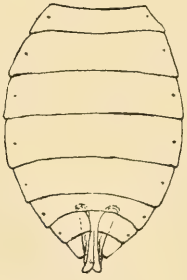

6

McAtee and Malloch on *Coccivora californica*.

rowed in front of them; antennae as long as head and thorax together, basal segment extending about as far anteriorly as the stout, blunt tylus, second segment about twice as long as first, third and fourth longer than first, subequal, the fourth fusiform. Pronotum constricted behind anterior margin, and again behind middle, the portion bounded by these constrictions somewhat tumid, the disc posteriorly flat, the hind angles triangularly elevated and produced posteriorly, the hind margin between them concave. Scutellum isosceles triangular, a transverse impressed line marking off apical third, which is depressed. Tegmen (Fig. 4) ending shortly beyond apex of the broad clavus, somewhat shorter than the pronotum and scutellum together, no membrane. Abdomen ovate. Viewed from below the following additional characters may be noted: Beak flattened dorsoventrally, head convex below, neither it nor the sterna with any groove for reception of beak; coxal cavities well separated, especially the posterior two pairs, the sterna between them convex, showing in uncleared specimens only the faintest indications of a median line. Two spiracle-bearing sternites cleft for reception of female genitalia (Fig. 3); hypopygium of male terminal.

Head and pronotum of male blackish, basal two-thirds of antennal segments 2 and 3 testaceous; scutellum and tegmen also blackish, the latter with a whitish wedge-shaped marking, the apex of which is turned toward inner posterior angle of tegmen, and the base of which is crossed by a narrow longitudinal black line; a lanceolate subapical spot across tegmen somewhat nearer to the inner than to the outer margin. Abdomen fuscous, testaceous basally. Legs testaceous. Females may be much paler, the head and thorax being entirely testaceous except for small areas along lateral margins; basal testaceous portion of abdomen more extensive; sterna sometimes tinged with reddish.

Length, 2–2.5 mm.

Described from numerous specimens collected under bark of Sycamore at Los Angeles, California, by H. M. Armitage. The insects were associated with numerous immature scale-insects upon which they were probably feeding. The scales have been identified by Harold Morrison as *Stomacoccus platani* Ferris.

Numerous nymphs are among the material; they are less spatulate in form than the adults, more reddish in color, and have two-segmented tarsi.

Explanation of Figures.

Fig. 1. Coccivora californica, dorsal view of male. *a.* beak of Myrmedobia tenella. *b.* beak of Orius insidiosus.

Fig. 2. Coccivora californica, ventral view of thorax.

Fig. 3. Coccivora californica, ventral view of abdomen of female.

Fig. 4. Coccivora californica, fore wing.

Fig. 5. Myrmedobia tenella, ventral view of thorax.

Fig. 6. Myrmedobia tenella, ventral view of abdomen of female.

Fig. 7. Saldula sp., ventral view of thorax.

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NOTES ON FOSSIL TERMITES WITH PARTICULAR REFERENCE TO FLORISSANT, COLORADO.

BY THOS. E. SNYDER.

Introduction.

By means of the study of Paleontology—the study of fossils that have been preserved in rocks, and of the fauna and flora that these imply—it is possible to reconstruct the world, not only in our imagination, but also by the arrangement of fossil skeletons of mammals, reptiles and birds grouped in museums and by paintings on canvas, as it existed in prehistoric times. It is also possible to trace geologic time and the evolution of plant and animal life by a study of successive strata of rocks and the fossils embedded in their layers. By means of such fossils and also fossil plants and insects, it is even possible to form an idea as to the character of the climate of the different prehistoric periods.

In those far distant days the fauna and flora of Europe and North America and the world in general were quite different from what they are to-day. There has been an age when reptiles were the dominant form of animal life, preceding the ages of mammals and of man. Species and genera of plants and animals now of an exceedingly restricted distribution or even entirely extinct, were formerly widely distributed.

This is due to the fact that there have been profound changes during the earth's history. The climate of the temperate zone at the present time is much cooler than that which existed through the longer part of the earth's history.

"Prehistoric" Termites.

No insects from the Silurian period are known. The ancestors of our present insect fauna must have had a long ancestry and

doubtless appeared earlier than the last part of the Carboniferous or the coal measures or during the Age of Amphibians and Lycopods. The roaches or Blattidae were among these fossils and are, therefore, among the oldest insects; the Paleodictyoptera of Scudder are the oldest insects (Paleozoic). Indeed, the Pennsylvanian period might be termed the Age of Roaches. These prehistoric insects were not the immediate ancestors of our living species. Termites, while they have a close systematic relationship with the roaches, are younger or more recently evolved. No termites are known from the Mesozoic or the Age of Reptiles, but may have then existed.

Termites have been collected from all deposits from the Lower Tertiary on (Handlirsch, 29); that is from the end of the Age of Reptiles and the beginning of the Age of Mammals. Holmgren (31) states that he believes that both groups, the termites and the Blattidae (the roaches) are offshoots of a more primitive group, the Protoblattidae. The "oldest Blattoideen" occur in the first part of the middle upper Carboniferous (Pottsville, North America); the "oldest Protoblattoideen" in the last part of the coal measures (Allegheny, North America); but the "youngest Protoblattoideen" occur in the Lower Permian formation of Europe (Germany).

Fossil termites are very well represented in the fauna of the Old World, and quite a number have been described from Europe. Many of the best preserved of these have been obtained in Baltic and other ambers—resins from coniferous trees; during the swarm, winged termites were entombed in the resin. Others fell into the shallow water or soft mud of prehistoric lake beds of accumulating fine volcanic ash from dust showers, mud flows—from feeder streams and sand, which, upon drying, hardened into rock. Fossil termites in the highly specialized family Termitidae are not found in Baltic amber! Fossil termites are also found in gum copal, an exudation from a tropical tree (*Trachylobium mossambicense* Klotsch), (a tree still extant and occurring in Africa) geologically, of comparatively recent formation (Pleistocene). The Termitidae or higher termites are well represented in gum copal. (Chart I.)

One might imagine several million years ago twilight on a warm evening in June or July, possibly after a heavy rain, in the Florissant Basin, with fairly large numbers of strong flying large

colonizing termites or "white ants" flitting about near the shores of the lake, seeking in dead coniferous trees, logs or stumps, crevices in which the males and females could establish new colonies. Many of these adventurous winged adults were carried out over the lake by the wind and their romance was ended by falling into the water.

Although they thus perished, their life was not in vain, for to-day they have been exhumed from their tombs in the Tertiary shales and, together with the fossil plants and other animals, they enable scientists to unfold the drama of the period in which they lived. The story is incomplete, indeed, far from a Pepys's diary, but there is sufficient to show the general topography and the mountain fauna and flora of the region.

Conditions in the Rocky Mountain Region in the Tertiary Period and To-day.

The Miocene shales of Florissant, Colorado, in North America have yielded many fossil termites. Fossil termites, as well as other animals and the plants, found in both the Tertiary beds at Oeningen and Radoboj in Europe and during the (upper?) Miocene epoch at Florissant, Colorado, indicate that the climate of these localities must have been very much warmer at that period than at present.

At Florissant, for instance, during the early Tertiary period, the vegetation was almost subtropical—including the fig and magnolia. The majestic redwood tree (*Sequoia haydeni* (Lesquereaux)) and incense cedar (*Heyderia* or *Libocedrus coloradensis* Cockerell) also occurred at Florissant during Tertiary times. The fossil termites and other insects of Florissant suggest a warm climate, such as that which is to-day found in the southwestern states, adjacent to the Mexican border. A fig insect has also been found in Florissant shales by Brues (5), apparently of the South American genus *Tetrapus* Mayr.

Prof. Cockerell believes that at Cathedral Bluff (west of Rifle, Colo.) fossil termites might possibly be found in older strata—Eocene; so far termites have not been found in the Eocene in Colorado. To-day the Rocky Mountain region of Colorado is in the Transition and Canadian Life Zones, although also containing Hudsonian, Arctic and Upper Sonoran. Florissant, notwithstanding its elevation of 8,193 feet above sea level, be-

longs to the upper part of the Transition Zone (Cockerell, 10). The fossil termite fauna, together with many of the fossil plants at Florissant, indicate that in the Miocene epoch of the Tertiary period this region must have been in the Lower Austral. Probably, however, the climate was more humid than the Sonoran or arid portion of the Lower Austral.

At Florissant, Colorado, the living *Sequoia* tree does not now exist; this tree disappeared with the decrease in humidity, during the later Tertiary period. No scrub oak and also, no living termites occur; the elevation is too great. Spanish Bayonet occurs on warm sites—sunny hillsides—at Florissant and elsewhere in Colorado.

Termites do not occur even on mountains in Arizona at such a great altitude as Florissant (8,193 feet), although colonies of *Reticulitermes tumiceps* Bks. occur sparsely at an elevation of 8,200 feet on the northern rim of the Grand Canyon, at Bright Angel Pt. In the Rocky Mountain region of Colorado 7,000 feet is approximately the altitude above which colonies of *Reticulitermes tibialis* Banks,—which is to-day the only living termite in Colorado,—are not found.

It is interesting to study the history of the redwood or *Sequoia* tree and its past and present distribution. To-day, there are only two living species, *S. sempervirens* (Lamb) Endlicher and *S. washingtoniana* (Winsl.) Sudworth; the latter of these trees is almost entirely restricted to the coast mountains and the former to Sierras of California; the coast species extends a few miles into Oregon. Thus there has been a gradual retreat until the present isolated groves are all that remain. Glaciers, fire, man and insects have greatly decimated their numbers.

In the vicinity of living *Sequoia* forests of to-day four species of termites occur; three of these species have been found living in the sapwood of this tree, namely *Termopsis angusticollis* Hagen, *T. nevadensis* Hag. and *Reticulitermes hesperus* Bks. Another species of *Reticulitermes* (*tibialis* Bks.) occurs in the same region in which the redwood (*S. sempervirens*) grows, but has not as yet been found infesting the wood of this tree.

Although grand and majestic to-day, towering above all other trees in the forest, in their past history they have played a more dominant rôle.

Berry (4) states that: "During the three to five million years

of Cretaceous time the sequoias had flourished and become widespread." * * * "Remains of sequoias from the lower beds of the Cretaceous have been found in western Europe, in Spitzbergen, in Texas and in the eastern United States. In slightly more recent deposits we find them in Greenland, Canada, in the Black Hills and in Montana. By the middle of the Cretaceous we find over a dozen different species spread over the United States, with still others in Greenland and in central and western Europe." * * * "The warm humid climate of the period seems to have been favorable for their development." * * * "The Miocene witnessed the zenith of sequoia development." * * * "Their remains are everywhere." * * * "The interval between the close of the Miocene and the modern sequoias is imperfectly known. Climates were becoming cooler." * * * "The sequoias were on the wane." * * *

In prehistoric ages the distribution of the *Sequoia* or "redwood"—our oldest and tallest North American evergreen or coniferous tree—extended over Asia, Europe and over much of North America; fossils of this tree have been found within the Arctic Circle. "Remains of at least two sequoias from which our species descended have been found in the Cretaceous and Tertiary periods, during which time they lived in the Arctic Zone," (Circle) (Sudworth, 51). However, the sequoias did not live in an Arctic climate!

Evidences of the former wide distribution of the *Sequoia* over North America are found to-day. Remnants of this tree occur in the petrified forests of Arizona and a large fossil stump of Sequoia is located near "Lake Florissant," a Miocene Lake-Bed of a Tertiary Lake in which the Florissant shales were deposited. Cockerell (8) figures this stump. Nearby, one may collect the fossil remains of its plant and insect associates of far distant days.

In the later (upper) Miocene epoch, the *Sequoia* trees made their last stand in what is know to-day as the Rocky Mountain Region. In the vicinity of Florissant, they grew, probably not in dense forests but as scattering trees, about the borders of the ancient lake where the climate was moist but warm. The lake was surrounded by mountains, some of which possibly were active, explosive volcanoes (Cockerell, 14). In this event, if there were a continual throwing up of clouds of dust, in settling

this would probably soon kill the *Sequoia* trees, since conifers can not withstand a clogging of the stomata of the leaves,—which results in suffocation. The climate became colder and more dry—too dry for *Sequoia* in the later Tertiary.

The writer has a specimen of a large winged adult fossil termite, probably *Parotermes scudderi* Cockerell, embedded in Florissant Miocene shale; these shales are wholly composed of volcanic sand and ash from a nearby source. In this identical specimen of shale—at a corresponding depth and on the same surface are embedded small twigs of *Sequoia*. These twigs were deposited at approximately the same time as the termite. *Parotermes* has no living representative and is an extinct genus. Twigs of *Sequoia* occur throughout the layers of this specimen of shale—on both faces; the specimen of shale is 4 mm. in thickness. At the time the shales were deposited the climate was warm but moist.

Arid conditions could have existed beyond this lake—which was in a deep, long, narrow valley (elevation unknown but lower than at Florissant to-day)—and its surrounding mountains on the plains. Old World (African) termites—species of ?*Hodotermes* Hagen or closely similar primitive termites—were present with the tsetse-fly (four species of *Glossina*) now exclusively African, indicating invasion of fauna from Eurasia. This is interesting in connection with the introduction of African mammals (*Mastodon*) into the Miocene of North America (Osborn, 37). Finally the lake was drained by shifting of the land and there came about an increasing aridity and lengthening droughts.

This would render an adaptation to such arid conditions necessary for survival. To-day species of *Hodotermes* (l. s.) and "*Eutermes*" Fritz Müller are so adapted; living species of "*Eutermes*," now placed in *Tenuirostritermes* Holmgren, a subgenus of *Nasutitermes* Banks, inhabit arid plains in southwestern Texas; surviving peccaries and the armadillo live in the same general region. In Arizona, a species of *Tenuirostritermes*, namely *tenuirostris* Desneux, occurs in the foothills and canyons of the Santa Catalina Mountains, where conditions are more or less desert-like.

With the draining of the Tertiary lake and general conditions of drought, the *Sequoia* tree doubtless made its last stand around the borders of Lake Florissant.

Similar conditions were caused by the slow reduction in size and gradual drying up of the ancient Lake Bonneville, to the present Great Salt Lake, which, however, was due to the increasing aridity of the country.

It is more probable that the fossil termite described by Scudder (47) as *Hodotermes? coloradensis* was a species more primitive and more generalized than *Hodotermes* of to-day. Von Rosen (52) has erected a new genus *Miotermes* for European fossil species, formerly considered to be *Hodotermes*, and places *coloradensis* in *Miotermes*. To the present writer it seems more probable that the species *H. ? coloradensis* was similar in habit to the primitive termite species of *Termopsis* Heer and *Archotermopsis* Desneux, rather than to *Hodotermes* Hagen, with its highly specialized worker caste adapted for foraging above ground in the sunlight, as do the dominant ants. Species of *Termopsis* have no true worker caste and apparently *Archotermopsis* likewise has none. But these termites possess a pigmented, worker-like third form reproductive type; these species are also adapted to mountain life, often being found at high altitudes, where the logs which they inhabit are covered with snow and ice for long periods of winter cold.

If a *Hodotermes*, it is odd that the worker is not found as a fossil! Also if a *Hodotermes*, it is very probable that this worker caste was developed in the late Tertiary period, in case of certain of these large primitive termites and was the factor that enabled them to survive.

None of the fossil termites are more generalized or more primitive than living termites. Indeed, a living species of the genus *Mastotermes* Froggatt of Australia is the most primitive; this termite has a wing structure similar to the roaches, and the egg mass is in an oötheca, indicating at least common ancestry. However, species of *Mastotermes* have also been found fossil in the Tertiaries of Great Britain (Von Rosen, 52). Nevertheless, in prehistoric times, there were naturally a greater prevalence of primitive termites than at present.

In the vicinity of the fossil forests of central eastern Arizona, termites of the same genus "*Eutermes*"—*Nasutitermes* Banks which occur as fossils with cones of Sequoia at Florissant, *may* occur living to-day. However, this is doubtful; unfortunately,

the writer has no termite specimens from the petrified forests of this section of Arizona.

The present termite fauna of southern Arizona, however, is numerous and rich in species; 14 species and 1 variety occur, representing 6 genera. The same number of species occur in Texas, but one more genus is represented. The southwestern portion (Sonoran) of the United States to-day has a larger number of termites in its fauna than any other section of this country. It is interesting to note that no living termite extends its range from coast to coast—across the continent.

On the following pages will be given an account of: The fossil termites of Florissant; the present meagre termite fauna of the Pikes Peak region of Colorado; the present geographical distribution of living species in the termite genera represented at Florissant by fossil species and of species of the two primitive genera *Termopsis* Heer and *Kalotermes* Hagen, which while they have not as yet been recognized as occurring in Colorado either as fossil or recent species, for the sake of comparison these latter genera will be treated here.

Genus **Kalotermes** Hagen.

This primitive genus is closely related to the genera *Termopsis* Heer and *Hodotermes* Hagen. Ocelli are present—a primitive character. Hagen considered *Kalotermes* to be the most primitive genus known in 1858. No fossil termites as yet have been found at Florissant, Colo., which are considered to belong in this genus. Fossil species of *Kalotermes* occur in the Tertiaries of Europe.

The living species of *Kalotermes* all have a southern habitat. To-day species of *Kalotermes* are restricted to the southern portions of North America; occurring in southeastern United States—north to Cape Henry, Va.; in southwestern United States (Texas, Arizona and southern California); also in Mexico and Lower California. The region in the vicinity of San Francisco is the northern limit of species of this genus on the Pacific Coast. The Siskiyou range of mountains, which is unusual in that it runs east and west, together with the colder climate is probably the barrier that prevents their extension into southern Oregon. This mountain range shuts off many southern insects from Oregon.

A very primitive and the largest known species of *Kalotermes*, namely, *K.* (*"Termes"*) *occidentis*, was described in 1853 by Walker from the West Coast of Central America. One of the types is in the British Museum, another in the Museum of Comparative Zoology at Cambridge, Mass. This termite has recently been found in Lower California on Angel Guardia Island, in the Gulf of California and in the Santa Catalina Mountains of

southern Arizona. Every specimen of soldier which has been found has vestiges of wings or rudimentary wing pads. This is a primitive or ancestral character; or a reversion to the time when all social insects were winged and there were no sterile worker or soldier castes. Holmgren (31) established a new subgenus (*Pterotermes*) for this termite.

Soldiers of other primitive termites have commonly been found with these vestigal wings, but only a very small proportion of the soldiers of any colony were so characterized. No other termite except the large primitive *Kalotermes occidentis* has been found in which all the soldiers in a colony have such wing pads.

Genus **Termopsis** Heer.

This genus was established by Heer for a fossil termite from the Miocene of Croatia, and Banks (1) considers *T. insignis* Heer to be the genotype. Von Rosen (52), however, places *insignis* in *Miotermes*. Another fossil species of *Termopsis* described by Cockerell (22) as *Termopsis? swinhoei* is from "burmite" or Burmese amber; "the stratum in which the amber is found is *Miocene*." Cockerell later (24) believed this amber to be older than Miocene. This species resembles *Termopsis? procerus* Heer, now the genotype of *Miotermes* Von Rosen. Hagen described as *Termopsis* three species from amber, i. e., *T.? bremii* Heer (placed in *Xestotermopsis* n. gen. by Von Rosen), *gracilicornis* Pictet and *deciduus* Hagen; Von Rosen believes all three represent but one species.

The only living species of *Termopsis* are three from North America; their distribution is rather limited. *Termopsis angusticollis* Hagen occurs along the coast in British Columbia, Washington, Oregon and California. A closely related species *T. nevadensis* Hagen occurs in British Columbia, Washington, Montana, Oregon, California and Nevada. As previously stated, both of these species of *Termopsis* are able to live at high altitudes and in regions where snow and ice cover the logs which they inhabit for long periods of winter cold. In this respect they are unlike most species of termites. According to Imms (34), *Archotermopsis wroughtoni* Desneux has similar habits in the Garwhal Himalayas (India).

T. laticeps Banks, a more distinct species, however, is confined to two southwestern states, i. e., Arizona and New Mexico.

It has been shown that no species of *Termopsis* either recent or as yet as fossils has been found in Colorado. It is possible, however, that fossil specimens occur at Florissant. Von Rosen believes *Parotermes insignis* Scudder to be a *Termopsis*.

Species of *Termopsis* are our largest living North American termites; they are also the most primitive Nearctic species. The genus *Termopsis* is more primitive than the genus *Kalotermes* Hagen, because the contained species are not as well defined in *Termopsis* as in *Kalotermes*. In the latter genus, some species are very distinct and the species are more numerous. In species of *Kalotermes* there is a reduction in the number of antennal joints. However, ocelli are present in *Kalotermes* and absent in *Termopsis;* the presence of ocelli is a primitive character.

Genus **Hodotermes** Hagen.

The genus *Hodotermes* (l. s.) is both recent and fossil. The species of this rather primitive genus, at present in the same subfamily as the genus *Termopsis* Heer, the *Hodotermitinae* Holmg., are grass or leaf-cutting termites but in their structure and pigmentation they show a progressive development. While they nest in subterranean galleries, they are termed "wander-termites," since both the workers and soldiers of some of the species are darkly pigmented, have faceted eyes, long legs and forage above ground exposed to the light. It is unusual for a generalized primitive termite to have a true worker caste and C. Fuller of South Africa believes that the worker caste has later been lost in the less primitive *Kalotermitidae* (*Termopsis*, *Kalotermes*, etc.). The presence of this highly specialized worker caste indicates that *Hodotermes* should be in a distinct family the *Hodotermitidae*.

Considering *Hodotermes* as being classified in the family *Kalotermitidae* where the worker caste is absent, it was believed that this worker of *Hodotermes* might prove to be an apterous third form reproductive type. The late Dr. (Miss) C. B. Thompson, Professor of Zoology at Wellesley College, Wellesley, Mass., was inclined to this view, from a study of the brain and eyes of two types of workers in *Macrohodotermes* (*Hodotermes*) *mossambicus* Hagen (?), but was unable to thoroughly study the sex organs due to lack of fresh material and hence could not confirm or disprove this. However, a superficial study indicated to Miss Thompson and the writer that these forms were sterile and not reproductive forms; the optic lobe is small, as is normal in the worker caste.

Furthermore, Fuller has kindly sent to the writer specimens of a yellowish, apterous caste, larger than the worker, that is found with species of *Macrohodotermes* Fuller; this caste has black pigmented eyes and may be a third form reproductive adult.

It is interesting to note in connection with the studies of blind animals that these workers of the diurnal, wandering termite *Hodotermes*, which forage for themselves above ground in the sunlight, have a deep body pigment and both compound (faceted) and simple eyes (ocelli). The apterous, ergatoid reproductive caste in termites which live entirely in underground galleries or hidden in tunnels in wood,—such as in species of the genus *Reticulitermes* Holmgren of subterranean habitat—have but little body pigment and have only traces of eyes.

An apterous queen of *Hodotermes* (*Anacanthotermes*) *ahngerianus* Jacobs. of Turkestan is figured by J. V. Vasiljev (Revue Russe d' Entomologie XI, 1911, pp. 235–245). The color of the head is brown and the eyes are black-brown.

Approximately two dozen living species in the genus *Hodotermes* (l. s.) occur in Africa (reaching furthest north in Egypt), Transcaspia, Turkestan, Persia and India.

No living species in the genus *Hodotermes* occurs at Florissant, Colo., or anywhere else in America, but as previously stated fossil species, doubtfully in this genus, have been found at Florissant.

The four fossil species of this genus found in Europe are *Hodotermes? procerus* Heer and *H.? haidlingeri* Heer, from Radoboj; also *H.? spectabilis* Heer and *H. insignis* Heer from Oeningen; all are placed in *Miotermes* by Von Rosen. In America at Florissant, Colo., *Hodotermes? coloradensis* Scudder occurs in Miocene shale. In the case of the species *coloradensis*, as other species, it is doubtful if this is a *Hodotermes;* however, it is a primitive species of huge size. Cockerell (19) states: "The presence of the subcostal (sub-marginal) vein, which was supposed to separate *Paroter-mes* from *Hodotermes*, is not diagnostic, this vein being present in true *Hodotermes.* It is *Porotermes* [Hagen], formerly considered a subgenus of *Hodotermes*, which has the subcosta absent or rudimentary. * * * The indications are, then, that *Parotermes* differs little from *Hodotermes*, so that it may be a matter of opinion whether it is really separable. * * * Its (*Hodotermes*) occurrence at Florissant affords a case parallel to those of the Nemopterids and Nemestrinids."

Cockerell described a new species from Miocene shale at Florissant, *Parotermes scudderi*, which is of great size and has the subcostal vein well developed and the abdominal appendages very small. The termite described by Scudder from the Florissant shales as *Hodotermes? coloradensis* is of great size and has unusually long abdominal appendages and the subcostal vein is totally absent. "It is therefore apparently not a true Hodotermes" (Cockerell, 19).

It is not definitely known whether the sections of all the countries which the living species of the genus *Hodotermes* (l. s.) inhabit are arid or humid; probably, however, they are usually arid and desert-like. The habit of these termites of wandering above ground in the sun is indicated by the true (faceted) eyes of the soldier and the worker.

The records written by fossil termites are at best very imperfect! While it has not been proved that *wingless* termite castes occurred in the Tertiary period, they doubtless occurred and were probably evolved during the late Cretaceous period. Polymorphism among the social insects may not have been as highly developed as at present, especially in the case of the reproductive forms, but it can not be stated that the sterile castes and colony or social habits developed *since* Tertiary times because of lack of fossil forms. Due to their habits, such sterile forms would be less liable to be preserved as fossils. Both mandibulate soldiers and nasuti have been found embedded in gum copal from the Pleistocene period.

Genus **Parotermes** Scudder.

Parotermes Scudder is a genus established from fossil termites alone and is peculiar to the American Tertiaries of Colorado; there are no living representatives; the genotype is *insignis* Scudder. The genus is closely allied to *Hodotermes, Termopsis* and *Kalotermes.*

At Florrisant, Colo., four species have been found, namely *Parotermes insignis* Scudder (placed in *Termopsis* by Von Rosen), *hagenii* Scudder, *fodinae* Scudder (both placed in *Kalotermes* by Von Rosen) and *scudderi* Cockerell. The replacement of some of these American species in this new fossil genus is doubtful; they might easily be assigned to recent genera.

Cockerell (19) states that *Parotermes* differs little from *Hodotermes* and may not be really separable.

Genus "Eutermes" Fritz Müller.

In the genus "*Eutermes*"—which has by recent classification been divided into several subgenera of the genus *Nasutitermes* Banks—the soldiers or "nasuti" have a nose-like process of the head, a nasus or "beak." The mandibles are merely vestigial or absent, but from this nose-like process is secreted a viscous fluid, which serves as a means of defense.

This genus is represented by both fossil and recent species. *Eutermes? obscurus* Heer and *E.? croaticus* Heer occur in the Radoboj of Europe; Von Rosen believes that they are in the family Termitidae. In the Miocene of Europe also occurs *Eutermes fraasi* Von Rosen; this is considering the genus "*Eutermes*" in its broad sense (s. l.), not in the more recent restricted meaning (s. str.).

In the Miocene of Florissant, Colo., occur two species, namely, "*Eutermes*" *fossarum* Scudder and "*E.*" *meadii* Scudder. Of these two species it may be said that their position in the present genus "*Eutermes*," that is, that they are either species of *Nasutitermes* Banks or *Tenuirostritermes* Holmgren, is doubtful.

According to Von Rosen "*Eutermes*" *meadii* might be a species of *Leucotermes* Silvestri close to *L. Hartungi* Heer from Oeningen. In a subgenus of *Leucotermes*, *Reticulitermes* Holmgren, a species to-day occurs in Colorado, namely, *R. tibialis* Banks. The present writer is unable to place *meadii*. The genus *Leucotermes* is not so highly specialized, as is "*Eutermes*" (s. l.). "*E.*" *fossarum* Scudd. is without doubt, even if not a "*Eutermes*," that is *Nasutitermes* (s. str.), one of the higher more specialized termites, not to-day represented by living species in the Rocky Mountain region. An examination of the type by the writer showed that the third joint of the antennae is apparently longer than the second or fourth, and that the wing scale is short, so it may really be a *Tenuirostritermes*,—species of which to-day occur in Arizona and Texas.

Living species of "*Eutermes*" (i. e., *Nasutitermes* or *Tenuirostritermes*) inhabit both humid and arid regions. The Lower Austral (Sonoran region) of Texas and Arizona is the present habitat of species of *Tenuirostritermes* in the United States. Living species of "*Eutermes*" (both *Nasutitermes* and *Tenuirostritermes*) occur in the West Indies or Antilles but not in either Florida or southern California; both these regions have, however, an environment *apparently* favorable.

Of course, the islands of the West Indies have a more diverse topography —including high mountains—than has Florida. Possibly the absence of these termites may be explained by disconnection by submergence in the Tertiary period of Florida and California from the extensive Niobrara Basin, when animals of this basin were moving southward due to the coming colder climate; or, previous to this change in climate, they had invaded the Florissant Basin from more southerly regions. Florida was probably elevated and definitely connected with North America towards the end of the Miocene (Dall, 25).

On the other hand, the presence of species of *Nasutitermes* "*Eutermes*" on the islands of the West Indies may be explained by a connection with the mainland through Yucatan, in the Tertiary period.

However, cycads,[1] which occur as Tertiary flora, to-day are living in Florida.

It is very difficult to generalize because of the doubtful identity of many of the fossil termites.

Summary and Conclusions.

It is evident from the foregoing that during the Tertiary period there was a relatively larger proportion (more genera) of primitive termites than of the higher species at Florissant, Colo., and than there is at present in North America. The same is also true of the termites of the Tertiaries of Europe. But none of the Florissant fossil termites exhibit exceptionally primitive characters except *Hodotermes? coloradensis* Scudder. The large size, the great length of the abdominal appendages (cerci), and wing venation of this termite are distinctive. Species of *Parotermes* Scudder are also characteristically primitive termites. The "excessive area of the externo-median vein, and the course of the latter, which is approximated much more closely than usual to the scapular vein and emits branches having an unusual longitudinal course" (Scudder, 47) are unusual.

Certain living termites—species of *Mastotermes* Froggatt of Australia, *Archotermopsis wroughtoni* Desn. of India—are generalized, primitive termites. Both of these genera are found as fossils.

In North America *Kalotermes occidentis* Walker—the largest species of *Kalotermes*—and species of *Termopsis* Heer, exhibit primitive characters. *K. occidentis* shows evidence—in the soldier with wing pads—of reversion to the winged ancestral condition when there were only the winged sexual adults.

Although there were a relatively larger proportion of the lower termites than higher at Florissant than at present found in North America, there were also representatives of the higher termites, such as species of "*Eutermes*" Fritz Müller. The presence of these termites—and *E. fossarum* Scudder from the Miocene appears to be a species of the subgenus *Tenuirostritermes*, genus *Nasutitermes*—indicates a warmer, more arid climate during the Tertiary period.

This, however, need not conflict with the presence of the humidity-loving *Sequoia* tree as a Miocene fossil at Florissant.

Species of *Tenuirostritermes*, while confined at present to the Sonoran portion of the Austral zonal region of the United States, are present in the more humid Antilles.

While there are no authentic paleontological records of termites before the Tertiary, Wheeler has stated (55) that "in all probability the termites, like the ants, reached their complete structural and social development in the late Cretaceous or early Tertiary and have since undergone very little modification."

[1] Zamia spp.

Fossil soldier and worker termites (sterile castes) have been found in gum copal, a resin which is of comparatively recent formation (Pleistocene). However, it is not probable that there was the elaborate polymorphism during the Tertiary period that exists to-day; this is especially true in the case of the reproductive forms, where polymorphism has probably come about since the Tertiary.

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GEOLOGICAL AGE AND GEOGRAPHICAL LOCATION OF DEPOSITS.

Middle Eocene Burmite, Burmese amber.	Upper Eocene Bartonian Bagshot Beds, Bournemouth, Hampshire, England.	Upper Eocene or Lower Oligocene Baltic Sea amber.	Middle Oligocene Brunstatt in Elsass.	Middle Oligocene Gurnet Bay Isle of Wight Bembridge limestone, England.	Upper Oligocene Rott, Rheinlande.	Upper Oligocene Bunzlau, Schlesien.	Lower Miocene Radoboj, Croatia.	Miocene Randeck, Würtemberg.	Miocene Shale Florissant, Colo., North America.	Upper Miocene Oeningen, Baden.	Upper Miocene Gabbro, Italy.	Pleistocene Gum copal, Africa.
FAMILY, SUBFAMILY, GENUS AND SPECIES, ISOPTERA.												
						MASTOTERMITIDAE.						
	Mastotermes bournemouthensis Von Rosen			*Mastotermes anglicus* Von Rosen		*Mastotermes (Hodotermes) heeriana* Assmann	*Mastotermes croaticus* Von Rosen					
				Mastotermes batheri Von Rosen		*Mastotermes (Termopsis) heeri* Goepp.						
						KALOTERMITIDAE.						
						HODOTERMITINAE.						
					"*Hodotermes*" sp. Von Rosen		*Miotermes ("Termes") procerus* Heer *Miotermes ("Termes") haidlingeri* Heer	*Miotermes randeckensis* Von Rosen	*Miotermes (Hodotermes) coloradoensis* Scudder	*Miotermes ("Termes") insignis* Heer *Miotermes ("Termes") spectabilis* Heer		
					Ulmeriella bauckhorni Meunier [1]							
		Xestotermopsis (Termopsis) bremii Heer										
		Archotermopsis tarquinii Von Rosen							*Parotermes scudderi* Cockerell *Termopsis (Parotermes) insignis* Scudder			
Termopsis zuninhoei Cockerell												
	Proelectrotermes (Kalotermes) berendtii Pictet											
	Electrotermes (Kalotermes) affinis Hagen *Electrotermes (Kalotermes) girardi* Giebel											
						KALOTERMITINAE.						
					Kalotermes rhenanus Hagen (2 species represented?)				*Kalotermes (Parotermes) fodinae* Scudder *Kalotermes (Parotermes) hageni* Scudder	*Kalotermes oeningensis* Von Rosen	*Kalotermes boaniaskii* Handlirsch	*Kalotermes (K.) recinatus* Von Rosen (MS) Gold Coast. Imagos. *Kalotermes (K.) erythraea* Von Rosen (MS) East Africa. Imagos. *Kalotermes (K.)* sp. (without pulvillus). German East Africa. Imagos. *Kalotermes (Neotermes)* sp. = *pallidicollis* Sjöst.? East Africa. Imagos. *Kalotermes (Cryptotermes) batheri* Von Rosen (MS) (= *brevis* Walker?) East Africa. Imagos *Kalotermes (Glyptotermes) pusillus* Heer. Gold Coast, East Africa, Sansibar. Imagos.
						RHINOTERMITIDAE.			*Leucotermes ("Eutermes") meadii* Scudder	*Leucotermes ("Termes") hartungi* Heer		
	Leucotermes (Reticulitermes) antiquus Germar *Leucotermes (Reticulitermes) borussicus* Von Rosen *Leucotermes (Reticulitermes) robustus* Von Rosen											*Coptotermes* 3-4 sp. Various localities. *Rhinotermes* sp. = *Rh. lamanianus* Sjöst.? Sansibar.
						TERMITIDAE.						
							"Termes" croaticus Heer *Termes gigandeus* Heer			*"Termes" buchii* Heer		*Termes (T.) amicus* Von Rosen. East Africa. Minor soldier and worker. *Termes (T.)* sp. = *goliath* Sjöst. German East Africa. Major soldier.
							Odontotermes ("Eutermes") pristinus Charpentier					*Odontotermes* 2 sp. Gold Coast, German East Africa. Imagos.
							"Eutermes" obscurus Heer		*"Eutermes" fossarum* Scudder	*"Eutermes"* (l. s.) *fraasi* Von Rosen		*Microtermes* sp.? East Africa. Imagos. *Eutermes (Trinervitermes) handlirschi* Von Rosen (MS). Gold Coast. *Eutermes (Trinervitermes)* sp. Sansibar.
												Miratermes recinatus Von Rosen. East Africa. Imagos. *Miratermes* sp. East Africa. Imagos.
												Microcerotermes (Eutermes) debilis Heer. Imagos. *Microcerotermes latinotus* Von Rosen (MS) East Africa. Imagos. *Microcerotermes* sp. East Africa. Worker.
						ISOPTERA INCERTAE SEDIS.						
	"Termes" rutafi Meunier (Worker?) ("*Termes*")—Burmeister ("*Termes*")—Guérin ("*Termes*")—Schlotheim ("*Termes*")—Smith	("*Termes*") Förster							*"Eutermes" sp.* Scudder (worker?) *"Eutermes"* sp. Scudder	("*Termes*") ? species Schüberlin *"Termes"* sp. Scudder		

[1] Cockerell and Snyder, Proc. Biol. Soc. Wash., Vol. 38, p. 86.

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