

more than four hours old and generally two were used. Results obtained were as follows: The figures indicate the number of days required for pupation.

Constant Temperature			Alternating Temperature (Alternated every 24 hours)		
Temper- atures	Relative Humidity		Temper- atures	Relative Humidity	
	60%	40%		60%	40%
15°	30	33	20°, 30°	10	—
20°	14-16	—	25°, 35°	7	8
25°	9	13	15°, 25°	13	20
30°	6-7	—	15°, 30°	11	—
35°	6	7			

Pupae exposed to alternating temperatures generally developed somewhat faster than would be predicted from their development rate at constant temperatures.

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Biological Notes and New Records of North American Chermidae (Homoptera).

By F. D. KLYVER, San Mateo Junior College, San Mateo, California.

The writer is indebted mainly to the following individuals, to each one of whom he here wishes to express his thanks, for the material on which the following new North American Chermidae (Psyllidae) records are based: Professor G. F. Ferris, Stanford University; Dr. P. N. Annand, Sugar Beet Insect Investigations, United States Bureau of Entomology; Mr. G. F. Knowlton, Agricultural Experiment Station, Logan, Utah; Mr. V. E. Romney, United States Bureau of Entomology, Mesilla Park, N. M.; Mr. H. H. Keifer, Curator Entomology Laboratory, California State Department of Agriculture; Mr. L. E. Myers, State Plant Board, A. & M. College, Mississippi; and Dr. Carl D. Duncan, Stanford University.¹ The biological

¹ Additional new records are to be found in the following papers by the writer: Chermidae From Utah, Nevada, and Arizona, Including Three New Species: *Pan-Pacific Entomologist* 7:131-143, 157-158; January, 1931. New records and Two New Species of Chermidae from British Columbia and Washington, With Biological Notes: *Pan-Pacific Entomologist* 8:11-17, July 1931.

notes here included are, with very few exceptions, based upon field observations made by the writer in California and Nevada during the past two years.

HOST PLANT RELATIONSHIPS OF THE CHERMIDAE

Since there apparently exists at the present time no definite statement of chermid host plant relationships it seems desirable to suggest the following criteria.

With very few exceptions the individual species of Chermidae have not been demonstrated to have as hosts any but closely related plant species, in the sense that a host is defined as a plant upon which the insect feeds at some stage of its existence. In the majority of cases definite proof of such feeding exists only for the nymphs, in fact, it apparently remains to be definitely proven that the adults feed at all. *Paratrionza cockerelli* is known to feed in its nymphal stages on a number of widely separated host plants.

Many chermid species have been taken as adults from an almost infinite variety of plants and these plants have been recorded as hosts, although there exists no evidence that the insects actually feed upon them, the plants perhaps serving more or less accidentally merely as shelters. For the purpose of emphasizing the biological connections, the term *host* is here restricted to plants upon which the insect is actually known to feed, as proved by the presence of the nymphs, while the expression *nominal host* is used to designate a plant from which a chermid has been taken without proof of its feeding upon that plant. Field observations indicate that the adults of certain species of chermids are found predominatingly on different plants at different times of the year. When proof is available that these adults actually feed upon different plant species, the plant upon which a chermid feeds as an adult but does not produce its young may be called an *alternate host*.

RECORDS AND BIOLOGICAL NOTES.

Sixty species, approximately one-third of the total number considered by Crawford in his monograph of the Chermidae of North America, are here included.

LIVIA CARICIS Crawford. IDAHO.—Adults only: from unknown host, wet meadow, near Craters of the Moon, June 29, 1930 (Annand); from unknown host, Craters of the Moon, same date (Annand). UTAH.—Adults only: from unknown host, Logan, April 20, 1927 (Knowlton); from unknown host, Richmond, April 29, 1927 (Knowlton). Host: Unknown.¹ Nominal Hosts: *Carex* spp.

APHALARA CALTHAE (L.) CALIFORNIA.—Adults and nymphs: from *Polygonum ariculare*, Winters, October 22, 1929 (Annand). Nymphs only: from herbarium specimen of *P. muhlenbergii*, 8 miles from Dos Palos, May 15, 1931 (Duncan and Merson). Adults only: from *Baccharis viminea*, Corral Hollow, 10 miles southwest of Tracy, November 4, 1929 (Annand); from *Atriplex*, north of Tracy, October 12, 1929 (Annand); from pear trees, Hood, Sacramento County, April 15, 1931 (Keifer); from *Salix*, Corral Hollow, November 30, 1929²; from *Salix*, south of Tehachapi, Kern County, April 13, 1930. IDAHO.—Adults only: from unknown host, Ketchum, July 20, 1930 (Annand); from unknown host, Alturas Lake, Stanley Basin, July 19, 1930 (Annand).

NEW MEXICO. Adults only: from *Salsola pestifer*, 3.1 miles southeast of Mora, July 16, 1929 (Romney). UTAH.—Adults only: from weed, Hooper, October 14, 1927 (Pack: Knowlton). Host: *Polygonum*. Nominal Hosts: *Caltha palustris*, *Artemisia tridentata*, *Salsola pestifer*, cultivated tomatoes, weeds.

The nymphs occur singly on the younger growth, particularly the ventral side of the leaves, unaccompanied by conspicuous wax secretion.

APHALARA RUMICIS Mally. NOVA SCOTIA.—Adults and nymphs: from *Rumex*., no locality data, no date (W. H. Britain).

Host: *Rumex*. Nominal Hosts: *Rumex altissimus*, *Sophia pinnata*.

Biological data lacking.

APHALARA SUAEDAE Crawford. CALIFORNIA.—Adults and nymphs: from *Suaeda*, Altamont Pass, east of Livermore, October 12, 1929 (Annand); from same host, south of South Dos Palos, December 6, 1929; from same host, Altamont Pass, November 30, 1929; from unrecorded host, Visalia, October 20, 1930 (Keifer: F. T. Scott); from *Suaeda*, Salt Wells Canyon,

¹ No biological data are given for species the nymphs of which are unknown.

² Specimens recorded without the collector's name were collected by the writer.

Inyo County, April, 1924 (Ferris). NEVADA.—Adults and nymphs: from *Dondia intermedia* (?), Moapa Valley, 4 miles east of Glendale, April 18, 1930 (Annand). NEW MEXICO.—Adults only: from *Lepidium alyssoides*, 16.5 miles southwest of Alamogordo, July 3, 1929 (Romney); from *Artemisia wrightii*, 6 miles west of Mule Creek, August 8, 1929 (Romney). TEXAS.—Adults only: from *L. alyssoides*, 1 mile north of Almo Alto, December 13, 1930 (Romney). UTAH.—Adults only: from beets, Delta, June 24, 1927 (Knowlton). Hosts: *Suaeda* spp. (= *Dondia*.) Nominal Hosts: *Lepidium*, *Artemisia*, beets.

The nymphs produce an abundance of white, cottony wax secretion, within which they become covered, among the younger branches. During the colder part of the year the adults may be found in this same material in a quiescent stage. A witches' broom effect in the younger growth is associated with severe attacks.

APHALARA VEAZIEI Pach. NOVA SCOTIA.—Adult only: from *Solidago*, King's County, no date (W. H. Brittain). Host: Unknown. Nominal Host: *Solidago*.

According to Crawford, this is an exceedingly variable and widely distributed species.

APHALARA PULCHELLA Crawford. CALIFORNIA.—Adults only: from *Carex*, 3 miles west of Corral Hollow, southwest of Tracy, November 30, 1929; from *Frankenia grandifolia*, Tulare Lake Basin, 10 miles south of Corcoran, December 7, 1929; from *Prosopis juliflora* var. *glandulosa*, Corral Hollow, May 16, 1930; from *Ceanothus cuneatus*, Table Mountain, Fresno County, April 16, 1930.

Host: Unknown. Nominal Hosts: *Carex*, *Frankenia*, *Prosopis*, *Ceanothus*.

APHALARA GUTIERREZIAE Klyver. CALIFORNIA.—Adults only: from *Gutierrezia*, on desert foothills 10 miles from Coalingo, March 24, 1930 (Annand); from *Chrysothamnus*, Mountain Springs Canyon, Coso Mountains, April 12, 1930; same host, Red Rock Canyon, April 13, 1930. NEW MEXICO.—Adults only: from *Lepidium alyssoides*, 3 miles east of Oro Grande, August 8, 1930 (Romney); from *Salsola pestifer*, Nara Visa, July 28, 1929 (Romney).

Host: Unknown. Nominal Hosts: *Gutierrezia*, *Salsola*, *Lepidium*, *Chrysothamnus*.

APHALARA MARTINI Van Duzee. CALIFORNIA.—Adults and nymphs: from *Frankenia grandifolia*, Tracy, November 4, 1929 (Annand); from same host, Little Panoche Creek, west of Firebaugh, November 5, 1929 (Annand); from same host, Corcoran, November 20, 1929 (Annand); from same host, salt marsh, San Mateo Point, San Mateo, May 5, 1929; same data, May 10, 1929; same data, May 19, 1929; same data, July 2, 1929; from same host, Livermore Valley, northeast of Livermore, November 30, 1929; same host, Tulare Lake Basin, 10 miles south of Corcoran, December 7, 1929. Adults only: from *Atriplex polycarpa*, 1 mile west of Coalinga, December 7, 1929; from *Frankenia*, same locality, December 8, 1929; from *Salix*, south of Hanford, December 7, 1929.

Host: *Frankenia*. Nominal Hosts: *Atriplex*, *Salix*.

The nymphs are usually abundant on the ventral side of the younger leaves in which they intensify the natural revolute tendency. They are accompanied by a sticky, slightly amber-colored honey-dew. The chermid has the effect of dwarfing the younger growth.

APHALARA (ANOMOCERA) MINUTISSIMA Crawford. CALIFORNIA.—Adults only: from *Artemisia californica*, Montara, San Mateo County, April 3, 1931; from *A. tridentata*, Volcanic Tableland, north of Bishop, June 19, 1931. IDAHO.—Adults only: from unknown host, Wapi, June 24, 1930 (Annand). UTAH.—Adults only: "feeding on sugar beet", Ogden, June 9, 1927 (Knowlton).

Host: Unknown. Nominal Hosts: *Artemisia*, sugar beets.

APHALARA (ANOMOCERA) ANOMALA Crawford. NEW MEXICO.—Adults only: from *Artemisia wrightii*, 6 miles west of Mule Creek, August 8, 1929 (Romney).

Host: Unknown. Nominal Host: *Artemisia*.

APHALAROIDA PITHECOLOBIA Crawford. NEW MEXICO.—Adults only: from *Lepidium alyssoides*, Playas, August 15, 1929 (Romney). TEXAS.—Adults only: from same host, 9 miles from Fabens, June 18, 1930 (Romney).

Host: Unknown. Nominal Hosts: *Lepidium*, *Pithecolobium*.

PAUROCEPHALA FREMONTIAE Klyver. CALIFORNIA.—Adults and nymphs: from *Fremontia californica*, 2 miles west of Tehachapi, Kern County, April 13, 1930; from same host, 3 miles east of Onyx, South Fork of Kern River, and lower Kern River Canyon west of Bodfish, both June 19, 1931.

Host: *Fremontia californica*.

This species apparently does not become abundant. The nymphs are found on the ventral side of the leaves. The small amount of wax produced is given off in the form of long, straight, transparent, and somewhat glistening brownish threads. These threads do not intermingle to form a cottony mass.

HETEROPSYLLA TEXANA Crawford. NEW MEXICO.—Adults only: from *Lepidium alyssoides*, 10 miles south of State College, Mesilla, April 8, 1930 (Romney); from the same host, Playas, August 15, 1930; from "P-65", 10 miles north of Columbus, same date; from *Salsola pestifer*, 5.7 miles north of Gallegos, July 12, 1929; from same host, 26.6 miles northwest of Logan, same date; from same host, 1.5 miles south of Ranchos de Taos, July 16, 1929; from same host, 4.2 miles northwest of Roy, July 13, 1929; from same host, 12.7 miles west of Clayton, June 29, 1929; from same host .5 mile south of Almo, August 3, 1929; from same host, .5 mile south of Animas, August 15, 1929. TEXAS.—Adults only: from *L. alyssoides*, 9 miles south of Fabens, April 30, 1930; from same host, Sierra Blanca, June 15, 1930. All the foregoing collections by Romney.

Host: *Prosopis glandulosa*. Nominal Hosts: *Pithecolobium*, *Shpaeralcea angustifolia*, *Monarda citriodora*, *Chrysopsis*, *Tamarax gallica*, *Celtis pallida*, *Acacia*, *Prosopis juliflor*.

An abundant species in its range. The nymphs are very imperfectly known.

CALOPHYA TRIOZOMIMA Schwarz. IDAHO.—Adults only: from unknown host, Shoeshone Falls, July 31, 1930 (Annand).

Host: Unknown. Nominal Host: *Rhus*.

The species of this genus have been taken predominantly from sumac.

KUWAYAMA MEDICAGINIS Crawford. NEW MEXICO.—Adults only: from *Chrysothamnus*, 13 miles northwest of Bernalillo, July 20, 1929; from *Parosela*, 5 miles northwest of Bernalillo, same date; from *Trianthema portulacastrum*, 2.5 miles east of Steins, August 15, 1929; from *Chrysothamnus serrulata*, 5 miles south of Datil, August 7, 1929; from *Lepidium alyssoides*, 3 miles west of Las Cruces, November 7, 1930; from same host, 1 mile east of Mesquite, May 19, 1931; from same host, Mesilla Valley, June 9, 1930. All the foregoing collections by Romney.

Host: Unknown. Nominal Hosts: *Medicago sativa*, *Chrysothamnus*, *Parosela*, *Trianthema*.

(To be continued)

Description of a New Race of *Eurema gundlachia* Poey from Ecuador (Lepid.: Pieridae).

By W. JUDSON COXEY.

EUREMA GUNDLACHIA race **morleyi** new race.

This race differs from the typical *gundlachia* from Southern United States, Mexico and Cuba in that the head and scapula have a strong admixture of black. The veins of the wing especially at the base are more or less defined by black scales.

♀ paler than the male with basal portion of the wings strongly suffused with black, however leaving the basal costal area wholly yellowish orange.

This race is readily distinguished from *Eurema proterpia watsoni* Klots, also described from Ecuador, by having the tails of the secondaries more acutely produced in both sexes.

Type—Male; Huigra, 4000 feet elevation, Ecuador, December, 1928. *Allotype*—Female; collected with type. *Paratypes*—1 ♀, collected with type; 2 ♀ Naranjapata, 1850 feet elevation, Ecuador, November, 1926. Collected by W. Judson Coxey and named for Edward Morley of Huigra, Ecuador, whose hospitality and assistance to the writer are greatly appreciated.

Types in the collection of the Academy of Natural Sciences of Philadelphia.

Biological Notes and New Records of North American Chermidae (Homoptera).

By F. D. KLYVER, San Mateo Junior College, San Mateo,
California.

(Continued from page 12.)

KUWAYAMA LAVATERAE Van Duzee. CALIFORNIA.—Adults and nymphs: from *Lavatera assurgentiflora*, Roosevelt High School, Daly City, May 4, 1929; from same host, North Grant Avenue, San Mateo, May 5, 1929; same data, July 2, 1929; from same host, Olympic Golf Course, San Francisco, July 6, 1929; from same host, King City, December 8, 1929; from same host, Spreckels, same date; from same host, Belmont, San Mateo County, November 15, 1930; from "Malva", San Francisco, November 1, 1930 (J. B. Steinweden).

Host: *Lavatera*.

This species becomes exceedingly abundant and apparently is sometimes the primary cause of death of its host. Adults, nymphs of all stages, and numerous eggs are to be found simultaneously on the ventral side of the leaves and on the younger growth including the buds and flowers. In moderate infestation the nymphs occur in blister-like depressions. In more severe cases there may be as many as three hundred or more nymphs on a single leaf. The fact that successive generations overlap in time in this species suggests that something has disturbed its synchronization. Possibly the influence of climate is responsible, since this species was supposedly introduced with its host from the islands off the coast of southern California.

LEURONOTA MACULATA Crawford. NEW MEXICO.—Adults only: from *Lepidium alyssosides*, 1 mile east of Mesquite, May 6, 1931 (Romney); same data, June 4, 1931.

Host: Unknown. Nominal Hosts: *Lepidium*, *Condalia obovata*, *Columbrina texana*.

PARATRIOZA COCKERELLI Sulc. ARIZONA.—Adults only: from *Salsola pestifer*, 2 miles south of Springerville, August 4, 1929 (Romney); same data, 13 miles east of Springerville. CALIFORNIA.—Adults and nymphs: from *Solanum umbelliferum*, Stanford University, April 24, 1929 (Duncan); from same host, Hillsborough, May 12, 1929. Nymphs only: from same host, Tesla, southeast of Livermore, May 11, 1929; from same host, Clark's Canyon, San Mateo, May 20, 1929; from *Convolvulus*, Stanford University, October 17, 1922 (Ferris); from pepper leaves, Santa Ana, August 31, 1930 (Keifer). Adults only: from *S. umbelliferum*, San Mateo, June 15, 1929; from *Pinus monophylla*, Marangue Peak, Argus Mountains, April 12, 1929; from *Chrysothamnus*, Rock Creek, north of Bishop, June 19, 1931; from *Atriplex*, 3 miles south of Lone Pine, June 19, 1931. NEW MEXICO.—Adults only: from *Salsola pestifer*, 3.5 miles west of Datil, August 6, 1929 (Romney); from same host, .5 mile south of Alma, August 3, 1929 (Romney); from *Senecio filifolius*, 21.5 miles north of Lordsburg, August 10, 1929 (Romney); from unknown host, Mesilla Valley, June 9, 1929 (Romney). UTAH.—Adults only: from beets, Delta, July 27, 1927 (Knowlton); from tomatoes, Hooper, October 14, 1927 (Pack: Knowlton); same data, from willow, same date; from unknown host, June 13, 1930 (Knowlton: Melvin Jones).

Hosts: *Solanum umbelliferum*, *S. nigrum*, *S. tuberosum*, *Capsicum annuum*, *Convolvulus*. Nominal Hosts: Alfalfa, arborvitae, spruce, tobacco, petunia, pine, beets, willow, *Datura*, *Iochroma*, *Covillea*, *Erigonum*, *Sophia*, *Norta*, *Chrysothamnus*, *Lepidium*, *Hymenoclea*, *Salsola*.

The nymphs of this species are found on the ventral side of the leaves, on the caylx, and the fruit, the eggs being most common on the younger growth as far as available records show. The nymphs are oval in outline, and closely appressed to the leaf in shallow depressions. The younger nymphs are orange in color, the older nymphs have pale green bodies with the wing pads orange, and the eggs are yellow. This species is evidently of considerable, but imperfectly known, economic importance. There is evidence that it may be of some importance as a carrier of pathogenic organisms infesting economic plants.

PARATRIOZA MACULIPENNIS Crawford. CALIFORNIA.—Adults only: from *Atriplex*, north of Tracy, October 12, 1929 (Annand); from *Lycium*, Darwin Wash, near Marangue Peak, Argus Mountains, April 12, 1930; from grass, Carmichael, Sacramento County, June 25, 1931 (Keifer).

Host: Unknown. Nominal Hosts: *Atriplex*, *Lycium*, *Convolvulus occidentalis*, *Salix*, *Convolvulus arvensis*, *Ceanothus cordulatus*, grass.

TRIOZA BAKERI Crawford. CALIFORNIA.—Adults only: from *Arctostaphylos*, 17.2 miles west of Coalinga, December 8, 1929; from pear trees, Kelseyville, April 8, 1931 (Keifer).

Host: Unknown. Nominal Hosts: *Pinus ponderosa*, *Abies*, *Arctostaphylos*, spruce, pear.

TRIOZA BREVIANTENNATA Crawford. CALIFORNIA.—Adult only: from *Atriplex*, north of Tracy, October 12, 1929 (Annand).

Host: Unknown. Nominal Host: *Atriplex*.

TRIOZA COLLARIS Crawford. CALIFORNIA.—Adults only: from *Baccharis viminea*, Corral Hollow, 10 miles southwest of Tracy, November 4, 1929 (Annand); same data, November (Annand and Klyver); from same host, 5 miles west of Coalinga, (adults mating), December 8, 1929; from same host, Keene, Tehachapi Creek, Kern County, April 13, 1930; from *B. pilularis*, sand dunes, San Francisco, April 3, 1931; from *Salix*, 4.7 miles southeast of Byron on Vasco Road, November 30, 1929; from *Ephedra*, Marangue Peak, Argus Mountains, April 12, 1930. NEW MEXICO.—Adults only: from *Lepidium alyssoides*, 1 mile east of Mesquite, May 26, 1931 (Romney).

Host: (*Baccharis*?) Nominal Hosts: *Baccharis*, *Salix*, *Ephedra*, *Lepidium*.

The skins of a number of last stage nymphs were taken from *Baccharis pilularis* on the sand dunes, San Francisco. While this is not positive proof that these are the skins of *T. collaris* nymphs, it is regarded as very strong circumstantial evidence to this effect, especially in view of the frequency with which this chermid has been taken from *Baccharis*.

The nymphal skins were unaccompanied by conspicuous wax secretion.

TRIOZA ALBIFRONS Crawford. CALIFORNIA.—Adults and nymphs; from *Urtica gracilis* var. *holosericea*, San Mateo Creek, San Mateo, October 25, 1929; from same host, Mallard Lake, Golden Gate Park, San Francisco, November 1, 1929; from same host, south of Tehachapi, Kern County, April 13, 1930; from same host, San Remo, south of Carmel, March 30, 1931; from same host, Smith Creek, Mount Hamilton Road, Santa Clara County, April 18, 1931. Nymph only: taken by sweeping weeds, 3 miles west of Corral Hollow, southwest of Tracy, November 30, 1929. Adults only: from *Urtica*, Three Rivers, Tulare County, April 18, 1930. NEW MEXICO.—Adults only: from *Amaranthus retroflexus*, Brazos, July 18, 1929 (Romney); same data, Chama, same date.

Host: *Urtica*. Nominal Hosts: *Amaranthus*, weeds.

The nymphs occur without waxy secretion on the ventral side of the leaves and on the younger growth. This species is especially interesting because of its close relationship to *T. urticae* (L.), the European species infesting nettle.

TRIOZA FRONTALIS Crawford. NEVADA.—Adults and nymphs: from *Amelanchier alnifolia*, Zephyr Point, Lake Tahoe, July 16, 1929.

Host: *Amelanchier*.

The nymphs are found on the ventral side of the leaves, unaccompanied by wax. They are not known to occur in abundance.

TRIOZA OBTUSA Patch. NOVA SCOTIA.—Adults only: from *Pinus*, Smith's Cove, no date (W. H. Brittain).

Host: *Amelanchier canadensis*. Nominal Host: *Pinus*.

The nymphs are found on the ventral side of the leaves. Un-

like the closely related western species, *T. frontalis*, they produce an abundance of white, floss-like wax.

TRIOZA MAURA Forster. CALIFORNIA.—Adults and nymphs: from *Salix lasiandra*, Santa Rosa, July 24, 1922 (Duncan); from *Salix*, Rock Creek, northwest of Bishop, June 19, 1931; from same host, Salinis River bridge, King City, December 8, 1929; from same host, south of Tehachapi, Kern County, April 13, 1930; from same host, Crystal Springs Lake, San Mateo County, May 1, 1930. Nymphs only: from same host, south end of Lake Tahoe, July 15, 1929. Adults only: from *Baccharis viminea*, Corral Hollow, 10 miles southwest of Tracy, November 4, 1929 (Annand); from pear trees, Andrus Island, Sacramento County, April, 1931 (Keifer); from same host, Hood, April 16, 1931 (Keifer); from *Salix*, Corral Hollow, November 4, 1929 (Annand); from *Carex* and weeds, 3 miles west of Corral Hollow, November 30, 1929; from *S. lasiandra*, lower Kern River Canyon, west of Bodfish, June 19, 1931; from *Salix*, 4.7 miles southwest of Byron on Vasco Road, November 30, 1929; from same host, Mountain Springs Canyon, Coso Mountains, April 12, 1930; from same host, near Shepherds Canyon, Argus Mountains, same date; from same host, Savory's Tule Pond, south of Fresno, April 15, 1930; from same host, Old Fort Miller, Fresno County, April 16, 1930. NEW MEXICO.—Adults only: from *Salsola pestifer*, 5 miles north of Salt Lake, June 5, 1929 (Romney).

Hosts: *Salix* spp. Nominal Hosts: *Baccharis*, *Salsola*.

The nymphs resemble a scale insect. They are oval in outline and occur very closely appressed to the ventral side of the leaves, forming shallow, blister-like depressions. They do not produce any conspicuous waxy secretion. Rarely have the nymphs been found in great abundance.

TRIOZA SALICIS Mally. IDAHO.—Adults only: from grass and shrubs, head of Salmon River, July 19, 1930 (Annand).

Host: Unknown. Nominal Hosts: *Salix* spp., grass, shrubs.

TRIOZA ALACRIS Flor. CALIFORNIA.—Adults and nymphs: from bay tree, Ontario, August 10, 1914 (Clausen: J. C. Chamberlin); from bay, Domoto Nursery, Oakland, no date (Ferris); from *Laurus nobilis*, Pasadena, January 24, 1929 (Keifer: E. L. Smith). Adults and eggs; from same host, nursery Ellsworth and Poplar avenues, San Mateo, May 17, 1929. Nymphs only: from same plants, June 17, 1929.

Host: *Laurus nobilis*.

The nymphs cause the leaves to curl ventrally and longitudinally, thicken, redden, and finally to drop. In severe infestation the hosts may be seriously defoliated.

NEOTRIOZELLA LATICEPS Crawford. NEW MEXICO.—Adults only: from unknown host, no data (Romney).

Host: Unknown.

PACHYPSYLLA VENUSTA Osten Sacken. MISSISSIPPI.—Adults and nymphs: from *Celtis occidentalis*, A. & M. College, January 26, 1931 (Myers).

Host: *Celtis occidentalis*.

This species forms numerous woody, polythalamous galls on the smaller branches and petioles of hackberry.

PACHYPSYLLA C.-MAMMA Riley. UTAH.—Adults only: from *Celtis*, Hooper, May 29, 1928 (Pack: Knowlton). Host: *Celtis* sp.

PACHYPSYLLA DUBIA Patch. UTAH.—Adults only: from *Celtis*, Hooper, May 29, 1928 (Pack: Knowlton). Host: *Celtis* sp.

EUPHYLLURA ARCTOSTAPHYLI Schwarz. CALIFORNIA.—Adults and nymphs: from *Arctostaphylos*, Tesla, Alameda County, May 11, 1929; from same host, Pine Ridge, east of Auberry, Fresno County, August 3, 1929; from same host, Pinnacles National Monument, April 1 and 2, 1931 (Hedgpeth and Smith); from same host, General Grant National Park, July 12, 1930. Nymphs only: from same host, near Deer Creek Inn, Placerville, July 15, 1929; from *A. manzanita*, Julian, August, 1916 (J. C. Chamberlin); from *Arctostaphylos*, Mount Hamilton, October 7, 1922 (Ferris); from same host, Stanford University, June 2, 1923 (Ferris); from same host, Clark's Canyon, San Mateo, March 10, 1930 (Hedgpeth). Adults only: from same host, 17.2 miles west of Coalinga, December 8, 1929. NEVADA.—Adults only: from same host, Zephyr Point, Lake Tahoe, September 1, 1930 (Keifer).

Host: *Arctostaphylos* spp.

The nymphs produce an abundance of white flaky or cottony wax and usually are found in individual cells constructed of this material. They are most prevalent on the ventral side of the leaves, but in severe infestations are found on both sides, as well as on the younger growth including the branches and buds. The leaves may be literally covered with wax cells.

EUPHYLLURA NEVEIPENNIS (Schwarz). CALIFORNIA.—Adults only: from *Arctostaphylos*, west of Placerville, July 15, 1929;

from same host, near Deer Creek Inn, Placerville, same date; from same host, Westpoint, Amador County, August 31, 1930 (Hedgpeth).

Host: Unknown. (Probably *Arctostaphylos* spp.) Nominal

Hosts: *Arctostaphylos* spp.

EUPHYLLURA ARBUTI Schwarz. CALIFORNIA.—Adults and nymphs: from *Arbutus menziesii*, Crystal Springs Road, San Mateo, April 10, 1929.

Host: *Arbutus menziesii*. Nominal Host: Honeysuckle.

The nymphs occur under the bark scales in cells constructed of their white cottony wax secretion, which frequently becomes heavily infested with jet black "sooty mold". In severe infestations the nymphs are also found on the leaves and younger growth.

EUPHYLLERUS VERMICULOSUS Crawford. CALIFORNIA.—Adults only: from *Ceanothus*, Green Valley, El Dorado County, May 30, 1931 (Keifer). UTAH.—Adults only: from unknown host, Logan Canyon, August 21, 1925 (Knowlton); from sage, Spring Canyon, altitude 6800 feet, August 28, 1925 (Knowlton).

Host: Unknown. Nominal Host: *Ceanothus*.

ARYTAINA ROBUSTA Crawford. CALIFORNIA.—Adults and nymphs: from *Ceanothus*, Black Mountain Road, Hillsborough, May 12, 1929. UTAH.—Adults only: from unknown host, Logan Canyon, Logan, July 24, 1930 (Annand).

Host: *Ceanothus*.

The nymphs occur on the ventral side of the leaves in individual cells constructed of white wax secretion, in which all the nymphal stages occur. The last stage nymph leaves its cell a short time before the last molt.

ARYTAINA FUSCIPENNIS Crawford. CALIFORNIA.—Adults and nymphs: from *Ceanothus papillosus*, Cone Peak, Santa Lucia Mountains, April 15, 1923 (Ferris). Nymphs only: from same host, Sierra Morena, October 15, 1922 (Ferris).

Host: *Ceanothus papillosus*. Nominal Hosts: *Ceanothus* spp.

Biological data lacking.

ARYTAINA RIBESIAE Crawford. CALIFORNIA.—Adults and nymphs: from *Ceanothus thyrsiflorus*, San Francisquito Creek, north of Felt Lake, Stanford University, June 20, 1929. Nymphs only: from same host, May 3, 1929. UTAH.—Adults only: from wild current, Hooper, October 14, 1927 (Pack:

Knowlton); from unknown host, Logan Canyon, Logan, July 24, 1930 (Annand).

Host: *Ceanothus thyrsiflorus*. Nominal Hosts: Wild current, *Ribes aureum*, *Rhus trilobata*, *Ceanothus* spp.

The nymphs are found in great abundance in white, wax cells on the ventral side of the leaves, and in severe infestations on the petioles and branches. By actual count, as many as fifty-six nymphs have been taken from individual cells on a single leaf.

(To be continued).

Notes on Some Stag-Beetles (Coleop.: Lucanidae).

By BERNARD BENESH, North Chicago, Illinois.

In plotting the distribution of the Boreal American Lucanids, I had the pleasure of examining the principal collections in the United States, recording as far as possible the localities, date of capture, etc., for a list to be published in the near future.

Some time ago, in the material sent to me for examination, through the courtesy of Mr. Paul H. Johnson, College of Agriculture, University of Missouri, a very interesting form has come under my notice.

The specimen that I am now describing was collected by some unknown student, who unfortunately forgot to record the locality, but Mr. Johnson assured me that the specimen in question is from the neighborhood of Columbia, Missouri.

PSEUDOLUCANUS PLACIDUS (Say).

♂ Mandibles elongate, 4 m/m long, porrect, curved slightly from the center towards the apex, terminating in an acute point. On the inner edge, one-third from the apex, armed with a single bifid tooth. Length, mandibles inclusive, 27 mm.

Differs radically from the typical form of *P. placidus* (Say), only in the mandibular dentition. Mandibles are not so robust, as in the typical form, are more elongate, showing no indication of the other teeth, as in the regular dentition of *P. placidus*. A male in my collection, number 1042.

An additional shipment of specimens from the same locality arrived in such condition that only the heads of the specimens

of the terminal arm at the base is quite different in shape. The flanges arising from the base of the uncus are very large and deeply serrate on the dorsal edge and apex, in *draudti* they are narrower and more elongate.

The measurement of expanse is twice the distance from the center of the thorax to the apex of one primary.

Biological Notes and New Records of North American Chermidae (Homoptera).

By F. D. KLYVER, San Mateo Junior College, San Mateo, California.

(Continued from page 40.)

ARYTAINA ASSIMILIS Crawford. CALIFORNIA.—Adults only: from *Ceanothus*, Black Mountain Road, Hillsborough, May 5, 1929; from *C. cuneatus*, Clark's Canyon, San Mateo, May 21, 1929; from same host, Tehachapi Pass, Kern County, April 13, 1930; from same host, Table Mountain, Fresno County, April 16, 1930.

Host: Not definitely known. (Probably *C. cuneatus*.) Nominal Hosts: *Ceanothus* spp.

ARYTAINA MINUTA Crawford. CALIFORNIA.—Adults and nymphs: from *Ceanothus cuneatus*, Clark's Canyon, San Mateo, May 20, 1929; same data, June 24, 1929. Adults only: from *Ceanothus*, summit of Peachtree Grade, west of Coalinga, December 8, 1929; from *C. cuneatus*, lower Kern River Canyon, west of Bodfish, June 19, 1931.

Host: *Ceanothus*.

Biological data incomplete.

ARYTAINA CEANOTHAЕ Crawford. CALIFORNIA.—Adults and nymphs: from *Ceanothus*, Black Mountain Road, Hillsborough, May 12, 1929; from *C. cuneatus*, Table Mountain, Auberry, Fresno County, April 16, 1930; from *C. thyrsiflorus*, San Remo, south of Carmel, March 30, 1931.

Host: *Ceanothus*.

Biological data incomplete.

ARYTAINA ACULEATA Crawford. CALIFORNIA.—Adults only: from *Cercocarpus betuloides*, Soda Creek, Napa County, May 3, 1931 (Keifer).

Host: Unknown. Nominal Host: *Cercocarpus*.

ARYTAINA PUBESCENS Crawford. CALIFORNIA.—Adults only: from *Purshia tridentata*, Rock Creek, northwest of Bishop,

June 19, 1931. IDAHO.—Adults only: from Antelope Bush, Craters of the Moon, June 29, 1930 (Annand).

Host: *Purshia tridentata*.

This species becomes very abundant. The nymphs are found among the younger branches and leaves, where they produce large amounts of wax secretion. Severe infestations are associated with the dwarfing of the host and the formation of a witches' broom effect in the parts most subject to attack.

PSYLLIA FIBULATA Crawford. IDAHO.—Adults only: from unknown host, wet meadow, near Craters of the Moon, June 29, 1930 (Annand); same data, Alturas Lake, August 2, 1930.

Host: Unknown. Nominal Hosts: None recorded.

PSYLLIA SINUATA Crawford. IDAHO.—Adults only: from grass and shrubs, head of Salmon River, July 19, 1930 (Annand).

Host: Unknown. Nominal Hosts: Grass and shrubs.

PSYLLIA MINUTA Crawford. CALIFORNIA.—Adults and nymphs: from *Purshia*, Marangue Peak, Argus Mountains, April 12, 1930. IDAHO.—Adults only: from unknown host, wet meadow, near Craters of the Moon, June 29, 1930 (Annand).

Host: *Purshia*. (Probably *P. tridentata*.)

This species and *Arytaina pubescens* Crawford, a distinct species, both have *Purshia tridentata* for a host. Although our biological data is incomplete, it appears that this species does not produce wax to the same extent as does *A. pubescens*.

PSYLLIA ALBA Crawford. CALIFORNIA.—Adults and nymphs: from *Salix*, Isabella Creek, Mountain Hamilton Range, October, 1922 (Ferris).

Host: *Salix*. Norminal Host: *S. longifolia*.

The available data are incomplete.

PSYLLIA HARTIGII Flor. NEW YORK.—Adults only: from pine, Cranberry Lake, July 26, 1920 (McLellan). NOVA SCOTIA.—Adults only: from unknown host, King's County, no date (Brittain).

Host: Unknown. Nominal Hosts: Pine, *Betula populifolia*.

PSYLLIA AMERICANA Crawford. CALIFORNIA.—Adults and nymphs: from *Salix*, Sacramento, March 30, 1929 (Keifer); from same host, south of Tehachapi, Kern County, April 13, 1930; from same host, Savory's Tule Pond, south of Fresno,

April 15, 1930; from same host, Old Fort Miller, Friant, Fresno County, April 16, 1930; from same host, Crystal Springs Lake, San Mateo County, May 1, 1930; from same host, San Remo, south of Carmel, March 30, 1931; from same host, sand dunes, San Francisco, April 3, 1931; from same host, Rock Creek, northwest of Bishop, June 19, 1931. Adults only: from *Salix* and *Artemisia heterophylla*, Sacramento, March 30, 1929 (Keifer); from pear trees, Andrus Island, Sacramento County, April, 1931 (Keifer); from same host, Hood, Sacramento County, April 16, 1931 (Keifer); from same host, Kelseyville, April 8, 1931 (Keifer); from *Salix*, Mountain Springs Canyon, Coso Mountains, April 12, 1930; from same host, Smith Creek, Mount Hamilton Road, April 18, 1931; from *Pinus monophylla*, south of Tehachapi, Kern County, April 13, 1930. IDAHO.—Adults only: from grass and shrubs, head of Salmon River, July 19, 1930 (Annand). NOVA SCOTIA.—Adults only: from *Salix*, 1924 (Brittain). Hosts: *Salix* spp. Nominal Hosts: *Pinus ponderosa*, *P. monophylla*, *Artemisia heterophylla*, pear, grass, shrubs.

The nymphs are found, unaccompanied by conspicuous wax secretion, on the leaves, petioles, smaller branches, and buds. Early in the season they are found most abundantly on the axillary buds.

PSYLLIA AMERICANA MINOR Crawford. CALIFORNIA.—Adults and nymphs: from *Salix*, Crystal Springs Lake, San Mateo County, May 1, 1930; from same host, San Remo, south of Carmel, March 30, 1931; from same host, sand dunes San Francisco, April 3, 1931; from same host, Rock Creek, northwest of Bishop, June 19, 1931. Adults only: from *Salix*, Donner Pass, Placer County, July 16, 1929; from same host, Corral Hollow, southwest of Tracy, November 30, 1929; from same host, lower Kern River Canyon, west of Bodfish, June 19, 1931; from *Baccharis viminea*, Corral Hollow, November 4, 1929 (Annand); from pear trees, Andrus Island, Sacramento County, April, 1931 (Keifer); from same host, Kelseyville, April 8, 1931 (Keifer). UTAH.—Adults only: from willow, Hooper, October 14, 1927 (Pack: Knowlton).

Hosts: *Salix* spp. Nominal Hosts: *Baccharis viminea*, pear.

Biology similar to that of species.

PSYLLIA MAGNICAUDA Crawford. CALIFORNIA.—Adults and nymphs (?): from *Prunus* sp., Rock Creek Gorge, northwest of Bishop, June 19, 1931.

Host: *Prunus* sp. (?)

A number of nymphs were taken with the adults from the same plants. These nymphs may not be those of this particular species, inasmuch as they are very distinctly *triozine* in form, superficially resembling those of *Trioza maura* in structure and habit. This situation is especially interesting because of the great number of adults of *P. magnicauda* found on several plants from which only this species was taken with the nymphs.

PSYLLIA STRIATA Patch. CALIFORNIA.—Adults only, from *Betula fontanalis*, Rock Creek, northwest of Bishop, June 19, 1931. NOVA SCOTIA.—Adults only: from unknown host, King's County, June, 1924 (McLellan).

Host: *Betula*. Nominal Host: *Corylus rostrata*?

According to Miss Patch, the nymphs are found on the leaves and terminal leaves and shoots of *Betula*. The nymphs cover themselves with inconspicuous wax. The adults emerge late in June in Maine.

PSYLLIA BREVISTIGMATA Patch. CALIFORNIA.—Adults and nymphs: from *Cercocarpus*, Santa Lucia Mountains, April 15, 1923 (Ferris); from same host, Rock Creek, northwest of Bishop, June 19, 1931; from *C. betuloides*, Stanford University, April 10, 1930 (Duncan), Nymphs only: from same host, south of Tehachapi, Kern County, April 13, 1930.

NEVADA.—Adults and nymphs: from *C. ledifolius*, Zephyr Point, Lake Tahoe, July 16, 1929. Adults only: from *Juncus*, Spooner, Tahoe-Carson City Road, July 16, 1929.

Hosts: *Cercocarpus betuloides* and *C. ledifolius*. Nominal Host: *C. parviflorus*.

This species has been found wherever an effort has been made to find it on *Cercocarpus*, but it is not known to ever occur in abundance. The nymphs occur on the ventral side of the leaves. The wax secretion produced is given off in the form of long, straight, transparent, and somewhat glistening brownish threads. These threads do not intermingle to form a cottony wax.

PSYLLIA FLOCCOSA Patch. NOVA SCOTIA.—Adults only: from *Alnus*, no date (W. H. Brittain).

Host: *Alnus*.

According to Miss Patch, the nymphs appear early in the spring, when they are found on the ventral side of the leaves. They produce an abundance of white, flocculent wax.

PSYLLIA ASTIGMATA Crawford. CALIFORNIA.—Adults and nymphs: from *Prunus emarginata*, Rock Creek, northwest of Bishop, June 19, 1931. Nymphs only: from same host, Chagoopa Creek, southern Sierra Nevada, 7000 feet, June 21, 1923 (Ferris); from *Prunus*, Donner Pass, Placer County, July 16, 1929; from *P. emarginata*, General Grant National Park, July 12, 1930. NOVA SCOTIA.—Adults and nymphs: from unknown host, no date (W. H. Brittain).

Host: *Prunus emarginata*. Nominal Host: *P. demissa*.

This species frequently becomes excessively abundant. The nymphs produce large amounts of floss-like, cottony wax. They usually occur on the ventral side of the leaves but in severe attacks they are found on the petioles, smaller branches, flowers and fruit, moving about freely and carrying their wax secretion, plume-like, about with them. Even in cases of very abundant attack the host does not seem to suffer any serious loss of vitality. The nymphs of this species superficially resemble those of *Psyllia mali*.

PSYLLIA TRIMACULATA Crawford. NEW YORK.—Adults only: from *Prunus*, Cranberry Lake, 1925 (W. H. Brittain).

Host: Unknown. Nominal Host: *Prunus*.

PSYLLIA ALNI AMERICANA Crawford. CALIFORNIA.—Adults and nymphs: from *Alnus rhombifolia*, San Francisquito Creek, Stanford University, May 3 and June 20, 1929; from same host, southern end of Lake Tahoe, July 15, 1929; from same host, Smith Creek, Mount Hamilton Road, April 18, 1931; from same host, Placerville, July 15, 1929. Adults only: from unknown host, Placerville, no date (E. O. Essig: Keifer). IDAHO.—Adults only: from unknown host, Alturas Lake, Stanley Basin, July 19, 1930 (Annand). WASHINGTON.—Adults and nymphs: from *Alnus*, Cathlamet, August 7, 1923 (Duncan).

Host: *Alnus rhombifolia*.

The nymphs occur, sometimes in exceedingly great abundance, on the younger leaves and smaller branches early in spring. They are usually conspicuous because of the vast amounts of white wax secretion, which may sometimes completely cover the leaves. Alder trees at the south end of Lake Tahoe and at Bass Lake, Madera County, California, were defoliated to a considerable degree, apparently by the chermid.

PSYLLIA BUXI (L.) CALIFORNIA.—Adults and nymphs: from *Buxus*, San Jose, June 12, 1920 (R. D. Hartman); from *B. sempervirens*, North Clarmont Street, San Mateo, May 5, 1929; same host, North Eldorado Street, San Mateo, May 10, 1929; from same host, Ellsworth Avenue, San Mateo, June 30, 1931. Nymphs only: from same host, North Clarmont Street, San Mateo, April 15, 1929; from same host, Parrott Estate, San Mateo, May 18, 1929.

Host: *Buxus sempervirens*.

The nymphs attack the young terminal leaves causing them to curl into a loosely cabbage-like growth. In severe infestations, which apparently are not uncommon, these growths considerably impair the beauty of the plants.

PSYLLIA CAUDATA Crawford. IDAHO.—Adults only: from unknown host, Alturas Lake, Stanley Basin, July 19, 1930 (Annan).

Host: Unknown. Nominal Host: *Alnus tenuifolia*.

***Cordylura tricineta* Loew, a Leaf-miner on *Smilacina racemosa* (L) Desf. (Dipt.: Scatophagidae).**

By S. W. FROST, The Pennsylvania State College.

For a number of years the writer has noticed mines on the leaves of *Smilacina racemosa*. In 1924,¹ he recorded the leaf-miner as an undetermined species of Diptera. In 1928,² the same miner was noted, its habits briefly summarized and the mine figured. At this time, adults had not been reared and it was thought to be a species of *Parallelomma*. Later an adult emerged and Mr. E. T. Cresson determined it as *Hexamitocera flavida* Coq. Mr. C. H. Curran has recently studied the types of this subfamily and states that *H. flavida* Coq., is a synonym of *Cordylura tricineta* Loew.

Cordylura tricineta Loew, appears to be somewhat rare in collections. It was originally described by Loew³ as *Coenosia tricineta* from the White Mountains, New Hampshire. As *Hexamitocera flavida*, Coquillett⁵ recorded it from Franconia, N. H. Mr. E. T. Cresson took one specimen at Caroline, New York, from which the record in the "List of Insects of New York"⁴ was obtained. In the National Museum, there is one specimen, besides the type, collected by Dr. J. M. Aldrich from Moscow, Idaho. Mr. C. W. Johnson⁶ took it at Eastport, Maine, and he has a specimen taken by Dr. C. P. Alexander at Orono, Maine. The writer has found the mines of

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Portrait of 1884.

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