

few red scales, below that, a white and reddish white area; the basal portion of the hind wing is sparsely covered with black and white hairs. On the underside the markings are reproduced in the typical *Euphydryas* fashion, the primaries have a salmon flush except at the apex and part way from the apex along the costa and outer margin, all black markings are very much reduced on both wings and the red and especially the white areas are larger. The antennae are dull red, the club black with reddish shading. The thorax and head are bluish black, palpi white at base, the balance salmon. The abdomen is black with six reddish bands, on the underside it is white, the legs are salmon.

Allotype ♀ 50 mm. The markings on both sides are similar to the ♂ but the reddish areas on the secondaries are more extensive and the reddish white areas and even some of the white spots in the ♂ are entirely red in the ♀. On the underside, the black areas on the primaries are more extensive than in the ♂. The appearance of many ♀♀ on the upperside is rather dull and suffused.

The types and their disposition are as follows:

Holotype—♂, Roosevelt Lake, Ariz., Mar. 30 (D. K. Duncan) and genitalia slide No. 68 (C. F. dos Passos).

Allotype—♀, Superstition Mts., Ariz. same date and collector; both in the American Museum of Natural History.

Paratypes—8 ♂♂, Roosevelt Lake, Ariz. Mar. 30 (6) Mar. 30, 1934 (1) Apr. 23, 1935 (1); 3 ♂♂, Superstition Mts., Ariz. Apr. 2 (1) no date (1) Mar. 30, 1934 (1); 1 ♂, Wheatfields near Globe, Ariz. Mar. 29, 1934; 2 ♂♂, San Carlos Lake, Ariz. Apr. 17, 1935; 3 ♀♀, Roosevelt Lake, Ariz. Mar. 30, 1934; 1 ♀, Roosevelt, Ariz. Apr. 23, 1935; 1 ♀, Superstition Mts., Ariz. Mar. 30. All collected by D. K. Duncan at altitudes of 2100 to 2500', 1 ♂, Roosevelt Dam, Ariz. Apr. 20, 1929; 1 ♀, Roosevelt Dam, Ariz. Apr. 20, 1929. One pair of paratypes each to the British Museum (Natural History), Paris Museum, Canadian National Collection, Los Angeles Museum, Academy of Natural Sciences, Carnegie Museum and U. S. National Museum. The remainder are in the collection of the author.

THE CHERMIDAE, (HOMOPTERA), OF ALBERTA.

BY E. H. STRICKLAND,
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The only published records of Chermidae captured in Alberta, which we have been able to find, refer to *Psyllia americana* Cwfd., *Trioza varians* Cwfd.¹ both taken at Banff, and *Paratrioza cockerelli* Sulc., which has been, in recent years, accidentally introduced into the province.

A few specimens, consisting of three or four species, have been represented in the University of Alberta collection for a number of years. These included a series of a species which we had tentatively identified as *P. cockerelli*. They were sent to us, in the early spring of 1928, from a greenhouse near Medicine Hat and were reported to be very abundant on tomatoes. This material was sent to two specialists for determination but it returned to us unnamed.

By 1934, the prevalence of "potato yellows" in a number of localities in Southern Alberta resulted in the definite identification of this species, both in

greenhouses and in the field, and the association of the potato disease with its presence². There can be little doubt but that it was brought into the province with infested greenhouse plants and that it escaped from the houses into the field.

It is very doubtful whether it can over-winter in the open here and it would appear that the persistent infestation of potatoes in Southern Alberta is due to annual escapes from infested greenhouses.

In 1936, a case of "yellows" was reported in a city garden in Edmonton. *P. cockerelli* was found to be abundant in this garden though, elsewhere in the city, neither the disease nor the Chermid could be found. Growing near the infested garden were tomatoes. No information could be obtained regarding their origin except that the seedlings had been purchased in the spring. We were, thus, unable to confirm our suspicion that they had been imported from an infested greenhouse in the southern part of the province. A careful survey of potato gardens around Edmonton in 1937 failed to reveal "yellows" or *P. cockerelli*. The latter appears to have been killed out during the winter.

Among the numerous specimens of *P. cockerelli* which were collected from the infested potatoes was a single specimen of *Trioza maura* Forst. Since this, apparently, breeds on *Salix* Spp. it would appear that its presence on potatoes was accidental. During the same year two further species were taken in large numbers on other vegetation which was being swept. This suggested that somewhat intensive sweeping of vegetation in the neighbourhood of Edmonton might add a few records to the species known to occur in the province.

Sweeping activities were, therefore, commenced during the latter part of May, 1937. These yielded such prolific results that they were continued energetically until towards the end of July. A large range of possible food plants was systematically examined and, when possible, records were kept of the plants on which various species were taken.

In a few instances, the presence of immature forms established "host" relationships. More often adults only were taken. When the latter were numerous and could be taken repeatedly from scattered representatives of the same plant though rarely, if ever, from neighbouring vegetation, we feel justified in considering the infested species to be of some biological significance in the life-cycle of the Chermid. Following the terminology of Klyver³, who states that there is no proof that adults ever feed, we are listing these plants as "nominal hosts," though we have no proof that the Chermid in question actually breeds on them. When, as frequently happened, adults were taken singly on plants other than on those on which they obviously congregated it would appear that their presence had no biological significance other than that the plant in question had served as a temporary resting place.

In the following list, therefore, "host" indicates that immature stages were taken; "nominal host" that adults evidently congregate on that particular species, while plants listed as "taken on" are recorded as a possible source of information should further observations suggest a relationship which is not, at present, indicated.

No particular efforts were made to ascertain the effects of the presence of the Chermids on the various plants. Nothing in particular was observed

which was attributed to their presence. It is hoped that more complete biological data will be obtainable in future years.

We were most fortunate in obtaining the assistance of Mr. J. S. Caldwell, of the Ohio Biological Survey, who most generously determined our material for us. With the assistance of Crawford's monograph on the Family, Mr. F. O. Morrison, a graduate student at this University, had already attempted to name the species taken. Although his attempts were largely successful, a complete lack of authoritatively determined species in our collection proved to be an insurmountable obstacle against so doing with any certainty.

Mr. Caldwell found that we had taken twenty-five recognized species. Four additional species could not be placed with any certainty until more material is available and Mr. Caldwell states that two of these are, undoubtedly, undescribed. He suggested that we describe these ourselves, which we hope to do in a future article when we are rather more familiar with the taxonomy of the group.

Livinginae.

Aphalara artemisiae Forst. Edmonton, Dapp. June to July.

Adults of the species were taken, in relatively small numbers (in comparison with *A. vancouverensis* Kby.) on three species of sage. No immature stages could be found. With reference to the determination Caldwell writes, "This is probably a 'composite' species . . . personally I doubt whether *artemisiae* Forst. actually occurs in this country."

Nominal host:—*Artemisia* Spp. (Sage).

Aphalara confusa Cald. Wabamun, Dapp, Lesser Slave Lake, Donelly. June to July.

Adults were taken rather freely on docks in the Peace River District. They appear to be definitely associated with this plant. At Dapp, however, they were taken sparingly on Asters, whereas docks growing in the vicinity were heavily infested, solely, with *A. rumicis* Mall.

Nominal host:—*Rumex* Sp. (Dock).

Taken on:—*Aster* Spp., Rushes and Slough Grass.

Aphalara curta Cald. Beaverlodge

A single adult was taken, without further data, by I. C. Shanks in 1934.

Aphalara dentata Cald. Medicine Hat. May.

Two adults were taken in 1928 by the late F. S. Carr.

Aphalara loca Cald. Edmonton, Dapp, Donelly. July.

Adults abundant on knotweed growing along infrequently used farm roads in several localities.

Nominal host:—*Polygonum erectum*. (Knotweed).

Taken on:—*Solidago* Sp. (Goldenrod), *Aster* Spp.

Aphalara simila Cald. Wabamun. June.

One specimen, only, was taken in sweeping vegetation by a lake-side.

Taken on:—*Juncus* Sp. (rush).

The preceding five species are members of the complex, formerly referred in American literature to *A. calthae* L., but which have recently been separated

by Caldwell⁴, who states that there are no authentic records of the European

calthae occurring on this Continent.

Aphalara hebecephala Cald. Edmonton, Wabamun, Dapp. June to July.

This breeds extensively on fireweed. It was first observed on June 13 at Edmonton. No eggs were found but nymphs were crowded, head downwards, at the base of the leaves. They were all mature, and left the plants, at about the time that the fireweed came into bloom.

Host:—*Epilobium angustifolium*. (Fireweed).

Taken on:—*Chenopodium album* (Lambsquarters), in July.

Aphalara nebulosa kincaidi Ashm. Edmonton, Beaverlodge. June to July.

Adults were moderately common on fireweed which was heavily infested with *A. hebecephala*. No host plant is known for the American variety, but Klyver⁵ states that fireweed is the host of the European variety.

Nominal host:—*Epilobium angustifolium* (Fireweed).

Aphalara rumicis Mall. Dapp, July.

This was very abundant on a patch of dock which was growing on a deserted farm site on the bank of the Pembina River. Elsewhere this weed was infested only with *A. confusa*. Patch⁶ states that the nymphs form pseudo-galls on the leaves of *Rumex*.

Host:—*Rumex* Sp. (Tall dock).

Aphalara vancouverensis Kby. Edmonton, Dapp, Beaverlodge. June to July.

Three species of *Artemisia* were very heavily infested at Edmonton from the beginning of June until observations stopped at the end of July. No immature stages could be found. No eggs were found when the plants were examined in October and a careful examination of plants which were very heavily infested during the previous year was made in May 1938, but no Chermids could be found. By June 26th, 1937, colonies of adults were found on isolated yarrows and related plants. From their abundance, and their scattered incidence, it would appear that they must have bred on these plants even though no nymphs were found.

Nominal host:—*Artemisia* (four) Spp., (Sage), *Achillea lanulosa* and *millefolium* (Yarrow), *A. ptarmica* (Wormseed).

Aphalara veaziei Patch. Edmonton, Donelly, Dapp. June to July.

Regarding this species, Caldwell writes "Probably several species are mixed up here." Adults were taken sparingly (a maximum of about seven to a patch of plants) as listed below. None were found on adjacent vegetation. Klyver³ gives *Solidago* as a host.

Normal host:—*Aster* Spp., *Solidago* Spp.

Triozinae.

Paratrioza cockerelli Sulc. Medicine Hat, Drumheller, Calgary, (Edmonton). January to December in greenhouses, July to September in the field.

Host plants:—Tomatoes, Potatoes, Jerusalem Cherry.

Triozia frontalis sulcata Cwfd. Edmonton, May and September.

Caldwell writes that Oman considers this to be a "good" species. Klyver³ gives *Amelanchier* as a host. Extensive sweeping of Saskatoons in 1937 produced no Chermids but adults are fairly common on them in May, 1938.

Triozia frontalis sulcata

Trioza maura Forst. Edmonton, Wetaskiwin. May to September.

Caldwell writes that this species is not well-defined and that Chermids, so determined, may belong to more than one species. Various authors give *Salix* Spp. as a host plant. A single adult was taken from potatoes, which were not growing in the vicinity of willows, in September, 1936, and adults are moderately abundant on willows during May and June.

Nominal host:—*Salix* Spp. (Willows).

Taken on:—Potatoes.

Trioza quadripunctata Cwfd. High Prairie, Dapp, Edmonton. July.

Adults were taken, in very large numbers, exclusively on nettles. Crawford states that they hibernate on grass-stems, but gives no host.

Nominal host:—*Urtica procera*. (Nettle).

Trioza (near) *similis* Cwfd.

One adult female, only, taken. No data as to food plant. Caldwell writes that, though this is very like *similis*, it is, apparently, not identical. Crawford records *similis* as feeding on *Amelanchier* Sp. None were taken in Alberta during consistent sweeping of Saskatoons.

Trioza varians Cwfd. Banff, Edmonton, High Prairie. June to August.

Crawford states that this feeds on *Salix* Sp. on which it was taken at Banff. We took it freely from willows growing on sand bars close to rivers but failed to find any on similar bushes if they grew at a distance of more than about fifty feet from the water.

Nominal host:—*Salix linearifolia* (Narrow leaved Willow).

Psyllinae.

Psyllia alba Cwfd. Edmonton, High Prairie. June to July.

Crawford gives *Salix longifolia* as a host. While this Chermid is moderately abundant on willows in Alberta the adults were taken so frequently, and in such large numbers, on asters that some biological significance is indicated.

Nominal hosts:—*Salix linearifolia*, *Aster* Spp.

Psyllia alni americana Cwfd. Nordegg, Athabasca. July.

Adults were abundant on swamp birch at Nordegg in 1936. None could be found on these bushes at Athabasca in 1937, though a few were taken in this locality from alders, which are given by Crawford and Klyver³ as host plants.

Nominal hosts:—*Alnus incana* (Alder), *Betulosa glandulosa* (Swamp birch).

Psyllia americana Cwfd. Banff. June.

This species was described from Banff by Crawford who gives as a food plant, *Pinus* Spp. We have not taken this typical variety.

Psyllia americana flava Cwfd. Edmonton. April to June.

Adults were taken from the surface of a snow-bank in April 1925. A single specimen was captured, in June, without data as to vegetation.

Psyllia (near) *fibulata* Cwfd. Edmonton. June.

Caldwell doubts whether this is a typical *fibulata* which he states is smaller, paler and with more slender genal cones.

Nominal host:—*Salix linearifolia* (close to water).

Psyllia floccosa Patch. Edmonton. June.

Patch⁷, in describing this species from Maine, states that the nymphs, which live on Alders, have a pale green head and thorax, and a yellow abdomen. She states further, that they are covered with white flocculent secretions. Nymphs which we took in association with the adults were destitute of secretions and were green with strongly contrasted black abdomens.

Nominal host:—*Alnus incana* (Alder).

Psyllia hartigii Flor. Edmonton. June.

Crawford states that, in Europe and America, this species feeds on birch. At Edmonton, diligent sweeping of birch yielded nothing except *P. sinuata*, which, though not common, was taken repeatedly on these trees. Two adults of *hartigii* were taken, however, on a very stunted basswood, which was rather heavily infested with *P. striata*. Data were too meagre to suggest a nominal host in Alberta.

Taken on:—Basswood.

Psyllia magnicauda Cwfd. Edmonton. June to July.

Nymphs were common in June on wolf willow. First adults taken on June 22 and they were plentiful throughout July. Klyver³ gives *Prunus?* as a host plant.

Host:—*Eleagnus commutata* (Wolf willow).

Psyllia negundinis Mall. Edmonton. June to July.

Caldwell writes that our specimens are not quite typical and adds:—"You, at least, have a new variety." Typical specimens are recorded by Crawford as feeding on Manitoba maple. We failed to obtain nymphs.

Nominal host:—*Negundo interius*. (Manitoba maple).

Psyllia sinuata Cwfd. Edmonton, Nordegg. June to July.

Nymphs and adults were taken on small spruces growing under deciduous trees. They could not be found on spruces which grew in the open. Adults were taken, repeatedly, on birch trees growing at a distance from spruces. Although this species was taken on a greater variety of vegetation than was any other, comparatively few specimens were found on anything with the exception of spruce and birch.

Host:—*Picea glauca* (White spruce).

Nominal hosts:—*Betula* Spp. (Birch, including swamp birch).

Taken on:—*Populus tremuloides* (Aspen), *Oxyccoccus macrocarpus* (High cranberry), *Quercus* Spp. (Oak), *Salix myrtillofolia* (Myrtle-leaved willow, Laurel leaved willow, tall grass in wood-lands).

Psyllia striata Patch. Edmonton. June.

A number of specimens were taken from a small, stunted, basswood on which, evidently, they congregated. Since this tree is not native to Alberta, and we know of one example only in Edmonton, it probably is not the normal host plant here. Patch⁸ bred this species from birch, but none could be found on this tree in Alberta.

Taken on:—Basswood.

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THELYOTOKOUS PARTHENOGENESIS IN CEPHUS CINCTUS NORT. (HYMENOPTERA: CEPHIDAE).

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The wheat stem sawfly (*Cephus cinctus* Nort.) has recently become established as a serious pest of wheat in the Nobleford—Lethbridge area of southern Alberta, the first appreciable damage to wheat occurring in 1934. Each succeeding year the insect has increased and spread rapidly throughout the area, and in many cases crop losses have run as high as 75 to 80 per cent.

During laboratory investigation in the winter of 1936-37 a complete absence of male sawflies was noticed in all the material collected from fields adjoining Lethbridge. In all other districts where wheat stem sawfly has been established for many years the sexes occur in approximately equal numbers. The lack of males in southern Alberta was tentatively attributed to a differential sex mortality, but since the mortality did not approach 50 per cent, this hypothesis was discarded.

Reared female *C. cinctus* Nort. were confined over host plants of wheat and brome grass for oviposition and developmental studies. After egg-laying was completed the eggs were removed from the stems and placed in seamless salve tins containing moist blotting paper. This precaution was necessary because cannibalism inside the stems would make an accurate check on hatchability impossible. One hundred and seventeen eggs were secured in this way and 92 per cent of them hatched. It is quite possible that some of the eggs were injured during stem dissection, which might account for the fate of some of the unhatched eggs.

A series of reared female wheat stem sawflies secured from an area where both sexes occur in approximately equal numbers was then placed on wheat plants in an outdoor cage for oviposition. This material was not disturbed until the larvae cut the stems at harvest time. Since these larvae apparently developed normally from unfertilized eggs, it appears as though the males are functionally useless so far as the survival of the species is concerned.

According to Hewitt¹, "The parthenogenetic young are constitutionally weak and may die before obtaining maturity." There is no evidence from either laboratory investigations or field observations of any constitutional weakness in the parthenogenetic progeny of *C. cinctus* Nort. The newly hatched larvae appear normal in every respect, and the adult females have approximately the same number of eggs as those taken from areas where both sexes occur.

A search of the literature failed to reveal similar cases in the *Cephus* group. Correspondence on this subject between Dr. Arthur Gibson, Dominion Entomologist, Ottawa, Canada, and Sir Guy Marshall, Director of Imperial In-

¹Memoirs and Proceedings of the Manchester Literary and Philosophical Society, Vol. 50, Pt. III, 1906, p. 5.