Notes on Hawaiian Aphidae, With a List of Food Plants (Homoptera).

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The number of aphid species occurring in Hawaii is not great, but some of them are of considerable economic importance, among which should be mentioned *Aphis sacchari, A. maidis, A. gossypii,* and *A. medicaginis.* Some, such as *Macrosiphum solanifolii,* which are important pests elsewhere, confine themselves almost exclusively to weeds and are, therefore, negligible here in an economic sense. The thirty-seven species now known from the Islands are apparently all introduced, and there is no absolute certainty that there was any aphid fauna at all in the Islands before the establishment of commercial relations with the outside world in the early part of the nineteenth century.

The purpose of these notes is primarily ecological, or to provide a working list of the species, together with their food plants. I have, therefore, not attempted to describe any of the species which are apparently new, but in the case of species of uncertain identity I have found it desirable to place on record a few simple characters by which they may be distinguished from their congeners present in the Islands. The classification employed is mainly that of Mr. A. C. Baker (U. S. Dept. Agric. Bull. No. 826, 1920), but with some modifications where Mr. Baker's treatment seems somewhat too rigid. My thanks are due to Mr. Baker for the identification of several species.

Subfamily Aphinae.

Tribe Lachnini.

1. **Lachnus tujafilinus** (Del Guercio).

This species has been discovered recently by Mr. Ehrhorn, who found apterous colonies on *Thuya occidentalis* L. in Manoa Valley, Oahu, at the last of January and during February, 1924. On account of the peculiar marking of the apterous form of this species, I believe that there is no doubt about the identification.

TRIBE CALLIPTERINI.

2. **Myzocallis kahawaluokalani** Kirkaldy.

Kirkaldy, 1907, Proc. Haw. Ent. Soc. 1, p. 101.

This species has not been found since Kirkaldy's description was published in 1907, and is unknown to me. It was described from specimens taken on the crepe myrtle, *Lagerstroemia indica* L., and was reported by Kirkaldy to occur on other shrubs in Honolulu, the identity of which was not made known.

TRIBE APHINI.

3. **Anuraphis helichrysi** (Koch).

Aphis myosotidis Fullaway, 1910, Ann. Rep. Haw. Agric. Exp. Sta. for 1909, p. 42.

This is the common species on *Erechtites,* and is sometimes found on *Gnaphalium purpureum* L. Both of these plants are introduced weeds, and the aphid; therefore, has no economic interest. It is known to occur on Oahu, Kauai, and Maui.

4. **Aphis sacchari** Zehntner.

This species is common throughout the Islands on sugarcane (*Saccharum officinarum* L.) and sometimes occurs in large infestations, but is generally a pest of minor importance due to its control by predaceous enemies. Mr. Fullaway found a colony on sorghum (*Andropogon sorghum* Brot.) in Honolulu in August, 1916, but its occurrence on this plant is evidently rare.

5. **Aphis maidis** Fitch.

This is a very common species on corn (*Zea mays* L.), various varieties of sorghum, Sudan and Tunis grass (*Andropogon sorghum* Brot.), wonder forage grass (*Andropogon* sp.), pearl millet (*Pennisetum glaucum* (L.) R. Br.), and Guatemala grass (*Tripsacum laxum* Nash.). It has been found in the Islands also on the following non-cultivated plants and weeds: Club rush (*Scirpus maritimus* L.), Job's tears (*Coix lacryma-jobi* L.), goose grass (*Eleusine indica* Gaertn.), fox tail grasses (*Chaetochloa lutescens* (Weigel) Stuntz and C. *verticillata* (L.) Scribn.), crab grasses (*Syntherisma pruriens* (Trin.) Arthur and *S. sanguinalis* (L.) Dulac), and barnyard grass (*Echinochloa crusgalli* (L.) Beauv.).

The economic importance of this pest is greatly increased by its transmission of mosaic disease from its normal hosts to sugar-cane. This phase of its activity has been investigated by Dr. Kunkel, and many of the above records of food plants are due to his work. Although the corn aphis does not establish colonies on sugar-cane in the Hawaiian Islands, immigrants undoubtedly settle on the cane plants and are able to live long enough to transmit disease. Forced but unsuccessful migrations to cane also take place when infested grasses are weeded out in the cane fields.

6. **Aphis middletonii** Thomas.

This is a root-inhabiting species on various Compositae and has been found in Honolulu on cultivated *Coreopsis* and China aster (*Callistephus chinensis* (L.) Nees).

7. **Aphis gossypii** Glover.

The cotton aphis, which, according to Van der Goot, is the *Aphis malvae* Walker of European authors, is one of our commonest and most destructive species. Its food plants are very numerous, and the list given herewith might be greatly increased by careful collecting. Among cultivated plants, it has been found in the Islands on cotton (*Gossypium barbadense* L.), *Cucumis,* taro (*Colocasia antiquorum* var. *esculenta* Schott), *Caladium bicolor* Vent., Hibiscus (*Hibiscus rosa-sinensis* L. and hybrids), *Clerodendron* sp., egg plant (*Solanum melongena* L.), pink and white shower (*Cassia nodosa* Ham.)., periwinkle (*Vinca rosea* L.), avocado (*Persea gratissima* Gaertn.), Ageratum (*Ageratum houstonianum* Mill.), hybrid of *Plumieria rubra* L., sunflower (*Helianthus annuus* L.), marigold (*Tagetes erecta* L.), Mexican creeper (*Antigonon leptopus* H. and B.), Zinnia (*Zinnia elegans* Jacq.), Ixora (*Ixora macrothyrsa* Theijsm. and Binn.), and hollyhock (*Althaea rosea* Cav.).

It also occurs in more or less abundance on the following weeds: *Bidens pilosa* L., *Cuphea hyssopifolia* H. B. and Kunth., *Waltheria americana* L., *Cassia bicapsularis* L., *Solanum nodiflorum* Jacq., *Malvastrum coromandelinum* (L.) Garke, *Malva parviflora* L., *Ipomoea pentaphylla* Jacq., *Desmodium uncinatum* D C., *Crotalaria incana* L., *Erechtites, Stachytarpheta dichotoma*

Vahl., *Euphorbia pilulifera* L., *Euphorbia* sp., *Sida cordifolia* L., and *Sida rhombifolia* L.

It was also found on a native Mucuna vine (*Mucuna* sp. near *urens* (L.) Medic.) on the Ditch Trail near Keanae, Maui, in July, 1920 (Swezey).

8. **Aphis** sp.

A bright orange-yellow species of *Aphis,* very similar to *Aphis gossypii* in structure, has been observed on *Waltheria americana* L. on the island of Oahu. Even the alate form has the abdomen bright yellow. The species is distinguished from *gossypii* by the coloration and by the different proportions of the antennal segments in the alate viviparous form.

9. **Aphis medicaginis** Koch.

Aphis papaveris Silvestri, 1909, Bol. Quind. Soc. Agr. Ital. 14, p. 344.

Aphis gossypii Fullaway, 1910, Ann. Rep. Haw. Agric. Exp. Sta. for 1909, p. 39 (in part).

Aphis medicaginis Higgins, 1910, Ann. Rep. Haw. Agric. Exp. Sta. for 1909, p. 54.

The first record of this pest under its correct name was by Higgins, in 1910. It was confused by Fullaway with *Aphis gossypii,* but is easily distinguished by the shiny black color and reticulate derm of the apterous females.

It has been found on the following cultivated plants: Various beans (*Phaseolus* spp.), Cowpea (*Vigna cylindrica* (L.) Merrill), pigeon pea (*Cajanus cajan* (L.) Millsp.), hyacinth bean (*Dolichos lablab* L.), and the night-blooming Cereus (*Cereus triangularis* (L.) Haw.). It is especially destructive to cowpeas.

It also occurs on the following weeds: *Portulaca oleracea* L., *Medicago denticulata* Willd., *Indigofera suffruticosa* Mill., *Euphorbia pilulifera* L., *Datura stramonium* L., *Tribulus cistoides* L., and *Acacia farnesiana* (L.) Willd. It was found on *Tribulus* on the outlying islands by the members of the Tanager Expedition in 1923.

10. **Aphis** sp.

A heretofore unrecorded and as yet unidentified species of *Aphis* was taken February 25, 1917, in large numbers on *Cam-*

pylotheca macrocarpa (Gray) Hbd. on the Manoa Cliff trail on Mt. Tantalus, Oahu.

It is distinguished from other species occurring here except *Aphis bambusae* and the following species on *Scirpus* by having secondary sensoria on the third to fifth antennal joints and from *bambusae* by the greenish-yellow color of the apterous phase which lacks a white waxy secretion and by the longer cornicles which are about as long as in *Aphis medicaginis.*

11. **Aphis** sp.

A yellow species on *Scirpus maritimus* L. was taken by Mr. Swezey in April, 1913, at Kewalo, in Honolulu. In many ways it is close to the preceding species on *Campylotheca,* but the antennae of this species are longer and wholly yellow, whereas the last four joints are black in the other species.

12. **Aphis swezeyi** Fullaway.

This species recorded by Fullaway on *Gnaphalium* sp. has not been collected since.

13. **Aphis bambusae** Fullaway.

Melanaphis bambusae Van der Goot, 1916, Zur Kenntniss der Blattläuse Javas, p. 61.

This species was found by Fullaway on a bamboo which was believed to be a species of *Phyllostachys.* It has been wrongly accredited to Kirkaldy by Van der Goot, and more recently by Baker.

14. **Brevicoryne brassicae** (Linnaeus).

The cabbage Aphis occurs here rather sparingly on cabbage (*Brassica oleracea* L.) and kale (*Brassica* sp.), and is sometimes found on *Capparis sandwichiana* D C.

15. **Toxoptera aurantii** (Fonscolombe).

This species is found commonly in the mountains of Oahu, generally at an elevation of 1500 to 2000 feet on various species of endemic trees and shrubs of which the following have been noted, although the list is by no means complete: *Scaevola chamissoniana* Gaud., *Pittosporum glabrum* Hook. and Arn., *Hibiscus arnottianus* Gray, *Pelea* sp., and *Straussia* sp.

It also occurs on the following cultivated or escaped shrubs and trees: Coffee (*Coffea arabica* L.) and mango (*Mangifera indica* L). The record on mango is based on a small colony found at Kaimuki, May 24, 1920, which is the only time that the species has been discovered in the coastal lowlands, to the writer's knowledge, except that a single-winged migrant was taken by Fullaway in October, 1922, on *Ixora macrothyrsa* Theijsm. and Binn. It has never been seen on Citrus in the Islands, probably because of its rarity in the lowlands, where most of the Citrus trees are grown.

16. **Vesiculaphis caricis** (Fullaway).

Toxoptera caricis Fullaway, 1910, Ann. Rep. Haw. Agric. Exp. Sta. for 1909, p. 32.

Vesiculaphis caricis Del Guercio, 1911, Redia, 7, p. 464.

This peculiar aphid was discovered by Fullaway on a sedge (*Carex* sp.) in the mountains back of Honolulu.

17. **Yamataphis oryzae** Matsumura.

Matsumura, 1917, Jour. Coll. Agr. Tohuku Univ. 7, p. 412.

A single alate female was taken by me while riding on a street-car between Kaimuki and Moilili, in Honolulu on March 24, 1924. This specimen agrees very well with Matsumura's description, and I believe the identification is certain, notwithstanding the limited material on which it is based. The species was discovered by Matsumura at Sapporo, Japan, on the roots of rice (*Oryza sativa* L.).

18. **Myzaphis** sp.

The apterous phase of this species is sometimes common on cultivated rose-bushes in Honolulu, and was first noticed in 1916, but the alate form was not discovered until March, 1923. In Theobald's table of rose aphids (Bull. Ent. Research, 6, p. 112, 1915) it runs to *neorosarum* Theobald, a new name for *rosarum* Buckton (not Kaltenbach), but it is apparently not that species. According to Buckton, *neorosarum* has black marks on the abdomen in the alate phase which is not true of the Honolulu species, and the capitate hairs of the body are more nearly as in *rosarum* (Kaltenbach) as figured by Theobald.

19. **Capitophorus braggii** (Gillette).

This species was discovered on artichoke (*Cynara scolymus* L.) April 12, 1923, by Mr. Swezey, in the Manoa Valley, Oahu.

20. **Amphorophora lactucae** (Kaltenbach).

This species was first noticed by the writer in Honolulu in November, 1922, and has since been found widely distributed on Oahu. It is now very common on *Sonchus oleraceus* L., and seems to have replaced *Macrosiphum solanifolii* on this food plant.

21. **Myzus citricidus** Kirkaldy.

This species recorded and described by Kirkaldy in 1907 (Proc. Haw. Ent. Soc. 1, p. 100) occurs abundantly on the tender growth of various species of Citrus on Oahu, and probably on most of the other Islands.

22. **Myzus** sp.

A small species apparently belonging to the genus *Myzus* was taken by Mr. Fullaway on bamboo, in Honolulu, on two occasions in the winter of 1917-1918. The material preserved is not sufficient for the identification of the species, but indicates that it is different from all other aphids known to occur here.

23. **Myzus persicae** (Sulzer).

The common peach aphis of the United States and Europe has so far been found in Hawaii only on cabbage (*Brassica oleracea* L.), kale (*Brassica* sp.), papaya (*Carica papaya* L.), and *Datura stramonium* L.

24. **Aulacorthum** sp.

This green *Aulacorthum* has the cornicles with about three to five rows of coarse irregular reticulations at the apex, the third antennal joint with about fifteen to nineteen sensoria in a row, the fourth joint with five or six sensoria, while the apterous phase has only about six sensoria in a row on the basal half of the third antennal joint. It is very close to *A. rosaefolium* (Theobald), but distinct in having much fewer sensoria on the third antennal joint of the apterous females. It apparently differs from any species of aphid so far recorded from rose-bushes.

This species infests cultivated rose-bushes (*Rosa,* hybrids)

and largely replaces *Macrosiphum rosae* in the lowlands of the Islands. I have found it on roses in Honolulu and on Tantalus, Oahu, and at Wailuku, Maui, and also collected it on rose-bushes at Whittier, California, in 1912.

25. **Aulacorthum circumflexum** (Buckton).

Circumflexum was discovered by Mr. Fullaway on poha (*Physalis peruviana* L.) on Tantalus, Oahu, and I have since taken it on one of the native shrubby violets (*Viola* sp.) in the Punaluu Mountains, Oahu, and on *Phyllostegia grandiflora* Benth. on Mt. Kaala, Oahu, at about 3000 feet. It has also been taken on pansies (*Viola tricolor* L.) in Honolulu by Mr. Fullaway.

Van der Goot makes this species the type of his genus *Neomyzus,* but it seems to me to agree in every respect with *Aulacorthum,* as the apterous females examined by me have one or two small sensoria on the third antennal joint.

26. **Aulacorthum** sp.

In 1918, Mr. Fullaway collected, on an unidentified composite on Maui, a green *Aulacorthum* without dark markings, which agrees almost exactly with *circumflexum* in structural details and in the color of the legs, cornicles and antennae. In March, 1920, he took what is apparently the same species on ferns at Kilauea, Hawaii.

27. **Aulacorthum** sp.

A small colony consisting entirely of apterous females was collected on a fern (*Polypodium* sp.) in the native forest on the Pauoa trail, Tantalus, Oahu, in February, 1916. The species is green, with the cornicles, antennae, excepting the first two joints and base of the third joint, the apex of the tibiae and the tarsi blackish. The frontal tubercles appear to be somewhat shorter than is usual for the genus, but they are gibbous on the inner side, the third antennal joint bears one or two sensoria near the base, and the cornicles are slightly tapering and transversely imbricated and imperfectly reticulated at apex. The identification of the species must rest until the alate form is discovered.

28. **Macrosiphoniella sanborni** (Gillette).

This aphid occurs on florists' Chrysanthemum (*Chrysanthemum hortorum*) in Honolulu, and was first recorded by Fullaway in 1910.

29. **Macrosiphum rosae** (Linnaeus).

The common rose aphid was recorded by Fullaway from Honolulu, Oahu, and from Mana and Puuopelu, Hawaii (2000 to 3500 feet). I have found but one specimen of it in Honolulu, but have seen it abundant on cultivated roses at Mountain View and Kilauea, Hawaii.

30. **Macrosiphum solanifolii** (Ashmead).

Macrosiphum trifolii Fullaway, 1910, Ann. Rep. Haw. Agric. Exp. Sta. for 1909, p. 23 (not Pergande, 1904).

For the determination of this species I am indebted to Mr. A. C. Baker, with whom I agree after comparing Hawaiian specimens with a long series collected in Texas, Utah, and California, on potato, rose, alfalfa, *Sonchus, Lactuca scariola* L., *Malva parviflora* L., *Citrus, Erodium cicutarium* L'Herit., and cultivated strawberry. I believe that *Macrosiphum creelii* Davis, described from specimens taken on alfalfa, is a synonym.

This species was formerly abundant in the lowlands on *Sonchus oleraceus* L., but I have been unable to find it during the last two years. On one occasion I discovered a small but vigorous colony on *Portulaca oleracea* L., and in January and February, 1920, I found small colonies on corn (*Zea mays* L.) in Manoa Valley, located mostly on the basal part of the stalk and on the lower leaves of vigorously growing plants.

31. **Neotoxoptera violae** (Pergande).

A species, believed by Fullaway to be the one described by Pergande, was taken by him on Tantalus, Oahu, on cultivated violets (*Viola odorata* L.). It has not been found since.

32. **Idiopterus nephrolepidis** Davis.

Macrosiphum kirkaldyi Fullaway, 1910, Ann. Rep. Haw. Agric. Exp. Sta. for 1909, p. 22, figs. 1-2.

Fullawayella kirkaldyi Del Guercio, 1911, Redia, 7, p. 462.

Nephrolepidis is a common species in the mountains back of Honolulu on *Acrostichum reticulatum* Kaulf., *Polypodium lin-*

eare Thunb. and doubtlessly several other species of ferns, and has been taken on ferns at Kilauea, Hawaii, by Fullaway.

The genus *Fullawayella* has been misunderstood by Baker, who wrongly uses it to replace *Neotoxoptera* Theobald and *Micromyzus* Van der Goot. Essig has also stated that *nephrolepidis,* without doubt, is a native of the Hawaiian Islands, and that it has been introduced from there into the United States. There is, however, no local evidence that *nephrolepidis* is endemic to the Islands, and I believe that it has been introduced here as likewise in the United States on imported plants.

33. **Pentalonia nigronervosa** Coquerel.

Nigronervosa is a not uncommon species on banana of various kinds (*Musa* spp.) in Honolulu, and presumably occurs throughout the Islands in the lowlands. It was also found by Mr. Fullaway in June, 1922, on ferns in Honolulu.

SUBFAMILY ERIOSOMATINAE.

34. **Eriosoma lanigerum** Hausmann.

Fullaway has recorded the woolly aphis from apple trees (*Pyrus malus* L.) at Waikii, Hawaii (4500 feet), and more recently Mr. Ehrhorn reported on finding the species at the same locality (Proc. Haw. Ent. Soc. 5, p. 18, 1922).

SUBFAMILY HORMAPHINAE.

35. **Cerataphis lataniae** (Boisduval).

This species occurs on the loulu palm (*Pritchardia* sp.) in Honolulu, and one or two trees at the College of Hawaii have been continuously infested for several years. It has been found by Dr. Lyon also on greenhouse orchids at the Moanalua gardens near Honolulu.

36. **Thoracaphis ficus** Baker.

Baker, 1920, U. S. Dept. Agric. Bull. No. 826, pl. 16, figs. Q, R.

Fullaway (Proc. Haw. Ent. Soc. 4, p. 471, 1921) has recorded the occurrence of this species on *Ficus* in Honolulu, under the name of *Thoracaphis fici* Van der Goot, which is apparently a manuscript name. It occurs frequently on the banyan tree (*Ficus Benghalensis* L.) about Honolulu.

37. Undescribed Aphid on **Araucaria.**

An undescribed and peculiar aphid was reported by the writer as occurring on the Norfolk Island pine (*Araucaria excelsa* R. Br.) in 1916 (Proc. Haw. Ent. Soc. 3, p. 267). It belongs to a new genus, apparently of the subfamily Hormaphinae, and can hardly be confused with any other Hawaiian species.