THE UNIVERSITY OF MANITOBA

A TAXONOMIC STUDY OF THE GENUS APHIS L. (HOMOPTERA: APHIDIDAE) IN MANITOBA

by

VALULI ROJANAVONGSE

A thesis

submitted to the Faculty of Graduate Studies in

partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Department of Entomology

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ABSTRACT

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Descriptions, illustrations, host plants and a key to the 37 species of Aphis L. found in Manitoba are presented. Five species are described as new: Aphis bulleri Robinson and Rojanavongse new species on Ribes sp., Aphis duckmountainensis Rojanavongse and Robinson new species on Senecio pauperculus Michx., Aphis manitobensis Robinson and Rojanavongse new species on Ribes sp., Aphis neomonardae Rojanavongse and Robinson new species on Agastache foeniculum (Pursh) Ktze. and Monarda fistulosa L., and Aphis whiteshellensis Rojanavongse and Robinson new species on Amelanchier alnifolia Nutt.

Other species of Aphis L. which are described are armoraciae Cowen, asclepiadis Fitch, astragalina Hille Ris Lambers, ceanothi Clarke, corniella (Hille Ris Lambers), craccae Linnaeus, decepta Hottes and Frison, fabae Scopoli farinosa Gmelin, forbesi Weed, gossypii Glover, helianthi Monell, heraclella Davis, knowltoni Hottes and Frison, maculatae Oestlund, masoni Richards, nasturtii Kaltenbach,

neogillettei Palmer, neomexicana (Cockerell), nivalis Hille Ris Lambers, oenotherae Oestlund, oestlundi Gillette, pomi DeGeer, ribiensis Gillette and Palmer, rubicola Oestlund, rumicis Linnaeus, saniculae Williams, sedi Kaltenbach, spiraecola Patch, spiraephila Patch, thaspii Oestlund and varians Patch.

Other important findings are as follows:

(1) Aphis rubifolii (Thomas) has not yet been collected in Manitoba, and previous reports of its occurrence by Robinson and Bradley (1965, 1968) are erroneous. Collections reported as rubifolii should be properly referred to as Aphis rubicola Oestlund. A lectotype has been designated for rubicola, and several other slides as paralectotypes, in the University of Minnesota collection.

(2) Aphis monardae Oestlund is a synonym of Aphis gossypii Glover.

(3) Aphis sanborni Patch and Aphis ribigillettei Knowlton and Allen are synonyms of Aphis neomexicana (Cockerell).

(4) Aphis luridis Hottes and Frison is a synonym of Aphis saniculae Williams.

(5) Aphis signatis Hottes and Frison is a synonym of Aphis thaspii Oestlund.

Many of the previous descriptions of fundatrices, alate and apterous viviparous females, and males and oviparae were inadequate. Some of these are described in this thesis in detail for the first time, from Manitoba material.

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gave permission in several instances for me to remount slides. Dr. V. F. Eastop, British Museum (Natural History) offered advice and lent slides of signatis, luridis and decepta. Dr. A. R. Forbes of the CDA Research Station in Vancouver, B. C., sent a live colony of fabae from host plant Vicia faba. Dr. D. Hille Ris Lambers, Bennekom, Netherlands, answered very many questions, and gave many slides of identified material for my collection. His material was particularly valuable, because he had in many cases seen type material not available to me, and his slides were almost as authentic as seeing the original material. Dr. G. F. Knowlton, Utah State University, Logan, kindly supplied 4 slides of ribigillettei from his collection. Dr. M. E. MacGillivray of the CDA Research Station in Fredericton, N.B., loaned to me a slide of forbesi, and sent a sample of nasturtii from a living culture on potatoes in a greenhouse. Miss Louise Russell, formerly of the United States Department of Agriculture at Beltsville, Maryland, arranged for the loan of specimens of menthaeradicis, saniculae, armoraciae, lugentis, senecionis, senecioradicis, decepta, luridis, signatis and nyctalis from the United States National Museum. She also offered valuable advice by letter on several occassions, concerning taxonomic problems with rubicola, sanborni, armoraciae and others. Dr. G. W. Simpson

arranged for the loan of 6 slides of sanborni from the Patch Collection, University of Maine, Orono. Dr. L. J. Stannard kindly sent specimens on loan of luridis, signatis, sanborni, nyctalis, decepta and rubifolii from the collection of the Illinois Natural History Survey. Mr. H.L.G. Stroyan, Harpenden, Hertfordshire, kindly offered advice on clydesmithi, luridis and saniculae. Prof. C. S. Wood-Baker, of Chislehurst, Kent, pointed out the existence of sedi in Manitoba, which we had not previously known, and checked for me samples of armoraciae and gossypii. To all these very helpful people I offer my very sincere thanks.

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TABLE OF CONTENTS

Chapter		Page
I.	INTRODUCTION	1
	The problem	2
	Scope of study	3
II.	REVIEW OF THE LITERATURE	
	General review of the literature of *Aphis* L.	4
	Some genera closely related to *Aphis* L.	9
III.	MATERIALS AND METHODS	
	Collecting techniques	15
	Clearing and mounting techniques	16
	Illustrations	18
	Measurements	19
IV.	BIOLOGY OF *APHIS* L.	
	Polymorphism	21
	Biological variations	23
	Feeding sites	24
V.	EXTERNAL MORPHOLOGY OF *APHIS* L.	25
VI.	KEY TO THE MANITOBA SPECIES OF *APHIS* L.	29
VII.	SYSTEMATICS OF GENUS *APHIS* L. IN MANITOBA	
	Aphis armoraciae Cowen	39
	A. asclepiadis Fitch	44
	A. astragalina Hille Ris Lambers	47
	A. bulleri Robinson and Rojanavongse new species	50

Chapter

	Page
A. ceanothi Clarke	53
A. corniella (Hille Ris Lambers)	57
A. craccae Linnaeus	64
A. decepta Hottes and Frison	68
A. duckmountainensis Rojanavongse and Robinson new species	72
A. fabae Scopoli	76
A. farinosa Gmelin	85
A. forbesi Weed	91
A. gossypii Glover	95
A. helianthi Monell	101
A. heraclella Davis	108
A. knowltoni Hottes and Frison	111
A. maculatae Oestlund	115
A. manitobensis Robinson and Rojanavongse new species	121
A. masoni Richards	125
A. nasturtii Kaltenbach	127
A. neogillettei Palmer	132
A. neomexicana (Cockerell)	138
A. neomonardae Rojanavongse and Robinson new species	143
A. nivalis Hille Ris Lambers	147
A. oenotherae Oestlund	149
A. oestlundi Gillette	153
A. pomi DeGeer	158
A. ribiensis Gillette and Palmer	164
A. rubicola Oestlund	168

Chapter		Page
	A. rumicis Linnaeus	175
	A. saniculae Williams	179
	A. sedi Kaltenbach	183
	A. spiraecola Patch	189
	A. spiraephila Patch	194
	A. thaspii Oestlund	199
	A. varians Patch	204
	A. whiteshellensis Rojanavongse and Robinson new species	210
VIII.	HOST INDEX OF MANITOBA PLANTS	216
IX.	SUMMARY	224
BIBLIOGRAPHY		227
PLATES (FIGURES 1-504)		241

Chapter I

INTRODUCTION

Many aphids transmit virus diseases of plants and more than one hundred species of aphids have been recorded as vectors of such diseases (Eastop, 1961). Damage to plants may also be caused by aphids sucking the plant sap; however most species appear to be of little or no economic importance. The extent of aphid injury to grain crops was evident in Alberta during the summer of 1949 when over one million dollars worth of barley was destroyed by their feeding (Archibald, 1958). Several species of the genus Aphis L. are of considerable economic importance on fruit and vegetable crops as well as field crops because of their feeding damage or because they transmit virus diseases. Allen and Knowlton (1939) reported seven species of Aphis infesting Ribes, while Stroyan (1961) described three species of Aphis on Citrus.

The economic importance of aphids was outlined by Palmer (1952) and occurs in three ways: "(1) by robbing the plant sap, (2) by the toxic action of their salivary secretions, injected during feeding, thus causing stunting of growth, deformation of leaves and even of fruit, or causing galls on leaves, stem or roots, (3) by acting as vector of viruses diseases of plants. Since aphids

are usually specific as to plants attacked and as to plant viruses carried in the capacity of vectors their taxonomy is highly important."

Aphis is one of the largest aphid genera, and includes species very difficult to distinguish because of their great morphological similarity. The colour of these aphids shows great variation even within the forms of the same species, e.g., in Aphis gossypii Glover, the colour can vary from pale yellow to black. Many attempts have been made to delineate the genus without satisfactory results.

There is no complete record of Aphis in Manitoba. Robinson and Chen (1969) recorded the Aphis spp. on Cornus spp. and Robinson and Bradley (1965, 1968) published lists of the aphids of Manitoba including Aphis. These lists are already out of date. The present study on the genus Aphis helps to revise the latest of those lists.

The problem

The purpose of the study was fourfold: (1) to assemble a collection of specimens of all species of the genus Aphis in Manitoba; (2) to identify these aphids to species, including new species; (3) to construct a taxonomic key to facilitate identification of the species found; and (4) to describe each species in detail.

Scope of study

The scope of this study includes all species of the genus Aphis on all of their host plants in Manitoba. References, and the original descriptions of the species, have been examined carefully. Comparison with types from the United States National Museum and elsewhere, and the submission of doubtful determination to various specialists were done in making the identifications.

A great deal of the material used in this study was collected by Professor A. G. Robinson and others in the years 1961-1972. The author and Professor Robinson made intensive collections during the summers 1973-1975. Attempts were made to collect all forms of each species, but for most species this was not possible.

Chapter II

REVIEW OF THE LITERATURE

General review of the literature of Aphis L.

The following list of references is exactly that of Baker (1920) and they are not included again in the Bibliography of this thesis.

1758. Aphis Linnaeus, Systema Naturae, 10th ed., p. 451.

1817. Loxerates Rafinesque, Am. Mo. Mag. & Crit. Review, v. 1, p. 361.

1907. Uraphis Del Guercio, Redia, v. 4, p. 192.

1907. Microsiphon Del Guercio, Redia, v. 4, p. 192.

1913. Myzaphis Van der Goot, Tijd. voor Ent., v. 56, p. 96.

1913. Stenaphis Del Guercio, Redia, v. 9, p. 185.

1916. Longiunguis Van der Goot, Zur Kenntniss der Blattläuse Java's, p. 112.

1916. Melanaphis Van der Goot, Zur Kenntniss der Blattäuse Java's, p. 61.

1917. Abura Matsumura, Jour. Coll. Agr. Tohoku Univ., v. 7, pt.6, p. 407.

1917. Arimakia Matsumura, Jour. Coll. Agr. Tohoku Univ., v. 7, pt. 6, p. 405.

Aphis is the oldest genus in the family Aphididae, dating from 1758, the time of Linnaeus' 10th Edition of Systema Naturae. In the 10th Edition, Linnaeus described approximately 26 species, all in the genus Aphis. Many other authors, such as DeGeer in 1773 and 1780, and Fabricius in 1775, placed other species in the genus Aphis, but their brief descriptions are inadequate for present-day requirements (Cottier, 1953).

Since that time many new genera have been split from Aphis by several authors, notably, Hartig (1841) who divided aphids into two groups primarily on the basis of wing venation. It was reported by Cottier (1953) that Kaltenbach used mainly wing venation and biological forms in arranging genera. Kaltenbach also included 158 species under Aphis. During 1854 to 1857, Koch reworked Kaltenbach's classification of the species included in Aphis and divided them into several new genera. Passerini (1863) published keys for identification of known genera and divided the family Aphididae into subfamilies with Aphis placed in the subfamily Aphidinae. In a series of papers from 1876-1883 Buckton placed Aphis in a "tribe" Aphidinae. A key for the identification of genera was published by Jules Lichtenstein (1885) and he placed Aphis in the family Aphidiens and tribe Aphides. In 1887, Oestlund described 11 new species from 39 species of Aphis in Minnesota.

According to Cottier (1953) van der Goot revised the family Aphididae using many characters to divide the family into subfamilies Aphidinae and Chermesinae. Swain (1919) made a synopsis of California aphids which contained the descriptions and a key to 44 species of Aphis.

In 1920, the genera of the family Aphididae of the world were studied by Baker. The following quotation from Baker (1920) illustrates his opinions on generic limits:

> In 1907 Del Guercio erected two genera, Uraphis and Macrosiphon, based on the relative length of the cornicles and cauda. When considering certain individual species these would appear as very fair characters for use. But when large series of species are studied it will be found that in the species having the cauda of the typical Aphis shape there are all gradations of cornicles from the very short to the very long. This will be also seen in the forms having the abruptly conical cauda. Some species have very short cornicles and some quite long ones. Moreover, in the same species the cornicles in the different forms will bear a different relation to the length of the cauda. Species, therefore, having cornicles and cauda of essentially the same character should not be used as types of different genera depending on the length of the cornicles.

Under this rule, it is believed that Longiunguis, Melanaphis and the other genera mentioned above would be synonyms of Aphis.

Besides synonymy, Baker also studied the genotype of Aphis. He reported that in 1801 Lamarck set Aphis ulmi L. as type, and in 1802 Latreille set Aphis sambuci L. as type. Aphis ulmi is, according to Passerini (1863),

Eriosoma lanuginosa Hartig and that species is now placed in Tetraneura. Aphis sambuci was retained as type, by suspension of the Rules of the International Code of Zoological Nomenclature.

There are several publications on Aphis which are mainly aphid lists or host lists, usually with inadequate descriptions of the species. Sanborn (1904, 1906) studied the Aphis of Kansas, and Williams (1910) the Aphididae of Nebraska where he described 13 new species of Aphis from the 35 species that he found in Nebraska. In 1918, Wilson and Vickery listed the species of Aphididae of the world. They also recorded their food plants. Oestlund (1887, 1922) studied the Aphidae of Minnesota. In 1923, Britton published the Hemiptera of Connecticut which included a section on Aphididae by Patch. Later, Patch (1938) published a food plant catalogue of the aphids of the world. She also published a series of pamphlets on the aphids of Maine.

Many attempts have been made to list the aphids of a particular area of North America; for example, Johansen (1954) made a preliminary list of the aphids and their host plants from the State of Washington. He reported 33 species of Aphis. Boudreaux (1951) listed the aphids of Louisiana. Bibby (1959) noted a few species from Arizona. In 1963, Leonard made a list of the aphids of New York, to which he has since added four supplements. In 1966a

Leonard published a preliminary list of the aphids of Massachusetts. Leonard (1968b) reported on the California aphids in the Cornell University Collection. Leonard and Bissell (1970) found about 33 species of Aphis from host plants in the District of Columbia, Maryland and Virginia. Recently, Leonard (1974b) listed 50 species of Aphis in a list of the aphids of Oregon. Other aphid lists by Leonard are: from New Jersey (1956, 1964, 1967, 1971b, 1972); from Missouri (1959, 1963a); Delaware (1967); Plummers Island (1966b); Staten Island (1974a); Vermont (1970); and Texas (1965).

In North America, no comprehensive taxonomic review of this group was available until 1931 when Hottes and Frison gave a systematic and descriptive account of the Aphididae of Illinois. They also published valuable keys with illustrations of Aphis. Gillette and Palmer (1932) and Palmer (1936) published keys to the species of Aphis which added considerably to the understanding of the specialized morphology and life cycles of many species. These works were brought up to date by Palmer (1952) in "Aphids of the Rocky Mountain Region." This book has been very useful in determinations of Manitoba species. In 1969, Medler and Ghosh published a key to species of alate aphids collected by traps in the North Central States, Oklahoma and Texas.

In Canada, this genus has received very little attention. MacGillivray (1952) published a list of 22 species of Aphis from the Maritime Provinces. Archibald (1957, 1958) published on the forest Aphididae of Nova Scotia, including species of Aphis. Richards (1963) reported on the Aphididae of the Canadian Arctic and described Aphis masoni as a new species. A list of the aphids of British Columbia and their host plants was published by Forbes et al (1973) and Forbes and Frazer (1973). This list recorded 17 species of Aphis and their host plants. Other brief lists from Canadian provinces are those by Glendenning (1924, 1925) for British Columbia, by Strickland (1953) for Alberta, by Quednau (1966) for Quebec, and by Leonard (1971c) for Newfoundland.

In Manitoba, Robinson and Bradley (1965, 1968) listed 27 species of Aphis, and their host plants, found in the southern part of Manitoba. In 1969 a key, and the descriptions for 7 species of Aphis on Cornus spp. of North America, was published by Robinson and Chen. This paper was very helpful to me in the determination of Aphis spp. collected on Cornus in 1973-1975.

Some genera closely related to genus Aphis L.

Eastop (1966) stated that Aphis is a large genus of perhaps several hundred species, in which some species groups have been raised to generic and subgeneric rank. It was

believed by Börner (1930) that the feature of wing venation, the arrangement of the antennae, the structure of the cauda, anal and genital plates, the presence and form of cornicles were the main taxonomic characters that should be noted while the presence and structure of the wax glands, formation of rostrum, the hind tibia in the oviparae, the form of the empodial hairs and arrangement of the dorsal hairs were of lesser importance. Modern taxonomists also emphasize the importance of chaetotaxy. Börner separated a "Aphidea Group" into 6 genera as follows: Rhopalosiphum Koch, Carolinaia Wilson, Aphis Linnaeus, Uraphis del Guercio, Cerosipha del Guercio and Toxoptera Koch.

In North America, Hottes and Frison (1931) placed Aphis in the subtribe Aphiea, including other genera such as Asiphonaphis Wilson and Davis, Brachycolus van der Goot, Cavariella del Guercio, Cerosipha del Guercio, Toxoptera Koch, Alphitoaphis Hottes, Hysteroneura Davis, Rhopalosiphum Koch, Brevicoryne van der Goot, and Hyalopterus Koch. But Gillette and Palmer (1932) placed the genus Aphis under the subtribe Aphina, including genera Atarsos Gillette, Cerosipha del Guercio, Aspidaphis Gillette, Cavariella del Guercio, Epameibaphis Oestlund, Pseudoepameibaphis Gillette and Palmer, Asiphonaphis Wilson and Davis, Siphonatrophia Swain, Flabellomicrosiphum Gillette and Palmer, Microsiphum Cholodkovski, Brachycolus Buckton,

Amphicercidus Oestlund, Braggia Gillette and Palmer, Toxoptera Koch, Rhopalosiphum Koch, Hyalopterus Koch, and Brevicoryne van der Goot. Later, in 1952, Palmer employed the same classification she used in 1931 except that she added Zyxaphis Knowlton and Durocapillata Knowlton to the subtribe Aphina in addition to the genera mentioned above.

When Börner (1952) gave an annotated catalogue of Central European aphids, he also separated the subfamily Aphidinae into tribes, genera and subgenera as follows:

I. Tribe Rhopalosiphonini
- Genus Hyalopterus Koch
- Genus Rhopalosiphon Koch
- Genus Schizaphis Börner
  1. Subgenus Paraschizaphis Hille Ris Lambers
  2. Subgenus Schizaphis Hille Ris Lambers
- Genus Euschizaphis Hille Ris Lambers
- Genus Geoktapia Mordvilko

II. Tribe Aphidini
- Genus Aphis Linnaeus
  1. Subgenus Aphis Linnaeus
  2. Subgenus Doralis Risso
  3. Subgenus Apataphis Börner
- Genus Comaphis Börner
- Genus Medoralis Börner
  1. Subgenus Medoralis Börner
  2. Subgenus Leucosiphon Börner
- Genus Cerosipha Del Guercio
  1. Subgenus Cerosipha Del Guercio
  2. Subgenus Uraphis Del Guercio
- Genus Toxopterina Börner
  1. Subgenus Tuberculaphis Börner

2. Subgenus Toxopterina Börner
- Genus Pergandeida Schouteden
1. Subgenus Doralis Börner
2. Subgenus Pergandeida Schouteden
- Genus Protaphis Börner
- Genus Xerophilaphis Nevsky
- Genus Toxoptera Koch

The New Zealand aphids were studied by Cottier (1953) and he divided the tribe Aphidini into several genera such as: Brachycaudus van der Goot, Pentatrichopus Börner, Myzaphis van der Goot, Cavariella del Guercio, Rhopalosiphum Koch, Toxoptera Koch, Aphis Linnaeus, Coloradoa Wilson, Macrosiphoniella del Guercio, Macrosiphum Passerini, Capitophorus van der Goot, Idiopterus Davis, Aulacorthum Mordvilko, Rhopalosiphoninus Baker, Hyperomyzus Börner, Neotoxoptera Theobald, Ovatus van der Goot, Myzus Passerini, Liosomaphis Walker, Elatobium Mordvilko, Hyadaphis Kirkaldy, Brevicoryne van der Goot, Lipaphis Mordvilko.

Archibald (1958) reported that the subtribe Aphina consisted of genera Cerosipha, Toxoptera, Hyalopterus, Aphis and Rhopalosiphum. Meanwhile, Bodenheimer and Swirski (1957), while studying the aphids of the Middle East, placed Aphis close to Toxoptera Koch and Brachyunguis Das. Börner and Heinze (1957) accepted Börner's classification of 1952 but added genus Aphidula Nevsky to subtribe Aphidina. In 1961,

Eastop gave an excellent explanation why the genera Toxoptera and Brachyunguis are related to Aphis in West Africa. Eastop (1966) also described a new genus Casimira from the Australian aphids and placed this genus close to Aphis and Toxoptera. He stated that: "Casimira differs from both Aphis and Toxoptera by the absence of lateral tubercles on abdominal segment VII and that all the first tarsal segments bear only two hairs. It also differs from Aphis by the media of the fore-wing being only once-branched and from Toxoptera by the absence of a stridulating mechanism."

Shaposhnikov (1964) published keys to Russian aphids. He divided subtribe Aphidina as follows:

- Genus Chomaphis Mordvilko
  1. Subgenus Chomaphis Mordvilko
  2. Subgenus Toxopterina Börner
- Genus Aphis Linnaeus
  1. Subgenus Aphis Linnaeus
  2. Subgenus Pergandeidea Schouteden
  3. Subgenus Medoralis Börner
  4. Subgenus Cerosipha del Guercio
  5. Subgenus Comaphis Börner
  6. Subgenus Brachysiphum Coot
  7. Subgenus Papillaphis Börner
- Genus Ephedraphis Hille Ris Lambers
- Genus Debilisiphon Shaposhnikov
- Genus Protaphis Börner
- Genus Brachyunguis Das
- Genus Xerobion Nevsky
- Genus Cryptosiphon Buckton
- Genus Toxoptera Koch

A Check List of British Insects has been revised recently by Kloet and Hincks (1964). They listed a subfamily Aphidinae into genera and subgenera as follows:

- Genus Hyalopterus Koch
- Genus Rhopalosiphum Koch
- Genus Euschizaphis Hille Ris Lambers
- Genus Schizaphis Börner
- Genus Paraschizaphis Hille Ris Lambers
- Genus Longiunguis van der Goot
- Genus Aphis Linnaeus

  Subgenus Aphidula Nevsky
  Subgenus Pergandeida Schouteden
  Subgenus Cerosipha del Guercio
  Subgenus Toxopterina Börner
  Subgenus Brachysiphum van der Goot

- Genus Toxoptera Koch

Most of their classification is based on Börner's classification of 1952. The subdivisions used by Kloet and Hincks are the most recent ones in general use by aphid taxonomists today.

Chapter III

MATERIALS AND METHODS

The aphids to be identified were treated in the following manner.

Collecting Techniques

The most efficient way to collect aphids was to remove a piece of host plant containing the aphid colony and to place it in a covered cardboard carton to be examined later in the laboratory. The mature aphids were transferred by a small aspirator to 70% alcohol while the last instar immature forms were left in the carton in the laboratory until they matured, usually within two or three days. A small piece of damp cotton was placed in the carton to prevent the host plants from drying out. Eastop and van Emden (1972) suggested that an aphid colony and host plant should be placed in a receptacle with some ventilation to reduce condensation. With the ant-attended aphid species it was worthwhile including also some ants because the aphids suffered in transit due to the accumulation of honeydew.

Another method recommended by Bodenheimer and Swirski (1957) was to place a sheet of strong paper or a thin cardboard under the host plant. The plant was then

shaken and the aphids fell on the paper or board and they were then easily collected. Many aphids which feed on aerial parts of plants drop off the plant at the slightest vibration.

Further observations were made relative to name of the host plants, that part of the plant on which the aphids were feeding e.g. the terminal growth, underside of the leaves, stem or branches etc., and on any abnormal appearance of the host plant associated with the presence of aphids e.g. distorted foliage, twig malformations etc. The colour of the aphids of all forms was also recorded.

Clearing and mounting techniques

The clearing method is basically that of Richards (1964) with slight modifications. The aphids were transferred from the 70% alcohol to 95% alcohol in a small Petri dish. The dish was then placed on a heater at 55°- 60° C and 2-3 particles of charcoal were added to prevent sputtering. When the alcohol started to boil, the temperature was reduced to 50° C and boiling continued for five minutes. The aphids were then removed singly from the alcohol and placed in a similar dish of 10% KOH and heated at 60°-65° C for 5-10 minutes. Following this, the aphids were placed in lactophenol (5 pounds or 2.27 kilograms of phenol crystals dissolved in a quart or 0.946 liters of lactic acid) at 85°- 90° C until they were cleared. The

large black aphids usually required a longer time. They were again placed in 10% KOH at 60°-65° C for five minutes and then removed to a solution of 1 part glacial acetic acid and 1 part oil of wintergreen at 80°-85° C for 10 minutes. Then the dish was removed from the heat and the aphids were placed in the final solution of 1 part oil of cedar, 1 part oil of lilac, 2 parts oil of wintergreen, and ½ part of glacial acetic acid which was heated at 85° C for 10 minutes. If aphids were collected in lactophenol, then they were processed with 10% KOH for 5-10 minutes; however if more clearing was required the aphids were heated in lactophenol before placing them in 10% KOH. The identification details were written in pencil and placed in the small Petri dish with aphids during the clearing process.

From the final solution the aphids were carefully transferred to a slide and placed in a drop of mounting medium. They now were arranged on the slide, i.e., the antennae, legs and wings (if present) were spread, and then covered with a cover glass. When the cleared aphids were placed on slides treated with mounting medium the forceps and needles used were constantly cleaned by immersing them in xylene for a few seconds. If not cleaned, damage occurred because specimens adhered to the mounting medium on the forceps or needles. When mounting very small specimens,

several to one slide, it helped to smear a light film of mounting medium on the surface of the cover slip which appeared to prevent excessive movement of the aphids when the cover slip was placed on the slide. Excessive mounting medium was wiped from around the cover slip with a piece of cheesecloth dipped in xylene. Cover slips were always cleaned with alcohol and dried with cheesecloth. The slides were baked in an oven at 50^{o} C for three to four weeks, or until firm.

Mounting medium: Piccolyte dry resin was melted gently in the water bath till entirely clear. A good mounting medium should retain its demarcation without spreading when placed on a slide. If, after a few months the mounting medium thickens, it can be thinned by the addition of alpha terpineol (lilacin).

Illustrations

Specimens were drawn with the aid of the Wild M20 drawing tube on a Wild microscope, or Bausch and Lomb microprojector. The illustrations of each species were drawn from the prepared specimen as previously described. No attempt was made to draw the illustrations to the same scale. Therefore the different illustrations are comparable only with regard to structural characteristics.

Measurements

An ocular micrometer was used to measure the length of the body from the anterior margin of the vertex to the apex of the anal plates (not including cauda) (Fig. 2); the length of unguis from distal margin of primary sensorium to the apex (Fig. 1); the length of rostral IV + V from along its grooved surface to the microsensillae. (Fig. 3); the length of hind tarsal segment II from base of segment to rounded part anterior to base of claws (Fig. 4); the length of cornicles from base to apex (Fig. 2); the length of cauda from base (soft portion) to apex (hard portion) (Fig. 2); the length of hair not including base of hair (Fig. 1).

At least 10 to 15 specimens of each species were measured in millimeters. For all measurements the mean was calculated, and in the text the range, mean, standard deviation and n (number of samples) are given.

During this research many hundreds of slides of aphids were permanently mounted. A complete set of all available forms of each species, including holotypes and paratypes of all new species, has been deposited in the Canadian National Collection in Ottawa. Paratypes of all new species and slides of most of the other species have also been deposited in the United States National Museum, Washington, D.C. and the British Museum (Natural History), London. Paratypes of new species, and remaining slides,

have been divided between the aphid collections of the University of Manitoba, Winnipeg, and Kasetsart University, Bangkok.

Chapter IV

BIOLOGY OF APHIS L.

Polymorphism

Unlike most insect species which exhibit polymorphism, primarily as metamorphosis (i.e.; complete or incomplete), the Aphididae possess a wide variety of polymorphisms. The life cycle is different from other insects by having an alternation of asexual generation with a sexual generation. The various "forms" or "morphs" occurring in this life cycle are as follows:

Fundatrices (stem mother) are always wingless females that hatch from overwintering eggs in the spring and produce offspring parthenogenetically. Generally there is a reduction in the number of sensoria and length of antenna, particularly the unguis. The body is always more rounded. Cauda and cornicles are shortened.

Fundatrigeniae are either wingless or winged offspring of the stem mother. When they mature they give rise to one or more generations parthenogenetically.

Apterous viviparous females are parthenogenetic wingless forms. Normally, they are similar to the fundatrix except for some characters which were mentioned above in the fundatrix.

Alate viviparous females are the parthenogenetic winged forms which resemble the apterous viviparous females except that they have wings and secondary sensoria on antennal segment III and occasionally on IV and V. According to Hille Ris Lambers (1966), there are two kinds of alate viviparous females occurring during early and late summer as follows:

Emigrant: Alate viviparous female that, in host-alternating species, leaves a primary host plant and colonizes a secondary host plant.

Immigrant: Alate viviparous female that, in host-alternating species, leaves a secondary host plant and produces oviparae, or oviparae and males, on a primary host plant.

Intermediates are the mature aphids that show both characters (i.e., apterous and alate viviparous females) in the same body. It is commonly found that the intermediate has secondary sensoria on antennal segments and small wing buds on the thorax but the other characters are the same as the apterous viviparous females.

Sexuparae are apterous or alate viviparous females which give birth to sexuales parthenogenetically.

Sexuales are the male and female offspring of the sexuparae.

Oviparae are normally wingless and very similar to apterous viviparous females but differ reproductively by

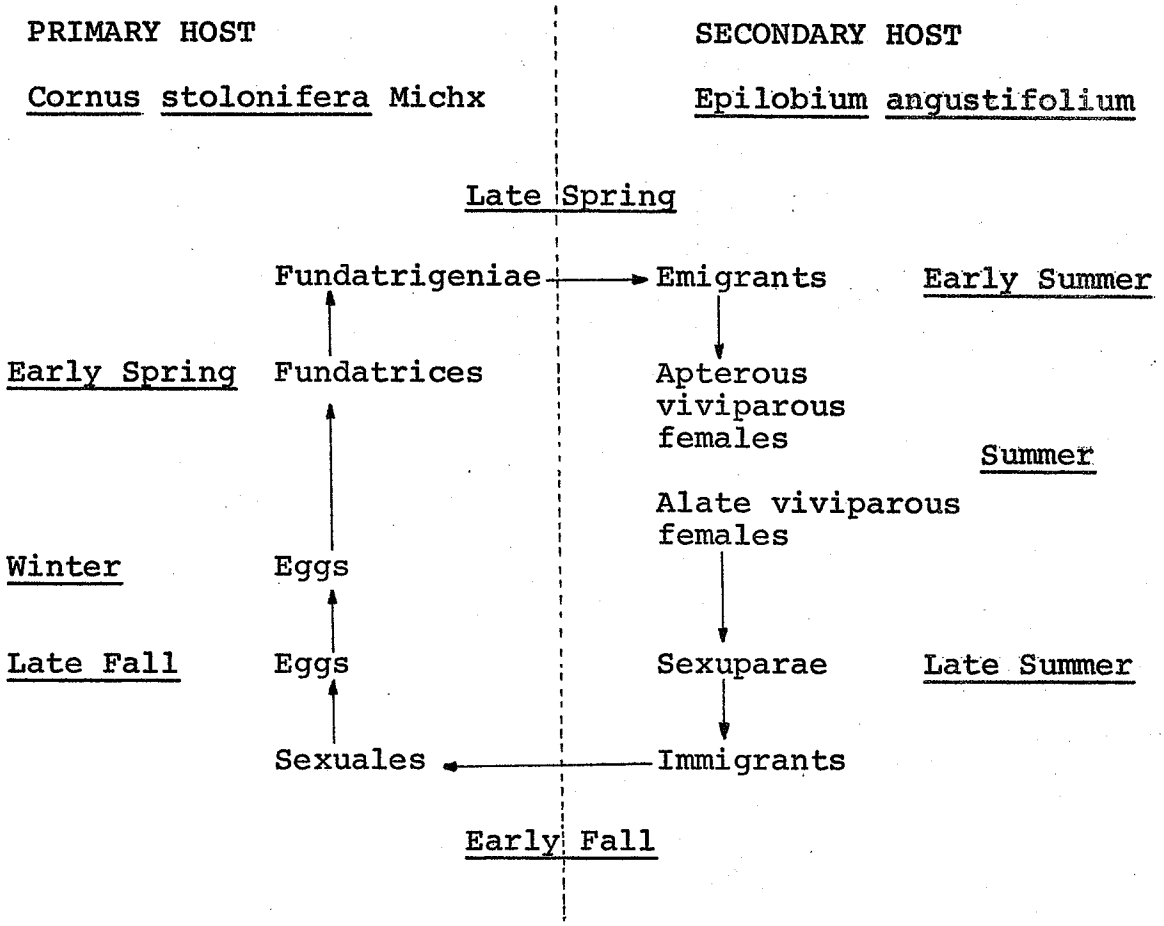
laying eggs instead of producing living young. Usually the hind tibiae are swollen, with numerous pseudosensoria.

Males are generally winged. They differ morphologically from alate viviparous females in having male genitalia and the antennae bear a much larger number of secondary sensoria.

Biological variation

The life cycles of aphids show variation between different species, and within the same species in different climates. In Manitoba, most are holocyclic species (capable of reproducing sexuales and fertilized eggs) while in the tropics most are anholocyclic species (reproducing parthenogenetically throughout the year), e.g. Aphis gossypii Glover, in Manitoba, can produce sexuales but this same species does not reproduce sexuales in the tropics. Generally, some species are specific to a certain kind of host plant, e.g. Aphis farinosa Gmelin passes its entire life history only on Salix spp., and it is said to be a "one host species". If, however, other species require two or more host plants to complete their life history, such a species is termed a "two host species", e.g. Aphis corniella (Hille Ris Lambers).

The life cycle of the two host species, Aphis corniella (H.R.L.), is shown as follows:



Life cycle of Aphis corniella (Hille Ris Lambers).

Feeding sites

Aphids are phytophagous insects usually living in colonies and often closely associated with ants. They feed wholly on plant juices. They may be found on the underside of a leaf at the base of terminal flowers and on fruits, on the stems, on the terminal leaves, or on the roots of the host plants, each according to the habit of the species. More detailed information of feeding sites will be mentioned again in the description of each species of Aphis.

Chapter V

EXTERNAL MORPHOLOGY OF APHIS L.

Plate I

A. Head

The head is broad and dorsoventrally flattened, with frontal tubercles never exceeding a slightly convex vertex.

1. Eyes: The compound eyes are many-faceted and posteriorly bear a laterally projecting 3-faceted tubercle called the "ocular tubercle". Alatae have three ocelli; two near the compound eyes and the third between the antennal bases.

2. Antennae (Fig. 1): The antennae of all forms, except some of the fundatrices and oviparae, are usually six-segmented and imbricated. Five-segmented antennae are occasionally found in the summer apterous forms of some species. The antennal tubercles are small or absent. The last antennal segment bears a prolongation called the unguis. Small sense pegs are found at the apex of the unguis. One large sub-circular primary sensorium occurs at the apex of antennal segment V. One large primary sensorium and normally six small sub-circular accessory sensoria are found at the base of antennal segment VI. Secondary sensoria are always present on antennal segment III of alatae and sometimes on antennal segments IV-V. In apterous forms the secondary

sensoria are occasionally present in some species.

3. Rostrum (Fig. 3): The four-segmented rostrum is attached to the ventral surface of the head. The basal or first segment is short and not prominent. The second segment is the longest, while the third is short and wide. The last rostral segment (rostral IV + V) usually tapers from a broad base to a narrow tip with "microsensillae" at the apex (Shaposhnikov, 1967). Three pairs of setae are usually present just before the apex of rostral IV + V and there are a variable number of accessory setae closer to the base (Hille Ris Lambers, 1974). In most species of Aphis two accessory setae occur, but some species may have 3-9 accessory setae.

B. Thorax

The thorax is composed of prothorax and fused mesothorax and metathorax. On each side of the prothorax there is a single lateral tubercle . The mesothorax of alatae is strongly developed with thoracic muscles. The metathorax is not as prominent as the mesothorax.

1. Wing: Wings are hyaline and fore wings and hind wings are attached laterally to mesothorax and metathorax respectively. Wing venation is normally with media twice-branched. In Aphis the wing venation is not very important for classification because there is little variability between species.

2. Legs: The legs are long and slender with usually two-thirds of the basal portion of tibiae pale in colour. In many species the hind tibiae of oviparae are swollen with numerous pseudosensoria. The tarsi are usually two-segmented with setae on the first segments 3, 3, 2 and rarely 3, 3, 3. A pair of claws is attached to tarsal segment II which is slender and longer than the first segment (Fig. 4).

C. Abdomen

The abdomen is composed of nine segments but only eight distinct tergites are visible. Distinct sutures between segments are usually not prominent in macerated specimens. The tergum is flattened and membranous with little sclerotization. The first abdominal segment is often reduced. Prominent lateral tubercles are always present on abdominal segments I and VII and small lateral tubercles are sometimes present on the other abdominal segments. Apterae are either pale or black dorsally while alatae are often without dorsal abdominal sclerotization; however usually dark transverse dorsal bands occur on abdominal segments VI - VIII. The lateral sclerites of abdominal segments II-IV and post-siphuncular sclerites are usually dark and slightly reticulated in alatae.

1. Spiracles: Seven pairs of spiracles are present on abdominal segments I-VII and normally occur at the anterior corner

or sterna, surrounded by small dark plates. The distance between the spiracles of abdominal segments I and II is usually less than that between other abdominal spiracles. The tubercle on abdominal segment I lies prominently between the first two spiracles.

2. Cornicles: A pair of cornicles is located between abdominal segments V and VI. Cornicles are usually imbricated and they may be cylindrical or tapering, with a small flange at the apex.

3. Cauda: The last tergum of the abdomen is extended posteriorly to form the cauda. The integument of the cauda is membranous and heavily armed with spicules over the entire surface. The shape of cauda, and number of setae on cauda, vary from species to species and also among the different forms within the same species.

4. Anal plate: The anal plate is situated on the last sternum of the abdomen below the cauda. Numerous setae are present on this plate. The anal opening is located between the cauda and the anal plate.

5. Genital plate: Ventrally, the genital plate lies cephalad to the anal plate. This plate is more or less oval and covered with short setae. The genital opening is located between the anal and genital plates. Three setaceous rudimentary projections called "gonophophyses" are visible close to the margin of the anal plate, in adult forms.

Chapter VI

KEY TO THE MANITOBA SPECIES OF APHIS L.

The construction of a key to species of Aphis L. is extraordinarily difficult. The keys to Aphis in Hottes and Frison (1931) and Palmer (1952) were freely admitted by their authors to be imperfect. The following key which I have made from Manitoba species is designed for both apterous and alate viviparous females; and it is estimated that perhaps 99 per cent of specimens of the 37 species will key out without too much difficulty. In those few cases where specimens do not key out easily, it is suggested that host plant data may be the only criterion.

1. Two to four accessory setae usually present on rostral segment IV + V 2
   - More than four accessory setae usually present on rostral segment IV + V 30
2. Longest setae on antennal segment III usually less than 0.035 9
   - Longest setae on antennal segment III usually more than 0.035 mm 3
3. Cornicles usually 2 - 3 times as long as cauda; unguis at least 3 times base of antennal segment VI . . . . maculatae Oestlund

- Cornicles usually shorter than 2 - 3 times as long as cauda; unguis shorter than 3 times base of antennal segment VI 4

4. Cauda normally with 6 - 12 setae 5

- Cauda normally with more than 12 setae 7

5. Cornicles longer than 1.2 - 1.5 times cauda . . . 6

- Cornicles shorter than 1.0 -1.2 times cauda. . . . . On Amelanchier sp. . . . . whiteshellensis Rojanavongse and Robinson new species

6. Dark olive-green; alate viviparous females usually with no dorsal markings on abdominal segments I - VI; normally 3 - 5 setae on abdominal tergite VIII; cornicles usually straight . . . . . neogillettei Palmer

- Brownish-red; alate viviparous females usually with dorsal bars, or broken traces on abdominal segments I - VI; normally 6 - 12 setae on abdominal tergite VIII; cornicles usually curved outwards . . . . . corniella (Hille Ris Lambers)

7. Secondary sensoria usually present on antennal segment III and occasionally on IV of alate viviparous females; no secondary sensoria on antennal segments of apterous viviparous females 8

- Secondary sensoria usually present on antennal segments III, IV and V of both apterous and

alate viviparous females . . . . . .
. . . duckmountainensis Rojanavongse and Robinson new species.

8. Two to six setae on abdominal tergite VIII . . . .
. . . fabae Scopoli

- Seven to twelve setae on abdominal tergite VIII
. . . astragalina Hille Ris Lambers.

9. Cornicles usually longer than 1.5 times unguis . . 10

- Cornicles usually shorter than 1.5 times unguis 11

10. Unguis normally longer than 1.5 times antennal segment III; rostral segment IV + V 0.12 - 0.13 mm long; cauda with 4-7 setae. On Ceanothus sp. . . . . .
. . . ceanothi Clarke

- Unguis normally shorter than 1.5 times antennal segment III; rostral segment IV + V 0.14 - 0.15 mm long; cauda with 7 - 14 setae. On Salix sp.
. . . farinosa Gmelin

11. Apterous viviparous females normally with dorsal markings on body 12

- Apterous viviparous females normally without dorsal markings on body 15

12. Secondary sensoria usually present on antennal segments III and rarely on IV of alate viviparous females; no secondary sensoria on antennal segments of apterous viviparous

females 13

- Secondary sensoria usually present on antennal segments III, IV and V of both apterous and alate viviparous females 14

13. Unguis longer than 2 times base of antennal segment VI; hind tarsal II 1.0 - 1.2 times as long as rostral segment IV + V . . . . craccae Linnaeus

- Unguis shorter than 2 times base of antennal segment VI; hind tarsal II less than 1.0 - 1.2 times as long as rostral segment IV + V . . . rumicis Linnaeus

14. Rostral segment IV + V, and cornicles, usually longer than 1.5 times hind tarsal II; small lateral tubercles normally present on one or more of abdominal segments II - V; hind tibiae of oviparae not swollen and without pseudosensoria; secondary sensoria normally absent on antennal segments of oviparae. On roots of Taraxacum sp. . . . . knowltoni Hottes and Frison

- Rostral segment IV + V, and cornicles usually shorter than 1.5 times hind tarsal II; small lateral tubercles normally absent on abdominal segments II - V; hind tibiae of oviparae swollen with numerous pseudosensoria; secondary

sensoria normally present on antennal segments of oviparae . . . . . armoraciae Cowen

15. Unguis usually less than 1.5 times base of antennal segment VI 16

- Unguis 1.5 times or more than base of antennal segment VI 17

16. Two setae normally on abdominal tergite VII; cauda bluntly tapering with 7 - 11 setae . . . . . nivalis Hille Ris Lambers

- Four to six setae on abdominal tergite VII; cauda fingertip-shaped with 11 - 18 setae . . . . . spiraephila Patch

17. Secondary sensoria usually present on antennal segment III, rarely on IV of alate viviparous females 18

- Secondary sensoria usually present on antennal segments III and IV, or III, IV and V of alate viviparous females 23

18. Less than 12 secondary sensoria, in a straight line on antennal segment III of alate viviparous females 19

- Many more than 12 secondary sensoria, not all of which are in a straight line on antennal segment III of alate viviparous females 22

19. Rostral segment IV + V at least 0.12 mm long,

longer than 1.5 times hind tarsal II 20

- Rostral segment IV + V less than 0.12 mm long, shorter than 1.5 times hind tarsal II . . 21

20. Rostral segment IV + V 0.12 - 0.14 mm long, usually not reaching abdomen; cauda with 4-6 setae; body pale green to bright green. On Oenothera sp. . . . . . oestlundi Gillette

- Rostral segment IV + V 0.14 - 0.17 mm long, usually reaching to abdomen; cauda with 6-8 setae; body bluish green to dark green. On roots of Fragaria sp. . . . . forbesi Weed

21. Antennal segment III 1.2 - 1.3 times as long as unguis; males alate . . . . . gossypii Glover

- Antennal segment III 0.7 - 0.8 times as long as unguis; males apterous . . . . . sedi Kaltenbach

22. Less than 35 secondary sensoria on antennal segment III of alate viviparous females; unguis usually 1.5 - 2 times as long as base of antennal segment VI; On Asclepias and Apocynum spp. . . . . asclepiadis Fitch

On Cornus sp. as winter host, and several summer hosts; but not Asclepias, Apocynum or

Umbelliferae . . . . . .
. . . helianthi Monell
On Umbelliferae . . . . . .
. . . heraclella Davis

- More than 35 secondary sensoria on antennal segment III of alate viviparous females, unguis usually 3 times as long as base of antennal segment VI; on Umbelliferae . . . . . .
. . . decepta Hottes and Frison

23. Secondary sensoria usually present on antennal segments III and IV of alate viviparous females . . 24

- Secondary sensoria usually present on antennal segments III, IV and V of alate viviparous females 27

24. Cauda 1.5 times as long as cornicles, unguis shorter than 2 times hind tarsal II . . . . . .
. . . masoni Richards

- Cauda less than 1.5 times as long as cornicles; unguis longer than 2 times hind tarsal II . . . 25

25. Two accessory setae normally present on rostral segment IV + V; two setae usually on abdominal tergite VIII 26

- Two to four accessory setae normally present on rostral segment IV + V; 3-5 setae on abdominal tergite VIII . . . . . .
. . . rubicola Oestlund

26. Abdomen with lateral tubercles on some or all of abdominal segments II - V; hind tibiae of oviparae not swollen, with few pseudosensoria . . . pomi De Geer

- Abdomen without lateral tubercles on abdominal segments II - V; hind tibiae of oviparae distinctly swollen, with numerous pseudosensoria.. spiraecola Patch

27. Less than 20 secondary sensoria on antennal segment III of alate viviparous females 28

- More than 20 secondary sensoria on antennal segment III of alate viviparous females 29

28. Unguis less than 2 times base of antennal segment VI; cornicles shorter than 1.5 times hind tarsal II . . . . ribiensis Gillette and Palmer

- Unguis more than 2 times base of antennal segment VI; cornicles longer than 1.5 times hind tarsal II; On Ribes sp.; not known from other plants . . . . bulleri Robinson and Rojanavongse new species On Rhamnus sp. as winter host, and several summer host plants (but not Ribes sp.) . . . . . nasturtii Kaltenbach

29. Abdomen of both apterous and alate viviparous females brownish green to dark green; secondary sensoria present on antennal segment IV of alate

viviparous females; 0-6 on V; no secondary sensoria on antennal segments of apterous females . . . . . .

. . . *thaspii* Oestlund

- Abdomen of both apterous and alate viviparous females yellowish green to golden yellow; secondary sensoria normally present on antennal segments III, IV and V of both apterous and alate viviparous females . . . . . .

. . . *saniculae* Williams

30. Rostral segment IV + V 1.2 times as long as hind tarsal II, at least 0.11 mm long; cornicles less than 1.5 times base of antennal segment VI. . *neomonardae* Rojanavongse and Robinson new species

- Rostral segment IV + V more than 1.2 times as long as hind tarsal II, usually longer than 0.11 mm; cornicles more than 1.5 - 2 times base of antennal segment VI 31

31. Less than 20 secondary sensoria usually present on antennal segment III of alate viviparous females; unguis 1.5-2 times base of antennal segment VI; not on Umbelliferae 32

- 35-67 secondary sensoria usually present on antennal segment III of alate viviparous females; unguis 3 times base of antennal segment VI; on Umbelliferae . . . . . .

. . . decepta Hottes and Frison

32. Two to four setae usually on abdominal tergite VIII; 5-14 secondary sensoria on antennal segment III of alate viviparous females . . . 33

-Four to nine setae usually on abdominal tergite VIII, with distance between the spinal pair very much greater than that to the nearest setae laterally; 14-25 secondary sensoria on antennal segment III of alate viviparous females . . . . . .

. . . varians Patch

33. Rostral segment IV + V normally longer than 1.5 times hind tarsal II, and reaching to abdomen; cornicles usually longer than 1.2 times cauda

. . . oenotherae Oestlund

- Rostral segment IV + V normally shorter than 1.5 times hind tarsal II, not reaching to abdomen; cornicles usually shorter than 1.2 times cauda..34

34. Longest setae on antennal segment III usually less than 0.035 mm . . . . . .

. . . neomexicana (Cockerell)

- Longest setae on antennal segment III usually more than 0.035 mm . . . . . .

. . . manitobensis Robinson and Rojanavongse new species

Chapter VII

SYSTEMATICS OF GENUS APHIS L. IN MANITOBA

Aphis armoraciae Cowen

Figs. 5-18

Aphis armoraciae Cowen (in Gillette and Baker 1895, p. 117); Palmer 1952, p. 123; Robinson and Bradley 1965, p. 40 and 1968, p. 61.

Aphis middletoni Thomas (misidentification) (in Gillette and Palmer 1932, p. 418).

APTEROUS VIVIPAROUS FEMALE. Colour when alive: dark green. Colour when macerated: head, antennae (except base of antennal segment III pale), cornicles, cauda, anal and genital plates dark brown. Dorsum of thorax and abdomen brown with dark brown lateral sclerites on abdominal segments II- V. Dark brown transverse dorsal bands on abdominal segments VII and VIII.

Morphology. Body length 1.41-1.79 (mean = 1.617 ± 0.116, n = 10) mm. Antennae six-segmented, imbricated, 0.65 - 1.01 (0.822 ± 0.111, n = 10) mm long. Length of antennal segments (in mm): III, 0.16 - 0.29 (0.227 ± 0.035, n = 10); IV 0.07 - 0.15 (0.110 ± 0.025, n = 10); V, 0.08 - 0.13 (0.097 ± 0.016, n = 10); VI, 0.08 - 0.11 (0.095 ± 0.009, n = 10) + 0.13 - 0.24 (0.182 ± 0.033, n = 10).

Longest setae on antennal segment III 0.012 - 0.018 (0.013 ± 0.002, n = 10) mm. Secondary sensoria 0-6 (2.650 ± 1.765, n = 20) on antennal segment III; 0 - 5 (1.850 ± 1.270, n = 20) on IV; 0 - 2 (0.500 ± 0.527, n = 20) on V. Rostrum reaching to abdomen; rostral IV + V 0.13 - 0.17 (0.152 ± 0.010, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.60 - 0.79 (0.698 ± 0.066, n = 10) mm; of hind tarsal II 0.10 - 0.13 (0.125 ± 0.010, n = 10) mm. Cornicles short, tapering, imbricated, 0.10 - 0.17 (0.145 ± 0.020, n = 10) mm long. Cauda bluntly tapering, 0.09 - 0.13 (0.103 ± 0.012, n = 10) mm long, with 12 - 19 (14.130 ± 2.214, n = 10) setae. Large lateral tubercles prominent on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 4 (2.60 ± 0.843, n = 10).

ALATE VIVIPAROUS FEMALE. Colour when alive: dark green to black. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen pale with lateral and post-siphuncular sclerites dark brown. Brown transverse dorsal band on abdominal segments VII and VIII.

Morphology. Body length 1.41 - 1.84 (1.620 ± 0.135, n = 10) mm. Antennae six-segmented, imbricated, 0.79 - 0.98 (0.874 ± 0.076, n = 10) mm long. Length of antennal segments (in mm): III, 0.21 - 0.29 (0.246 ± 0.035,

n = 10); IV, 0.09 - 0.13 (0.109 ± 0.014, n = 10); V, 0.08 - 0.11 (0.097 ± 0.012, n = 10); VI, 0.09 - 0.11 (0.099 ± 0.007, n = 10) + 0.18 - 0.22 (0.207 ± 0.012, n = 10). Longest setae on antennal segment III 0.012 - 0.016 (0.014 ± 0.002, n = 10) mm. Secondary sensoria 7 - 22 (11.850 ± 3.979, n = 20) arranged in irregular rows on antennal segment III; 2 - 6 (4.050 ± 0.956, n = 20) on IV; 0 - 3 (1.45 ± 0.762, n = 20) on V. Rostrum reaching to abdomen; rostral IV + V 0.13 - 0.16 (0.144 ± 0.013, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.62 - 0.80 (0.701 ± 0.063, n = 10) mm; of hind tarsal II 0.10 - 0.12 (0.112 ± 0.009, n = 10) mm. Cornicles tapering, imbricated, 0.10 - 0.15 (0.123 ± 0.013, n = 10) mm long. Cauda bluntly tapering 0.08 - 0.10 (0.095 ± 0.007, n = 10) mm long, with 10 - 14 (12.50 ± 1.509, n = 10) setae. Large lateral tubercles present on prothorax and abdominal segment I and VII. Setae on abdominal segment VIII dorsally 2 - 4 (2.90 ± 0.738, n = 10).

OVIPARA. Colour when alive: not observed. Colour when macerated much the same as for apterous viviparous female except hind tibiae swollen to about twice normal size, with a few pseudosensoria, mostly on basal swollen portion. Body length 1.85 - 2.50 (2.169 ± 0.162, n = 11) mm. Antennae six-segmented, imbricated, 0.90 - 1.00 (0.955 ± 0.042, n = 11) mm long. Length of antennal segments (in mm): III, 0.23 - 0.27 (0.246 ± 0.016, n = 11)

IV, 0.13 - 0.16 (0.142 ± 0.012, n = 11); V, 0.13 - 0.15 (0.138 ± 0.009, n = 11), VI, 0.12 - 0.15 (0.130 ± 0.009, n = 11) + 0.15 - 0.18 (0.169 ± 0.009, n = 11). Longest setae on antennal segment III 0.020 - 0.024 (0.021 ± 0.001, n = 11) mm. Secondary sensoria 3-8 (4.947 ± 1.353, n = 20) on antennal segment III, 3 - 5 (3.631 ± 0.597, n = 22) on IV. Rostral IV + V 0.15 - 0.16 (0.156 ± 0.005, n = 11) mm long, with 2 accessory setae. Length of hind tibiae 0.62 - 0.70 (0.647 ± 0.030, n = 11) mm; of hind tarsal II 0.11 - 0.12 (0.17 ± 0.005, n = 11) mm. Cornicles cylindrical, imbricated, 0.11 - 0.16 (0.137 ± 0.116, n = 11) mm long. Cauda blunt, 0.10 - 0.14 (0.118 ± 0.012, n = 11) mm long. with 14 - 19 (15.00 ± 1.789, n = 11) setae. Setae on abdominal segment VIII dorsally 7 - 11 (9.454 ± 1.293, n = 11).

TYPES. Palmer (1952) reported that she had selected a neotype, and that it was deposited in the United States National Museum. However, she was apparently unaware that there is a type slide in the USNM marked "6320 Aphis armoraciae Cowen (Type) = A. maidis radicis Cowen on horse radish Hotchkiss, Colo. 7/18/94." This slide containing 2 alatae and 3 apterae was obtained on loan, cleared and remounted, and all specimens returned to the USNM.

HOST PLANTS. A. armoraciae was collected in Manitoba on root crowns of Artemisia frigida and Rudbeckia serotina.

It must be regarded as a "root aphid", despite the original description by Cowen as "on the petioles of horse-radish." Perhaps alatae of the aphid were found climbing up the petioles as they were leaving the horse-radish plant. On one occasion (10 July 1972) we found large numbers of alatae escaping from the root crown of R. serotina, some of them crawling upwards on the stem.

COMMENTS. It is believed that armoraciae overwinters in the egg stage on the roots or root crowns, because oviparae were found on 28 September 1963 on Artemisia frigida. Distinguishing characters are the short, bushy cauda, short cornicles, usual presence of secondary sensoria on antennal segments III, IV and V of apterae, and dark lateral abdominal sclerites on apterae, with prominent dark bands dorsally on abdominal segments VII and VIII, and sometimes on those anterior. Some authorities place armoraciae in the genus Brachyunguis Das. A. armoraciae is listed by Kennedy et al (1962) as a vector of at least 4 virus diseases of plants.

MANITOBA SPECIMENS EXAMINED. 76 apterae, 78 alatae and 14 oviparae.

Carberry, 10 July 1972, 26 July 1973, 25 July 1974;
Sandilands Provincial Forest, 28 September 1963;
Spruce Woods Provincial Park, 10 July 1972.

Aphis asclepiadis Fitch

Figs. 19-28

Aphis asclepiadis Fitch 1851, p. 65; Hottes and Frison 1931, p. 181; Robinson and Bradley 1965, p. 40 and 1968, p. 60; Medler and Ghosh 1969, p. 44.

APTEROUS VIVIPAROUS FEMALE. Colour when alive: yellowish green to pale green. Colour when macerated: mostly pale except tip of antennal segments V and VI; cornicles, cauda, anal and genital plates dark brown. Abdomen pale with post-siphuncular sclerites and dorsal band on abdominal segment VIII light brown.

Morphology. Body length 1.24 - 2.07 (1.764 ± 0.230, n = 15) mm. Antennae six-segmented, imbricated, 0.84 - 1.18 (1.017 ± 0.106, n = 15) mm long. Length of antennal segments (in mm): III, 0.20 - 0.38 (0.289 ± 0.045, n = 15); IV, 0.13 - 0.20 (0.156 ± 0.021, n = 15); V, 0.12 - 0.19 (0.145 ± 0.019, n = 15); VI, 0.09 - 0.13 (0.105 ± 0.014, n = 15) + 0.17 - 0.25 (0.213 ± 0.001, n = 15). Longest setae on antennal segment III 0.020 - 0.040 (0.028± 0.007, n = 15) mm. Rostrum reaching to middle coxae; rostral IV + V 0.10 - 0.12 (0.11 ± 0.009, n = 15) mm long, with 2 accessory setae. Length of hind tibiae 0.65 - 0.99 (0.796 ± 0.093, n = 15) mm; of hind tarsal II 0.11 - 0.13 (0.115 ± 0.007, n = 15) mm. Cornicles

tapering, imbricated, 0.15 - 0.28 (0.213 ± 0.031, n = 15) mm long. Cauda tapering, 0.13 - 0.19 (0.155 ± 0.016, n = 15) mm long, with 8 - 13 (10.20 ± 1.146, n = 15) setae. Lateral tubercles prominent on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 4 - 6 (4.867 ± 0.516, n = 15).

ALATE VIVIPAROUS FEMALE. Colour when alive: greenish yellow to green. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen pale, with brown traces of transverse dorsal bars on abdominal segments VI, VII and VIII. Dark brown lateral and post-siphuncular sclerites.

Morphology. Body length 1.60 - 1.90 (1.765 ± 0.098, n = 10) mm. Antennae six-segmented, imbricated, 1.02 - 1.21 (1.124 ± 0.069, n = 10) mm long. Length of antennal segments (in mm): III 0.30 - 0.40 (0.340 ± 0.030, n = 10); IV, 0.15 - 0.22 (0.184 ± 0.022, n = 10); V, 0.13 - 0.18 (0.156 ± 0.014, n = 10); VI, 0.10 - 0.12 (0.108 ± 0.008, n = 10) + 0.20 - 0.25 (0.230 ± 0.014, n = 10). Longest setae on antennal segment III 0.014 - 0.020 (0.018 ± 0.002, n = 10) mm. Secondary sensoria 15 - 29 (21.95 ± 4.211, n = 20) on antennal segment III. Rostrum reaching to middle coxae; rostral IV + V 0.10 - 0.12 (0.106 ± 0.007, n = 10) mm long, with 2 acces-

sory setae. Length of hind tibiae 0.84 - 0.98 (0.901 ± 0.043, n = 10) mm; of hind tarsal II 0.10 - 0.13 (0.116 ± 0.011, n = 10) mm. Cornicles cylindrical, imbricated, 0.16 - 0.21 (0.183 ± 0.019, n = 10) mm long. Cauda fingertip-shaped 0.13 - 0.16 (0.150 ± 0.008, n = 10) mm long, with 9 - 12 (10.50 ± 0.972, n = 10) setae. Lateral tubercles prominent on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 4 - 5 (4.3 ± 0.483, n = 10).

TYPES. Location unknown.

HOST PLANTS. Apocynum androsaemifolium, A. sibiricum, Asclepias spp.

COMMENTS. Details on the life history of asclepiadis in Manitoba are not known, and I have been unable to find characters, other than host plants, to reliably separate it from A. helianthi Monell.

MANITOBA SPECIMENS EXAMINED. 88 apterae, 142 alatae.
Camp Morton, 10 August 1971
La Salle, 2 July 1963
Newton, 13 August 1974
Stony Mountain, 27 July 1965
Winnipeg, 19 July 1966; 30 June 1967; 2 July 1974; 16 July 1974; 17 July 1974.

Aphis astragalina Hille Ris Lambers

Figs. 29-38

Aphis astragalina Hille Ris Lambers 1974, p. 112.

APTEROUS VIVIPAROUS FEMALE. Colour when alive: very red, almost black. Colour when macerated: head, antennae (except antennal segments III, IV and base of V pale), cornicles, cauda, anal and genital plates dark brown. Lateral sclerites on thorax and abdominal segments II-V brown. Brown broken dorsal bars on abdominal segments with dark brown transverse dorsal bands on abdominal segments VI, VII and VIII.

Morphology. Body length 2.20 - 2.64 (2.412 ± 0.127, n = 13) mm. Antennae six-segmented, imbricated, 1.20 - 1.54 (1.369 ± 0.084, n = 13) mm long. Length of antennal segments (in mm): III, 0.31 - 0.41 (0.355 ± 0.028, n = 13) IV, 0.22 - 0.31 (0.266 ± 0.027, n = 13); V, 0.22 - 0.29 (0.247 ± 0.024, n = 13); VI, 0.14 - 0.16 (0.146 ± 0.007, n = 13) + 0.17 - 0.27 (0.220 ± 0.025, n = 13). Longest setae on antennal segment III 0.042 - 0.053 (0.047 ± 0.004, n = 13) mm. Rostrum reaching to middle coxae; rostral IV + V 0.13 - 0.14 (0.132 ± 0.004, n = 13) mm long, with 2 accessory setae.

Length of hind tibiae 1.02 - 1.16 (1.088 ± 0.046, n = 13) mm; of hind tarsal II 0.13 - 0.14 (0.135 ± 0.005, n = 13) mm. Cornicles tapering, imbricated, 0.31 - 0.35 (0.334 ± 0.019, n = 13) mm long. Cauda fingertip-shaped, 0.25 - 0.28 (0.269 ± 0.011, n = 13) mm long, with 14 -20 (16.923 ± 1.754, n = 13) setae. Lateral tubercles prominent on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 7 - 11 (9.615 ± 1.502, n = 13).

ALATE VIVIPAROUS FEMALE. Colour when alive: very dark red, almost black. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown. Dark brown lateral and post-siphuncular sclerites, with transverse dorsal bars on abdominal segments VII and VIII.

Morphology. Body length 2.10 - 2.50 (2.256 ± 0.178, n = 5) mm. Antennae six-segmented imbricated, 1.37 - 1.51 (1.458 ± 0.054, n = 5) mm long. Length of antennal segments (in mm): III, 0.35 - 0.39 (0.366 ± 0.017, n = 5); IV, 0.29 - 0.34 (0.322 ± 0.022, n = 5); V, 0.23 - 0.28 (0.256 ± 0.021 n = 5); VI, 0.13 - 0.15 (0.146 ± 0.009, n = 5) + 0.23 - 0.26 (0.238 ± 0.013, n = 5). Longest setae on antennal segment III 0.021 - 0.042 (0.034 ± 0.008, n = 5) mm. Secondary sensoria 6 - 10 (7.222 ± 1.641, n = 10) irregular in size on antennal segment III; 0 - 4 (1.111 ± 1.269, n = 10) on IV.

Rostrum reaching to middle coxae; rostral IV + V 0.13 - 0.13 mm long, with 2 accessory setae. Length of hind tibiae 1.05 - 1.17 (1.114 ± 0.051, n = 5) mm; of hind tarsal II 0.13 - 0.14 (0.132 ± 0.004, n = 5) mm. Cornicles slightly tapering, imbricated 0.21 - 0.28 (0.232 ± 0.029, n = 5) mm long. Cauda mostly cylindrical, 0.21 - 0.23 (0.218 ± 0.011, n = 5) mm long, with 16 - 19 (17.40 ± 1.140, n = 5) setae. Large lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 7 - 12 (9.2 ± 1.924, n = 5).

TYPES. Holotype is in collection of D. Hille Ris Lambers.

HOST PLANT. Hedysarum alpinum var. americanum

COMMENTS. A. astragalina was described by Hille Ris Lambers from specimens sent to him from Astragalus sp. and "white flowered Leguminosa", Alberta and Montana. Specimens from Hedysarum in Manitoba were submitted to Hille Ris Lambers, who confirmed our identifications. This species was first found in Manitoba by Dr. R. J. Heron while collecting Lepidoptera in Riding Mountain National Park.

MANITOBA SPECIMENS EXAMINED. 26 apterae, 5 alatae. Lake Audy, Riding Mountain National Park, 22 July, 1974.

Aphis bulleri Robinson and Rojanavongse new species

Figs. 39-48

APTEROUS VIVIPAROUS FEMALE. Colour when alive: pale green. Colour when macerated: mostly pale.

Morphology. (One specimen) Body length 1.94 mm. Antennae six-segmented, imbricated, 1.21 mm long. Length of antennal segments (in mm): III, 0.30; IV, 0.20; V, 0.18; VI, 0.10 + 0.30. Longest setae on antennal segment III 0.012 mm. Rostrum reaching to middle coxae; rostral IV + V 0.13 mm long, with 2 accessory setae. Length of hind tibiae 0.88 mm; of hind tarsal II 0.12 mm. Cornicles, tapering, imbricated, 0.30 mm long. Cauda fingertip-shaped and constricted near base 0.20 mm long, with 8 setae. Prominent lateral tubercles on prothorax and abdominal segment I and VII and usually present on most other abdominal segments.

ALATE VIVIPAROUS FEMALE. Colour when alive: yellowish green to pale green. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates brown. Abdomen pale with brown lateral and post-siphuncular sclerites.

Morphology. Body length 1.38 - 1.67 (1.549 ± 0.106, n = 15) mm. Antennae six-segmented, imbricated, 0.92 - 1.21 (1.087 ± 0.078, n = 15) mm long. Length of antennal segments (in mm): III, 0.23 - 0.31 (0.261 ± 0.027, n = 15); IV, 0.15 - 0.21 (0.179 ± 0.012, n = 15); V, 0.13 - 0.18 (0.161 ± 0.014, n = 15); VI, 0.09 - 0.12 (0.108 ± 0.01, n = 15) + 0.24 - 0.29 (0.269 ± 0.014, n = 15). Longest setae on antennal segment III 0.006 - 0.015 (0.01 ± 0.002, n = 15) mm. Secondary sensoria , 6 - 12, (8.767 ± 1.524, n = 30) on antennal segment III; 1 - 5 (2.8 ± 1.063, n = 30) on IV; 0 - 2 (0.833 ± 0.699, n = 30) on V. Rostrum not quite reaching to middle coxae; rostral IV + V 0.09 - 0.13 (0.111 ± 0.01, n = 15) mm long, with usually 2 and occasionally 3 accessory setae. Length of hind tibiae 0.67 - 0.86 (0.747 ± 0.06, n = 15) mm; of hind tarsal II 0.08 - 0.10 (0.093 ± 0.006, n = 15) mm. Cornicles only slightly tapering, imbricated, 0.14 - 0.19 (0.171 ± 0.019, n = 15) mm long. Cauda cylindrical 0.13 - 0.17 (0.148 ± 0.011, n = 15) mm long, with 5 - 7 (6.667 ± 0.9, n = 15) setae. Prominent lateral tubercles on prothorax and abdominal segments I and VII and usually present on most other abdominal segments. Setae on abdominal segment VIII dorsally 2.

TYPES. Holotype: alate viviparous female, left specimen of three on one slide, Winnipeg, Manitoba, 11 June 1971 (A.G. Robinson), on sucker growth at base of Ribes aureum,

No. 13917 in Canadian National Collection, Ottawa.

Paratypes: 13 alate viviparous females and one apterous viviparous female (on 5 slides), same data as for holotype, and 4 alate viviparous females on 2 slides, Winnipeg, Manitoba, 21 June 1974 (Valuli Rojanavongse).

HOST PLANT. Ribes sp.

COMMENTS: Aphis bulleri was found close to the foundation of the Buller Building on the Campus of the University of Manitoba, named after an early biologist at the University, Prof. A. H. R. Buller. The species is distinguished from others on Ribes in North America by the usual present of lateral tubercles on abdominal segments II - VI, similar to the European species grossulariae Kaltenbach and schneideri Börner.

MANITOBA SPECIMENS EXAMINED. 1 aptera, 16 alatae. Winnipeg, 11 June 1971, 21 June 1974.

Aphis ceanothi Clarke

Figs. 49-61

Aphis ceanothi Clarke 1903, p. 250; Essig 1917, p. 338, Gillette and Palmer 1932, p. 388; Palmer 1952, p. 127; Robinson and Bradley 1965, p. 40 and 1968, p. 60.

Aphis ceanothi-hirsuti Essig 1911, p. 525; Gillette and Palmer 1932, p. 389.

APTEROUS VIVIPAROUS FEMALE. Colour when alive: not observed. Colour when macerated: head, antennae (except base of antennal segment III), cornicles, cauda, anal and genital plates dark brown. Brown to dark brown dorsal bands on abdominal segments VII and VIII.

Morphology. Body length 1.05 - 1.52 (1.282 ± 0.174, n = 10) mm. Antennae six-segmented, imbricated, 1.11 - 1.32 (1.174 ± 0.063, n = 10) mm long. Length of antennal segments (in mm): III, 0.22 - 0.30 (0.252 ± 0.023, n = 10); IV, 0.18 - 0.24 (0.194 ± 0.022, n = 10); V, 0.18 - 0.20 (0.11 ± 0.186, n = 10); VI, 0.10 - 0.13 (0.12 ± 0.009, n = 10) + 0.29 - 0.36 (0.307 ± 0.022, n = 10). Longest setae on antennal segment III 0.02 - 0.06 (0.029 ± 0.011, n = 10) mm. Rostrum

reaching to abdomen; rostral IV + V 0.12 - 0.14 (0.126 ± 0.007, n = 10) mm long, with 2 - 4 accessory setae. Length of hind tibiae 0.70 - 0.86 (0.74 ± 0.04, n = 10) mm; of hind tarsal II 0.10 mm. Cornicles cylindrical, imbricated, 0.30 - 0.42 (0.346 ± 0.037, n = 10) mm long. Cauda conical 0.14 - 0.16 (0.147 ± 0.009, n = 10) mm long, with 4 - 7 (5.4 ± 0.966, n = 10) setae. Prominent lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 3 (2.6 ± 0.516, n = 10).

OVIPARA. Colour when alive: not observed. Colour when macerated much the same as for apterous viviparous females except hind tibiae with few pseudosensoria. Body length 1.43 - 1.64 (1.523 ± 0.074, n = 10) mm. Antennae usually six-segmented, imbricated, 1.05 - 1.09 (1.113 ± 0.051, n = 10) mm long. Length of antennal segments (in mm): III, 0.20 - 0.24 (0.22 ± 0.017, n = 9); IV, 0.15 - 0.20 (0.181 ± 0.014, n = 9); V, 0.16 - 0.20 (0.181 ± 0.01, n = 10); VI, 0.11 - 0.14 (0.126 ± 0.008, n = 10) ± 0.26 - 0.34 (0.29 ± 0.024, n = 10). Longest setae on antennal segment III 0.02 - 0.04 (0.028 ± 0.006, n = 10) mm. Rostral IV + V 0.10 - 0.12 (0.117 ± 0.007, n = 10) mm long, with 2 - 3 (2.6 ± 0.52, n = 10) accessory setae. Length of hind tibiae 0.58 - 0.72 (0.644 ± 0.039, n = 10) mm; of hind tarsal II 0.10 - 0.11 (0.104 ± 0.005, n = 10) mm. Cornicles cylindrical, imbricated, 0.20 - 0.32 (0.27 ± 0.032, n = 10) mm long. Cauda less

tapering 0.13 - 0.16 (0.15 ± 0.009, n = 10) mm long, with 7 - 11 (8.5 ± 1.08, n = 10) setae. Setae on abdominal segment VIII dorsally 3 - 6 (5.2 ± 1.033, n = 10).

APTEROUS MALE. Colour when alive: not observed. Colour when macerated the same as for alate viviparous females. Body length 1.16 - 1.34 (1.291 ± 0.142, n = 10) mm. Antennae six-segmented, imbricated, 1.05 - 1.25 (1.141 ± 0.06, n = 10) mm long. Length of antennal segments (in mm): III, 0.23 - 0.28 (0.254 ± 0.02, n = 10); IV, 0.18 - 0.25 (0.209 ± 0.02, n = 10); V, 0.18 - 0.20 (0.187 ± 0.009, n = 10), VI, 0.10 - 0.13 (0.112 ± 0.008, n = 10) + 0.23 - 0.27 (0.254 ± 0.012, n = 10). Longest setae on antennal segment III 0.02 - 0.04 (0.026 ± 0.006, n = 10) mm. Secondary sensoria 0 - 1 (0.45 ± 0.51, n = 20) on antennal segment III, 5 - 9 (6.95 ± 1.5, n = 20) on IV; 5 - 8 (6.45 ± 0.945, n = 20) on V. Rostral IV + V 0.11 - 0.12 (0.118 ± 0.004, n = 10) mm long, with 2 - 4 (2.6 ± 0.5, n = 10) accessory setae. Length of hind tibiae 0.55 - 0.70 (0.627 ± 0.045, n = 10) mm; of hind tarsal II 0.09 - 0.10 (0.096 ± 0.005, n =10) mm. Cornicles cyclindrical, imbricated, 0.16 - 0.20 (0.181 ± 0.014, n = 10) mm long. Cauda conical, 0.10 - 0.12 (0.11 ± 0.009, n = 10) mm long, with 5 - 7 (5.44 ± 0.726, n = 10) setae. Setae on abdominal segment VIII dorsally 2 - 4 (3.10 ± 0.738, n = 10).

TYPES. According to Palmer (1952) cotypes of ceanothi are in the Essig collection and of ceanothi-hirsuti are in Essig and Colorado Collections.

HOST PLANTS. Ceanothus ovatus

COMMENTS. Important morphological characters are those given in the Key, and an important identification character is the association with Ceanothus spp. Life history in Manitoba is not known. During three summers, 1973 - 1975, despite diligent searching of host plants, no specimens could be found. Possibly in some years it is blown in from the south on southerly winds, and does not successfully overwinter. If this conjecture is true, it will in most years be absent from Manitoba.

MANITOBA SPECIMENS EXAMINED. 59 apterae, 32 oviparae and 10 males.
Sandilands Provincial Forest, 28 September 1963; 3 September 1964.

Aphis corniella (Hille Ris Lambers)

Figs. 62-81

Doralis corniella Hille Ris Lambers 1935, p. 117.

Aphis corniella (Hille Ris Lambers) (in Kloet and Hincks 1964, p. 72); Robinson and Bradley 1965, p. 40 and 1968, p. 60; Heie 1969, p. 75; Robinson and Chen 1969, p. 522.

Comaphis corniella Börner 1952, p. 78; Heie and Heikinheimo 1966, p. 120.

FUNDATRIX. Colour when alive: dark olive-green to bluish green. Colour when macerated: head, thorax, antennae (except on antennal segments III + IV and base of V pale); cornicles, cauda, anal and genital plates brown.

Morphology. Body length 1.46 - 2.08 (1.818 ± 0.180, n = 8) mm. Antennae five-segmented, slightly imbricated, 0.67 - 0.76 (0.720 ± 0. 037, n = 8) mm long. Length of antennal segments (in mm): III + IV, 0.24 - 0.29 (0.264 ± 0.017, n=8); V, 0.12 - 0.14 (0.131 ± 0.008, n = 8); VI, 0.09 - 0.12 (0.009 ± 0.011, n = 8) + 0.08 - 0.14 (0.114 ±

0.018, n = 8). Longest setae on antennal segment III + IV 0.02 - 0.04 (0.031 ± 0.007, n = 8) mm . Rostrum reaching to middle coxae; rostral IV + V 0.09 - 0.11 (0.10 ± 0.005, n = 8) mm long, with 2 accessory setae. Length of hind tibiae 0.60 - 0.70 (0.645 ± 0.033, n = 8) mm ; of hind tarsal II 0.09 - 0.10 (0.095 ± 0.005, n = 8) mm. Cornicles cylindrical, imbricated 0.13 - 0.18 (0.158 ± 0.018, n = 8) mm long. Cauda bluntly elongated 0.12 - 0.14 (0.129 ± 0.008, n = 8) mm long, with 6 -9 (6.875 ± 1.126, n = 8) setae. Prominent lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 4 - 8 (6.0 ± 1.512, n = 10).

APTEROUS VIVIPAROUS FEMALE. Colour when alive: brownish-red. Colour when macerated: head, antennae (except antennal segments III, IV and base of V pale), thorax, cornicles, cauda, anal and genital plates brown. Abdomen pale with post-siphuncular sclerites and dorsal bands on abdominal segments VII and VIII light brown to brown.

Morphology. Body length 1.08 - 2.04 (1.663 ± 0.386, n = 10) mm. Antennae six-segmented, imbricated, 0.81 - 1.51 (1.206 ± 0.269, n = 10) mm long. Length of antennal segments (in mm): III, 0.19 - 0.45 (0.329 ± 0.094, n = 10); IV, 0.12 - 0.26 (0.187 ± 0.051, n = 10); V, 0.13 - 0.26 (0.198 ± 0.047,

n = 10), VI, 0.08 - 0.14 (0.111 ± 0.022, n = 10) + 0.19 - 0.32 (0.262 ± 0.041, n = 10). Longest setae on antennal segment III, 0.04 - 0.05 (0.045 ± 0.013, n = 10) mm . Rostrum reaching to middle coxae; rostral IV + V 0.09 - 0.11 (0.104 ± 0.08, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.56 - 1.08 (0.854 ± 0.209, n = 10) mm; of hind tarsal II 0.08 - 0.12 (0.105 ± 0.016, n = 10) mm. Cornicles tapering, imbricated, very strongly curved outwards, 0.08 - 0.36 (0.212 ± 0.094, n = 10) mm long. Cauda elongated 0.08 - 0.16 (0.129 ± 0.031, n = 10) mm long, with 7 - 11 (8.5 ± 1.354, n = 10) setae. Prominent lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 5 - 12 (7.8 ± 2.7, n = 10).

ALATE VIVIPAROUS FEMALE. Colour when alive: brownish black. Colour when macerated: head, antennae, thorax, cornicles, anal and genital plates dark brown. Abdomen pale with lateral and post-siphuncular sclerites dark brown. Brown broken dorsal bands on abdominal segments I - VI and dark brown transverse dorsal bands on abdominal segments VII and VIII.

Morphology. Body length 1.76 - 2.50 (1.922 ± 0.222, n = 10) mm. Antennae six-segmented, imbricated, 1.36 - 1.79

(1.47 ± 0.133, n = 10) mm long. Length of antennal segments (in mm): III, 0.36 - 0.50 (0.403 ± 0.041, n = 10); IV, 0.22 - 0.33 (0.254 ± 0.036, n = 10); V, 0.21 - 0.29 (0.237 ± 0.023, n = 10); VI, 0.10 - 0.15 (0.127 ± 0.016, n = 10) + 0.23 - 0.31 (0.315 ± 0.038, n = 10). Longest setae on antennal segment III 0.03 - 0.04 (0.037 ± 0.006, n = 10) mm. Secondary sensoria 8 - 22 (15.45 ± 3.486, n = 20) on antennal segment III. Rostrum reaching to middle coxae; rostral IV + V 0.10 - 0.11 (0.107 ± 0.005, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.96 - 1.30 (1.056 ± 0.116, n = 10) mm; of hind tarsal II 0.10 - 0.13 (0.115 ± 0.010, n = 10) mm. Cornicles slightly tapering, imbricated, less strongly curved than in apterae 0.14 - 0.22 (0.117 ± 0.026, n = 10) mm long. Cauda tapering 0.13 - 0.16 (0.140 ± 0.010, n = 10) mm long, with 8 - 11 (8.8 ± 1.135, n = 10) setae. Prominent lateral tubercles on prothorax and on abdominal segments I and VII. Setae on abdominal segment VIII dorsally 5 - 8 (6.5 ± 0.972, n = 10).

OVIPARA. Colour when alive: not observed. Colour when macerated much the same as for apterous viviparous females except hind tibiae swollen with numerous pseudosensoria over the whole length. Body length 1.22 - 1.40 (1.293 ± 0.066, n = 7) mm. Antennae six-segmented, occassionally five-segmented, slightly imbricated, 0.65 - 0.96

(0.776 ± 0.130, n = 7) mm long. Length of antennal segments (in mm): III, 0.14 - 0.28 (0.211 ± 0.063, n = 7); IV, 0.07 - 0.14 (0.083 ± 0.038, n = 7); V, 0.03 - 0.12 (0.123 ± 0.088, n = 7); VI, 0.07 - 0.09 (0.079 ± 0.009, n = 7) + 0.14 - 0.38 (0.194 ± 0.084, n = 7). Longest setae on antennal segment III 0.01 - 0.03 (0.026 ± 0.009, n = 7) mm. Rostral IV + V 0.08 - 0.09 (0.084 ± 0.005, n = 7) mm long, with 2 accessory setae. Length of hind tibiae 0.48 - 0.53 (0.503 ± 0.021, n = 7) mm ; of hind tarsal II 0.08 - 0.09 (0.083 ± 0.005, n = 7) mm. Cornicles tapering, imbricated, 0.08 - 0.10 (0.09 ± 0.008, n = 7) mm long. Cauda elongated 0.10 - 0.12 (0.104 ± 0.008, n = 7) mm long, with 7 - 12 (9.571 ± 1.718, n = 7) setae. Setae on abdominal segment VIII dorsally 7 - 11 (8.57 ± 1.512, n = 7).

ALATE MALE. Colour when alive: not observed. Colour when macerated much the same as alate viviparous females. Body length 1.74 - 1.97 (1.837 ± 0.099, n = 10) mm. Antennae six-segmented, imbricated, 1.50 - 1.77 (1.70 ± 0.100, n = 10) mm long. Length of antennal segments (in mm): III, 0.42 - 0.53 (0.466 ± 0.032, n = 10); IV, 0.22 - 0.34 (0.289 ± 0.039, n = 10); V, 0.20 - 0.30 (0.269 ± 0.031, n = 10); VI, 0.12 - 0.17 (0.148 ± 0.016, n = 10) + 0.32 - 0.42 (0.378 ± 0.036, n = 10). Longest setae on antennal segment III 0.029 - 0.035 (0.032 ± 0.003, n =10) mm.

Secondary sensoria 32 - 47 (38.050 ± 7.287, n = 20) irregular in size, on antennal segment III: 2 - 28 (18.25 ± 5.258, n = 20) on IV; 9 - 16 (11.35 ± 2.03, n = 20) on V. Rostral IV + V 0.09 - 0.12 (0.108 ± 0.012, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.94 - 1.08 (1.024 ± 0.042, n = 10) mm; of hind tarsal II 0.11 - 0.12 (0.115 ± 0.005, n = 10) mm . Cornicles cylindrical, imbricated, 0.12 - 0.16 (0.127 ± 0.015, n = 10) mm long. Cauda bluntly elongated, 0.10 - 0.14 (0.114 ± 0.013, n = 10), with 6 - 11 (8 ± 1.33, n = 10) setae. Setae on abdominal segment VIII dorsally 2 - 6 (4.5 ± 1.269, n = 10).

TYPES. According to Hille Ris Lambers (1935) cotypes are in his collection.

HOST PLANTS. Cornus stolonifera; Epilobium angustifolium.

COMMENTS: The relationship between corniella and other species on Ribes has been discussed by Robinson and Chen (1969). This species was originally described from Europe, migrating from Cornus alba L. to Epilobium angustifolium L. In Manitoba it overwinters on the wild Cornus stolonifera, and possibly on some of the ornamental cultivars, and migrates in the spring to the common fireweed.

MANITOBA SPECIMENS EXAMINED. fundatrices 8; apterae 112, alatae 28; oviparae 7 and 17 males.

Caddy Lake, 10 June 1974.

Portage la Prairie, 25 June 1974

Winnipeg, 29 April 1968; 5 May 1968; 25 May 1968; 6 June 1973.

Aphis craccae Linnaeus

Figs. 82-91

Aphis craccae Linnaeus 1758 (in Eastop 1962, p. 143); Russell 1966, p. 1021; Robinson and Bradley 1965, p. 40 and 1968, p. 60; Heie 1969, p. 76; Stroyan 1972, p. 59.

Aphis viciae craccae Linnaeus 1758 (in Russell 1966, p. 1023).

Aphis viciae Fabricius (in Russell 1966, p. 1023).

Aphis (Pergandeida) leguminosae Theobald 1915 (in Kloet and Hincks 1964, p. 73).

Aphis (Pergandeida) craccae (Linnaeus) [in Kennedy et al 1962, p. 55]; Kloet and Hincks 1964, p. 73; Russell 1966, p. 1023; Quednau 1966, p. 426.

Pergandeida craccae (Linnaeus) [in Börner 1952, p. 83]; Russell 1966, p. 1023.

Macrosiphon craccae (Schrank) [in Russell 1966, p. 1023].

APTEROUS VIVIPAROUS FEMALE. Colour when alive: dark green to black with whitish powder on the body. Colour when macerated: head, antennae (except base of antennal segments III and IV pale), cornicles, cauda, anal and genital plates dark brown. Black dorsal bands on abdominal segments I - VI with black transverse dorsal bands on abdominal segments VII and VIII.

Morphology. Body length 1.80 - 2.46 (2.224 ± 0.211, n = 10) mm. Antenna six-segmented, imbricated, 1.14 - 1.80 (1.552 ± 0.228, n = 10) mm long. Length of antennal segments (in mm): III, 0.30 - 0.49 (0.403 ± 0.059, n = 10); IV, 0.16 - 0.34 (0.276 ± 0.059, n = 10); V, 0.18 - 0.33 (0.276 ± 0.049, n = 10); VI, 0.11 - 0.16 (0.145 ± 0.015, n = 10) + 0.25 - 0.36 (0.298 ± 0.042, n = 10). Longest setae on antennal segment III 0.015 - 0.024 (0.02 ± 0.013, n = 10) mm. Rostrum reaching middle coxae; rostral IV + V 0.12 - 0.15 (0.142 ± 0.009, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.88 - 1.28 (1.146 ± 0.142, n = 10) mm; of hind tarsal II 0.14 - 0.18 (0.160 ± 0.018,n = 10) mm. Cornicles tapering, imbricated 0.17 - 0.25 (0.242 ± 0.052, n = 10) mm long. Cauda cylindrical 0.22 - 0.30 (0.269 ± 0.024, n = 10) mm long, with 9 - 17 (12.5 ± 2.677, n = 10) setae. Lateral tubercles present on prothorax and abdominal segments I and VII.
Setae on abdominal segment VIII dorsally 3 - 7

(4.4 ± 1.174, n = 10).

ALATE VIVIPAROUS FEMALE. Colour when alive: greenish black. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen with lateral, post-siphuncular sclerites, broken dorsal bars on abdominal segments II - VI and transverse dorsal bands on abdominal segments VII and VIII dark brown.

Morphology. Body length 1.90 - 2.54 (2.15 ± 0.211, n = 10) mm. Antennae six-segmented, imbricated, 1.36 - 1.74 (1.542 ± 0.123, n = 10) mm long. Length of antennal segments (in mm): III, 0.34 - 0.43 (0.399 ± 0.031, n = 10); IV, 0.23 - 0.31 (0.28 ± 0.031, n = 10); V, 0.23 - 0.32 (0.266 ± 0.029, n = 10); VI, 0.13 - 0.16 (0.145 ± 0.011, n = 10) + 0.26 - 0.37 (0.31 ± 0.031, n = 10). Longest setae on antennal segment III 0.015 - 0.023 (0.018 ± 0.003, n = 10) mm. Secondary sensoria 7 - 12 (8.45 ± 1.234, n = 10) irregular in size, on antennal segment III. Rostrum reaching to middle coxae; rostral IV + V 0.13 - 0.14 (0.136 ± 0.005, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.96 - 1.38 (1.111 ± 0.131, n = 10) mm; of hind tarsal II 0.13 - 0.18 (0.155 ± 0.016, n = 10) mm. Cornicles tapering, imbricated, 0.12 - 0.23 (0.116 ± 0.032, n = 10) mm long. Cauda fingertip-shaped 0.20 - 0.24 (0.226 ± 0.018, n = 10) mm

long, with 9 -13 (10.6 ± 1.578, n = 10) setae. Prominent lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 3 - 6 (4.4 ± 1.075, n = 10).

TYPES. Linnaeus left no types.

HOST PLANTS. Vicia cracca

COMMENTS. Russell (1966) reported that this European species was first found in North America in 1966. It was first found in Manitoba in 1968. Russell (1966) also provided a key to distinguish craccae from fabae and craccivora. A.craccae is reported by Kennedy et al (1962) as a vector of at least 2 virus diseases of plants.

MANITOBA SPECIMENS EXAMINED. 66 apterae, 30 alatae.
Caddy Lake, 16 July 1973.
Winnipeg, 25 June 1968; 28 June 1968, 30 July 1968, 9 July 1971; 26 June 1973; 16 July 1974, 17 July 1974.

Aphis decepta Hottes and Frison

Figs. 92-101

Aphis decepta Hottes and Frison 1931, p. 192.

APTEROUS VIVIPAROUS FEMALE. Colour when alive: yellowish green to golden yellow. Colour when macerated: head, antennae (except base of antennal segments III and IV pale), cornicles, cauda, anal and genital plates dark brown. Post-siphuncular sclerites and transverse dorsal bands on abdominal segments VII and VIII dark brown.

Morphology. Body length 1.9 - 2.8 (2.326 ± 0.184, n = 20) mm. Antennae six-segmented, imbricated, 1.20 - 1.66 (1.427 ± 0.129, n = 20) mm long. Length of antennal segments (in mm): III, 0.31 - 0.50 (0.415 ± 0.053, n = 20); IV, 0.18 - 0.29 (0.223 ± 0.030, n = 20); V, 0.16 - 0.23 (0.190 ± 0.022, n = 20); VI, 0.09 - 0.13 (0.116 ± 0.021, n = 20) + 0.29 - 0.39 (0.339 ± 0.028, n = 20). Longest setae on antennal segment III 0.010 - 0.035 (0.026 ± 0.007, n = 20) mm. Rostrum reaching to hind coxae; rostral IV + V slightly obtuse, 0.14 - 0.16 (0.150 ± 0.001, n = 20) mm long, with 2 - 4 (3.15 ± 0.813, n = 20) accessory setae. Length of hind tibiae 0.96 - 1.25 (1.161 ± 0.121, n = 20)

mm; of hind tarsal II 0.12 - 0.13 (0.126 ± 0.005, n = 20) mm. Cornicles tapering, imbricated, 0.31 - 0.42 (0.365 ± 0.027, n = 20) mm long. Cauda tapering, 0.17 - 0.22 (0.190 ± 0.016, n = 20) mm long, with 11 - 18 (14.95 ± 2.064, n = 20) setae. Large lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 3 - 7 (4.65 ± 1.137, n = 20).

ALATE VIVIPAROUS FEMALE. Colour when alive: yellowish green to deep green. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen pale, with lateral, post-siphuncular sclerites and transverse dorsal bars on abdominal segments VII and VIII dark brown.

Morphology. Body length 1.84 - 2.64 (2.206 ± 0.195, n = 23) mm. Antennae six-segmented, imbricated, 1.22-1.72 (1.506 ± 0.129, n = 23) mm long. Length of antennal segments (in mm): III, 0.40 - 0.54 (0.475 ± 0.04, n = 23); IV, 0.16 - 0.29 (0.231 ± 0.030, n = 23); V, 0.14 - 0.22 (0.193 ± 0.017, n = 23); VI, 0.09 - 0.14 (0.118 ± 0.013, n = 20) + 0.28 - 0.42 (0.371 ± 0.031, n = 23). Longest setae on antennal segment III 0.017 - 0.035 (0.026 ± 0.006, n = 23) mm. Secondary sensoria 35 -67 (55.667 ± 7.122), n = 45) somewhat tuberculate and very crowded together on

antennal segment III. Rostrum reaching to hind coxae; rostral IV + V 0.11 - 0.15 (0.14 ± 0.011, n = 23) mm long, with 2 - 6 (3.304 ± 1.222, n = 23) accessory setae. Length of hind tibiae 0.93 - 1.47 (1.179 ± 0.122, n = 23) mm; of hind tarsal II 0.09 - 0.14 (0.120 ± 0.012, n = 23) mm. Cornicles tapering, imbricated, 0.24 - 0.38 (0.297 ± 0.035, n = 23) mm long. Cauda tapering, 0.13 - 0.20 (0.16 ± 0.016, n = 23) mm long, with 14 - 20 (16.261 ± 2.115, n = 23) setae. Large lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 3 - 6 (4.696 ± 0.876, n = 23).

TYPES. Morphotype is in Illinois Natural History Survey Collection.

HOST PLANTS. Heracleum lanatum

COMMENTS. This species has been found in Manitoba only on Heracleum lanatum. It can be recognized by the very large number of accessory sensoria on antennal segment III of alate viviparous females, slightly tuberculate, and so crowded together that every space on the segment appears to be covered by the secondary sensoria. Paratype slides were obtained on loan from the USNM, BM (Nat. Hist.) and Illinois Natural History Survey. A. decepta is listed

by Kennedy et al (1962) as a vector of 1 virus disease of plants.

MANITOBA SPECIMENS EXAMINED. 33 apterae, 51 alatae.
Duck Mountain Provincial Park, 19 July 1973.
Winnipeg, 6 July 1971; 28 June 1974; 17 July 1974.

Aphis duckmountainensis Rojanavongse and Robinson new species

Figs. 102-111

APTEROUS VIVIPAROUS FEMALE. Colour when alive: black. Colour when macerated: head, antennae (except base of antennal segments III and tips of antennal segments III, IV and V pale), legs (except base of femora pale), cornicles, cauda, anal and genital plates dark brown. Brown reticulated lateral sclerites on thorax and abdominal segments II - V. Post-siphuncular sclerites and transverse dorsal bars on abdominal segments VII and VIII dark brown.

Morphology. Body length 2.02 - 2.41 (2.224 ± 0.123, n = 14) mm. Antennae six-segmented, imbricated, 1.31 - 1.51 (1.389 ± 0.061, n = 14) mm long. Length of antennal segments (in mm): III, 0.34 - 0.42 (0.377 ± 0.022, n = 14); IV, 0.22 - 0.30 (0.259 ± 0.026, n = 14); V, 0.21 - 0.25 (0.226 ± 0.012, n = 14); VI, 0.13 - 0.15 (0.145 ± 0.007, n = 14) + 0.22 - 0.25 (0.234 ± 0.010, n = 14). Secondary sensoria 3 - 26 (13.889 ± 5.373, n = 27) irregular in size and crowded at apex on antennal segment III, 10 - 20 (15.407 ± 2.620, n = 27) on IV and 0 - 6 (2.111 ± 1.739, n = 27) on V. Longest setae on antennal segment III 0.042 - 0.063 (0.054 ± 0.007, n = 14) mm. Rostrum reaching to middle

coxae; rostral IV + V 0.14 - 0.15 (0.141 ± 0.003, n = 14) mm long, with 2 accessory setae. Length of hind tibiae 0.90 - 1.22 (1.104 ± 0.09, n = 14) mm; of hind tarsal II 0.12 - 0.13 (0.124 ± 0.005, n = 14) mm. Cornicles, tapering, imbricated, 0.21 - 0.24 (0.221 ± 0.011, n = 14) mm long. Cauda tapering, 0.18 - 0.23 (0.206 ± 0.012, n = 14) mm long, with 12 - 16 (14.0 ± 1.109, n = 14) setae. Prominent lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 6 - 11 (7.429 ± 1.453, n = 14).

ALATE VIVIPAROUS FEMALE. Colour when alive: black. Colour when macerated: head, antennae, thorax, legs (except base of femora pale), cornicles, cauda, anal and genital plates dark brown. Dark brown lateral, pre and post-siphuncular sclerites. Brown transverse dorsal bars on abdominal segments VII and VIII.

Morphology. Body length 2.0 - 2.37 (2.148 ± 0.115, n = 11) mm. Antennae six-segmented, imbricated, 1.32 - 1.51 (1.403 ± 0.066, n = 11) mm long. Length of antennal segments (in mm): III, 0.38 - 0.47 (0.424 ± 0.030, n = 11); IV, 0.22 - 0.26 (0.245 ± 0.017, n = 11); V, 0.20 - 0.25 (0.222 ± 0.013, n = 11); VI, 0.14 - 0.15 (0.145 ± 0.008, n = 11) + 0.21 - 0.25 (0.235 ± 0.014, n = 11). Secondary

sensoria tuberculated, with fairly wide rims, irregular in size 44 - 53 (49.0 ± 3.071, n = 22) on antennal segment III; 14 - 22 (19.36 ± 2.08, n = 22) on IV; 3 - 8 (5.45 ± 1.65, n = 22) on V. Longest setae on antennal segment III 0.035 - 0.053 (0.043 ± 0.006, n = 11) mm. Length of hind tibiae 1.06 - 1.24 (1.473 ± 0.061, n = 11) mm; of hind tarsal II 0.11 - 0.13 (0.122 ± 0.006, n = 11) mm. Cornicles tapering, imbricated, 0.18 - 0.23 (0.208 - 0.017, n = 11) mm long. Cauda tapering 0.17 - 0.21 (0.187 ± 0.013, n = 11) mm long, with 13 - 19 (15.545 ± 1.864, n = 11) setae. Lateral tubercles prominent on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 6 - 10 (7.364 ± 1.120, n = 11).

TYPES. Holotype will be deposited in the Canadian National Collection.

HOST PLANTS: Senecio pauperculus

COMMENTS. Other Aphis spp. in North America which have been reported from Senecio are lugentis Williams, senecionis Williams, senecioradicis (Gillette and Palmer) and nyctalis Hottes and Frison. Type material of all these species was examined. Aphis duckmountainensis differs from all these in being "longer-haired" on body and appendages, especially on antennal segments and hind tibiae, and in having 8 - 10

setae dorsally on abdominal tergite VIII.

MANITOBA SPECIMENS EXAMINED. 34 apterae, 25 alatae. Duck Mountain Provincial Forest, 20 July 1973.

Aphis fabae Scopoli

Figs. 112-131

Aphis fabae Scopoli 1763, p. 136 and 139 (in Palmer 1952); Janisch 1926, p. 314; Jones 1942, p. 67; Jacob 1945, p. 102 and 1947, p. 431; Palmer 1952, p. 135, Kloet and Hincks 1964, p. 72; Robinson and Bradley 1965, p. 40 and 1968, p. 60.

Aphis rumicis Linnaeus [in Davidson 1921, p. 81 (misidentification)]; Horsfall 1925, p. 1; Franssen 1927, p. 16; Theobald 1927, p. 98; Gillette and Palmer 1932, p. 439; Hille Ris Lambers 1934, p. 27.

Aphis papaveris Fabricius 1781 (in Kloet and Hincks 1964, p. 72).

Aphis atriplicis Fabricius 1775, nec Linneus, 1758 (in Doncaster 1961, p. 7); Kloet and Hincks 1964, p. 72.

Aphis hortensis Fabricius 1781 (in Kloet and Hincks 1964, p. 72).

Aphis thlaspeos Schrank 1801 (in Kloet and Hincks 1964, p. 72).

Aphis addita Walker 1849 (in Doncaster 1961, p. 7); Kloet and Hincks 1964, p. 72.

Aphis adducta Walker 1849 (in Doncaster 1961, p. 7); Kloet and Hincks 1964, p. 72.

Aphis advena Walker 1849 (in Doncaster 1961, p. 7); Kloet and Hincks 1964, p. 72.

Aphis indistincta Walker 1849 (in Doncaster 1961, p. 7); Kloet and Hincks 1964, p. 72.

Aphis inducta Walker 1849 (in Doncaster 1961, p. 7); Kloet and Hincks 1964, p. 72.

Aphis translata Walker 1849 (in Doncaster 1961, p. 7); Kloet and Hincks 1964, p. 72.

Aphis abietaria Walker 1849 (in Doncaster 1961, p. 7); Kloet and Hincks 1964, p. 72.

Aphis brevisiphona Theobald 1913 (in Kloet and Hincks 1964, p. 72).

Aphis ?apii Theobald 1925 (in Kloet and Hincks 1964, p. 72).

Aphis watsoni Theobald 1929 (in Kloet and Hincks 1964, p. 72).

FUNDATRIX. Colour when alive: dark green to black. Colour when macerated: head, antennae (except antennal segments III + IV and base of V pale), cornicles, cauda, anal and genital plates dark brown. Body light brown with lateral and post-siphuncular sclerites dark brown and brown transverse dorsal bands on abdominal segments VII and VIII.

Morphology. Body length 1.67 - 2.28 (2. 101 ± 0.173, n = 11) mm. Antennae five-segmented, imbricated, 0.78 - 0.99 (0.892 ± 0.070, n = 11) mm long. Length of antennal segments (in mm): III + IV, 0.30 - 0.39 (0.346 ± 0.028, n = 11); V, 0.13 - 0.19 (0.162 ± 0.018, n = 11); VI, 0.09 - 0.13 (0.111 ± 0.011, n = 11) + 0.10 - 0.18 (0.145 ± 0.021, n = 11). Rostrum reaching to middle coxae, rostral IV + V 0.12 - 0.14 (0.128 ± 0.006, n = 11) mm long, with 2 accessory setae. Longest setae on antennal segment III 0.014 - 0.048 (0.029 ± 0.009, n = 11) mm. Length of hind tibiae 0.76 - 0.89 (0.827 ± 0.048, n = 11) mm; of hind tarsal II 0.09 - 0.12 (0.102 ± 0.008, n = 11) mm. Cornicles tapering, imbricated, 0.14 - 0.20 (0.165 ± 0.018, n = 11) mm long. Cauda slightly tapering, 0.17 - 0.23 (0.198 ± 0.017, n = 11) mm long, with 13 - 20 (15.818 ± 2.401, n = 11) setae. Lateral tubercles large and prominent on prothorax and abdominal segments I and VII. Small lateral tubercles occasionally present on other abdominal segments.

Setae on abdominal segment VIII dorsally 3 - 8 (4.636 ± 1.629, n = 11).

APTEROUS VIVIPAROUS FEMALE. Colour when alive: deep green to black. Colour when macerated: head, antennae (except antennal segments III, IV and base of V pale), cornicles, cauda, anal and genital plates dark brown. Abdomen light brown with lateral and post-siphuncular sclerites, broken dorsal bars on abdominal segments I - VI and transverse dorsal bands on abdominal segments VII and VIII dark brown.

Morphology. Body length 1.41- 2.53 (2.050 ± 0.311, n = 10) mm. Antenna six-segmented, imbricated, 0.88 - 1.68 (1.373 ± 0.231, n = 10) mm long. Length of antennal segments (in mm); III, 0.21 - 0.38 (0.323 ± 0.059, n = 10); IV, 0.12 - 0.30 (0.218 ± 0.053, n = 10); V, 0.14 - 0.29 (0.220 ± 0.044, n = 10); VI, 0.10 - 0.14 (0.131 ± 0.014, n = 10) + 0.21 - 0.42 (0.332 ± 0.060, n = 10). Longest setae on antennal segment III 0.05 - 0.07 (0.058 ± 0.009, n = 10) mm. Rostrum reaching to hind coxae; rostral IV + V 0.13 - 0.16 (0.151 ± 0.01, n = 10) mm long, with usually 2 and occasionally 3 accessory setae. Length of hind tibiae 0.70 - 1.26 (1.063 ± 0.175, n = 10) mm; of hind tarsal II 0.09 - 0.14 (0.123 ± 0.015, n = 10) mm. Cornicles tapering, imbricated,

0.13 - 0.29 (0.237 ± 0.059, n = 10) mm long. Cauda tapering and constricted near base 0.16 - 0.31 (0.215 ± 0.042, n = 10) mm long, with 15 - 23 (17.20 ± 2.53, n = 10) setae. Large lateral tubercles prominent on prothorax and abdominal segments I and VII. Small lateral tubercles occasionally present on other abdominal segments. Setae on abdominal segment VIII dorsally 3 - 6 (4.0 ± 0.943, n = 10).

ALATE VIVIPAROUS FEMALE. Colour when alive: dark green to black. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown to black. Dark brown lateral and post-siphuncular sclerites on abdominal segments II - V. Brown to dark brown small broken dorsal bars on abdominal segments I - VI and transverse dorsal bars on abdominal segments VII and VIII.

Morphology. Body length 1.75 - 2.45 (2.0 ± 0.22, n = 10) mm. Antennae six-segmented, imbricated 1.21 - 1.46 (1.341 ± 0.086, n = 10) mm long. Length of antennal segments (in mm): III, 0.27 - 0.34 (0.312 ± 0.023, n = 10); IV, 0.18 - 0.27 (0.225 ± 0.028, n = 10); V, 0.18 - 0.23 (0.205 ± 0.014, n = 10); VI, 0.10 - 0.14 (0.127 ± 0.013, n = 10) + 0.27 - 0.37 (0.335 ± 0.031, n = 10). Secondary sensoria 11 - 22 (15.80 ± 2.876, n = 20) on antennal segment III; 0 - 6 (2.5 ± 2.328, n = 20) on IV. Longest setae on antennal

segment III 0.04- 0.06 (0.051 ± 0.006, n = 10) mm. Rostrum reaching to hind coxae; rostral IV + V 0.14 - 0.15 (0.147 ± 0.005, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.97 - 1.27 (1.099 ± 0.111, n = 10) mm; of hind tarsal II 0.11 - 0.13 (0.12 ± 0.007, n = 10) mm. Cornicles slightly tapering, imbricated, 0.15 - 0.29 (0.027 ± 0.051, n = 10) mm long. Cauda tapering 0.16 - 0.22 (0.178 ± 0.021, n = 10) mm long, with 14 - 23 (18.3 ± 2.669, n = 10) setae. Large lateral tubercles prominent on prothorax and abdominal segments I and VII. Small lateral tubercles present on other abdominal segments. Setae on abdominal segment VIII dorsally 2 - 4 (3.1 ± 0.994,n = 10).

OVIPARA. Colour when alive: dark green to black. Colour when macerated much the same as for apterous viviparous female, except basal half of hind tibiae swollen with numerouus pseudosensoria mostly on swollen portion. Body length 1.22 - 1.50 (1.436 ± 0.091, n = 10) mm. Antennae normally six-segmented, imbricated, 0.66 - 0.78 (0.719 ± 0.041, n = 10) mm long. Length of antennal segments (in mm): III, 0.12 - 0.15 (0.143 ± 0.02, n = 10); IV, 0.08 - 0.13 (0.099 ± 0.014, n = 10); V, 0.10 - 0.13 (0.117 ± 0.011, n = 10); VI, 0.08 - 0.09 (0.089 ± 0.003, n = 10) + 0.15 - 0.18 (0.172 ± 0.01, n = 10). Longest setae on antennal segment III 0.012 - 0.030 (0.021 ± 0.006, n = 10) mm. Rostral IV + V 0.10 - 0.13 (0.105 ± 0.01, n = 10) mm long, with 2 accessory setae.

Length of hind tibiae 0.53 - 0.56 (0.549 ± 0.03, n = 10) mm; of hind tarsal II 0.08 - 0.12 (0.095 ± 0.014, n = 10) mm. Cornicles tapering, imbricated, 0.09 - 0.12 (0.099 ± 0.009, n = 10) mm long. Cauda bluntly tapering, 0.08 - 0.13 (0.104 ± 0.016, n = 10) mm long, with 15 - 21 (16.20 ± 1.87, n = 10) setae. Setae on abdominal segment VIII dorsally 6 - 10 (7.70 ± 1.25, n = 10).

ALATE MALE. Much the same as for alate viviparous female, but with somewhat more sclerotized lateral abdominal sclerites. Body length 1.41 - 1.84 (1.563 ± 0.139, n = 8) mm. Antennae six-segmented, imbricated, 1.17 - 1.56 (1.343 ± 0.140, n = 8) mm long. Length of antennal segments (in mm): III, 0.28 - 0.37 (0.319 ± 0.029, n = 8); IV, 0.19 - 0.28 (0.238 ± 0.035, n = 8); V, 0.16 - 0.23 (0.201 ± 0.026, n = 8); VI, 0.11 - 0.14 (0.121 ± 0.012, n = 8) + 0.28 - 0.40 (0.328 ± 0.041, n = 8). Secondary sensoria 31 - 45 (36.813 ± 3.674, n = 16) irregular in size on antennal segment III, 16 - 32 (21.625 ± 4.177, n = 16) on IV, 9 - 16 (12.688 ± 2.774, n = 16) on V. Longest setae on antennal segment III 0.03 - 0.04 (0.035 ± 0.004, n = 8) mm. Rostral IV + V 0.12 - 0.14 (0.129 ± 0.006, n = 8) mm long, with 2 accessory setae. Length of hind tibiae 0.78 - 1.05 (0.923 ± 0.103, n = 8) mm; of hind tarsal II 0.09 - 0.12 (0.101 ± 0.008, n = 8) mm. Cornicles slightly tapering, imbricated, 0.09 - 0.13 (0.108 ± 0.013, n = 8) mm long. Cauda tapering,

0.10 - 0.14 (0.114 ± 0.015, n = 8) mm long, with 11 - 17 (12.88 ± 1.88, n = 8) setae. Setae on abdominal segment VIII dorsally 2 - 4 (2.88 ± 0.83, n = 8).

TYPES. Location not known.

HOST PLANTS. Achillea millefolium; Arctium minus; Aster sp; Bidens frondosa; Cirsium arvense; Dahlia sp.; Gladiolus sp.; Lilium sp.; Philadelphus coronarius; Rheum rhaponticum; Rumex crispus; Senecio vulgaris; Spiraea sp.; Tropaeolum majus; Viburnum opulus and Zinnia sp.

COMMENTS. Taxonomic problems associated with identification of fabae have been discussed by many authors, and useful references are Jacob (1945), Janisch (1926) and Jones (1942). Most aphidologists now use the terms "Aphis fabae complex" or "Aphis fabae group", because differences in physiology or ethology may be demonstrated, but when specimens are cleared and mounted there are no consistent morphological differences. In our laboratory I could easily rear our Manitoba fabae on Tropaeolum majus, the common nasturtium, but on Vicia faba only with very great difficulty, and most specimens died. But a culture obtained from Vicia faba from the laboratory of Agriculture Canada Research Station, Vancouver, B.C., thrived on Vicia

faba in our laboratory, and could be transferred only with very great difficulty to Tropaeolum majus.

In Manitoba Aphis fabae overwinters mainly on Viburnum spp., and occasionally on Philadelphus coronarius, migrating in the spring to various summer hosts in widely separated plant families. Aphis fabae is not an economic pest in Manitoba. It is listed by Kennedy et al. (1962) as a vector of more than 30 virus diseases of plants.

MANITOBA SPECIMENS EXAMINED. 12 fundatrices; 83 apterae; 40 alatae; 37 oviparae and 8 males.

Portage la Prairie, 25 June 1974.

Winnipeg, 14 July 1971; 26 July 1971; 5 June 1973; 29 June 1973; 16 August 1973; 17 August 1973; 26 August 1973; 30 August 1973; 30 September 1973; 4 October 1973; 11 October 1973; 26 October 1973; 4 December 1973; 9 January 1974; 28 May 1974; 11 June 1974; 15 June 1974; 19 June 1974; 25 June 1974; 10 September 1974; 25 October 1974.

Aphis farinosa Gmelin

Figs. 132-148

Aphis farinosa Gmelin 1788 (in Pintera 1959, p. 72); Bodenheimer and Swirski 1957, p. 293; Hille Ris Lambers 1945, p. 50; Doncaster 1961, p. 94; Tanasijevic and Eastop 1963, p. 266; Robinson and Bradley 1965; p. 40 and 1968, p. 60; Heie 1969, p. 80.

Aphis saliceti Kaltenbach 1843, p. 103; Koch 1854, p. 118; Buckton 1879, p. 52; Gillette and Bragg 1918, p. 89; Theobald 1927, p. 171; Hottes and Frison 1931, p. 217; Gillette and Palmer 1932, p. 440; Palmer 1952, p. 172.

Aphis salicicola Thomas 1878, p. 8 and 1879, p. 212; Monell 1879, p. 24; Cowen (in Gillette and Baker) 1895, p. 121 (misspelled "salicola"); Gillette 1910, p. 403.

Aphis (Aphidula) farinosa Gmelin 1788 (in Börner 1952, p. 78); Kloet and Hincks 1964, p. 72; Quednau 1966, p. 426.

APTEROUS VIVIPAROUS FEMALE. Colour when alive: yellowish green to green and rust-red. Colour when macerated: head, antennae (except antennal segments III, IV and base of V and VI pale), cauda, anal and genital plates brown. Cornicles pale with brown at the tips.

MORPHOLOGY. Body length 1.58 - 2.0 (1.844 ± 0.193, n = 10) mm. Antenna six-segmented, imbricated, 1.12 - 1.35 (1.233 ± 0.077, n = 10) mm long. Length of antennal segments (in mm): III, 0.25 - 0.38 (0.342 ± 0.041, n = 10); IV, 0.18 - 0.22 (0.199 ± 0.017, n = 10); V, 0.14 - 0.22 (0.176 ± 0.024, n = 10); VI, 0.12 - 0.15 (0.133 ± 0.008, n = 10) + 0.18 - 0.27 (0.243 ± 0.028, n = 10). Longest setae on antennal segment III 0.01 - 0.03 (0.025 ± 0.006, n = 10) mm. Rostrum reaching to hind coxae; rostral IV + V 0.13 - 0.15 (0.144 ± 0.007, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.79 - 1.0 (0.914 ± 0.073, n = 10) mm; of hind tarsal II 0.12 - 0.13 (0.121 ± 0.009, n = 10) mm. Cornicles tapering, imbricated, 0.42 - 0.52 (0.487 ± 0.040, n = 10) mm long. Cauda fingertip-shaped, 0.18 - 0.26 (0.230 ± 0.022, n = 10) mm long, with 6 - 14 (10.90 ± 2.234, n = 10) setae. Large lateral tubercles prominent on prothorax and abdominal segments I and VII. Small lateral tubercles present on other segments. Setae on abdominal VIII dorsally 2 - 4 (2.40 ± 0.843, n = 10).

ALATE VIVIPAROUS FEMALE. Colour when alive: bright green. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen pale with lateral, post-siphuncular sclerites and transverse dorsal bars on abdominal segments VII and VIII dark brown.

Morphology. Body length 1.60 - 1.98 (1.812 ± 0.125, n =10) mm. Antennae six-segmented, 1.08 - 1.20 (1.124 ± 0.042, n = 10) mm long. Length of antennal segments (in mm): III, 0.30 - 0.31 (0.302 ± 0.005, n = 10); IV, 0.16 - 0.20 (0.179 ± 0.015, n = 10); V, 0.14 - 0.18 (0.159 ± 0.018, n = 10); VI, 0.11 - 0.13 (0.116 ± 0.008, n = 10) + 0.20 - 0.28 (0.238 ± 0.023, n = 10). Longest setae on antennal segment III 0.01 - 0.03 (0.019 ± 0.009, n = 10) mm. Secondary sensoria 5 - 10(6.45 ± 1.099, n = 20) on antennal segment III. Rostrum reaching to hind coxae; rostral IV + V rather slender 0.14 - 0.14 mm long, with 2 accessory setae. Length of hind tibiae 0.83 - 0.96 (0.877 ± 0.046, n = 10) mm ; of hind tarsal II 0.12 - 0.14 (0.122 ± 0.006, n = 10) mm. Cornicles slightly cylindrical, imbricated, 0.36 - 0.44 (0.39 ± 0.026, n = 10) mm long. Cauda fingertip-shaped, 0.16 - 0.19 (0.174 ± 0.010, n = 10) mm long, with 7 - 14 (9.7 ± 2.263, n = 10) setae. Large lateral tubercles present on prothorax and abdominal segments I and VII. Small lateral tubercles also present on other

abdominal segments. Setae on abdominal VIII dorsally 2 - 3 (2.2 ± 0.422, n = 10).

OVIPARA. Colour when alive: rust red. Colour when macerated the same as for apterous viviparous female except hind tibiae on proximal half slightly swollen and bearing a few pseudosensoria. Body length 1.34 - 1.74 (1.612 ± 0.146, n = 10) mm long. Antennae six-segmented, imbricated, 0.80 - 1.88 (0.996 ± 0.324, n = 10) mm long. Length of antennal segments (in mm): III, 0.18 - 0.37 (0.221 ± 0.055, n = 10); IV, 0.08 - 0.14 (0.121 ± 0.02, n = 10); V, 0.09 - 0.15 (0.124 ± 0.019, n = 10); VI, 0.09 - 0.11 (0.094 ± 0.01, n = 10) + 0.19 - 0.26 (0.239 ± 0.02, n = 10). Longest setae on antennal segment III 0.007 - 0.012 (0.010 ± 0.002, n = 10) mm. Rostrum reaching to hind coxae; rostral IV + V 0.12 - 0.14 (0.137 ± 0.007, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.46 - 0.59 (0.54 ± 0.039, n = 10) mm; of hind tarsal II, 0.08 - 0.10 (0.091 ± 0.01, n = 10) mm long. Cornicles cylindrical, imbricated, 0.28 - 0.34 (0.303 ± 0.033, n = 10) mm long. Cauda tapering, 0.14 - 0.18 (0.155 ± 0.015, n = 10) mm long, with 7 - 12 (9.8 ± 1.619, n = 10) setae. Setae on abdominal segment VIII dorsally 2 - 8 (5.6 ± 1.95, n = 10).

APTEROUS MALE. (One specimen) Colour when alive: not observed. Colour when macerated the same as for

alate viviparous female. Body length 1.14 mm long. Antennae six-segmented, imbricated, 1.09 mm long. Length of antennal segment (in mm): III, 0.22; IV, 0.16; V, 0.15; VI, 0.10 + 0.34. Longest setae on antennal segment III 0.01 mm. Secondary sensoria 10 - 19 on antennal segment III; 6 - 9 on IV; 4 - 8 on V. Rostral IV + V 0.14 mm long, with 2 accessory setae. Length of hind tibiae 0.60 mm; of hind tarsal II 0.10 mm long. Cornicles slightly tapering, imbricated, 0.28 mm long. Cauda cylindrical, 0.09 mm long, with 9 setae. Setae on abdominal segment VIII dorsally 5.

TYPES. Location not known.

HOST PLANTS. Several species of Salix (willows).

COMMENTS. Specimens have longer than normal cauda and cornicles for the genus. As far as is known this species remains on Salix for its entire life history. Most collections in southern Manitoba have been of the "green form". A large sample collected in 1975 in Churchill were entirely of the "red form". Sexuales are formed very early, sometimes as early as June.

MANITOBA SPECIMENS EXAMINED. 90 apterae, 16 alatae, 14 oviparae and 1 male.
Caddy Lake, 10 July 1961; 20 July 1963; 20 July 1971.
Churchill, 22 July 1975.

Falcon Lake, 9 June 1973.

Moose Lake, 10 July 1968.

Pinawa, 8 August 1974.

Sandilands Provincial Forest, 27 June 1973; 12 July 1974.

Aphis forbesi Weed

Figs. 149-162

Aphis forbesi Weed 1889 a, p. 148 and 1889 b, p 273; Sanderson 1900, p. 3; Gillette 1908, p. 178; Smith 1909, p. 24; Patch 1923, p. 293; Marcovitch 1925, p. 441; Cutright 1925, p. 197, Gillette and Palmer 1932, p. 392; Palmer 1952, p. 137; Forbes 1962, p. 42; Szelegiewicz 1965, p. 36; Müller and Seidel 1968, p. 445; Heie 1969, p. 80.

Cerosipha (Cerosipha) forbesi Börner 1952, p. 90.

APTEROUS VIVIPAROUS FEMALE. Colour when alive: bluish to dark green. Colour when macerated: head, antennae, cornicles, cauda, anal and genital plates brown. Abdomen pale, with brown lateral sclerites and transverse dorsal band on abdominal segments VII and VIII.

Morphology. Body length 1.36 - 1.86 (1.649 ± 0.176, n = 10) mm. Antennae six-segmented, imbricated, 0.93 - 1.18 (1.068 ± 0.111, n = 10) mm long. Length of antennal segments (in mm): III, 0.20 - 0.28 (0.234 ± 0.026, n = 10); IV, 0.11 - 0.20 (0.152 ± 0.027, n = 10); V, 0.13 - 0.19 (0.16 ± 0.022, n = 10); IV, 0.09 - 0.12 (0.106 ± 0.012, n = 10) + 0.27 - 0.34

(0.298 ± 0.025, n = 10). Longest setae on antennal segment III 0.006 - 0.012 (0.008 ± 0.002, n = 10) mm. Rostrum reaching to abdomen; rostral IV + V 0.15 - 0.18 (0.16 ± 0.011, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.67 -0.83 (0.756 ± 0.058, n = 10) mm; of hind tarsal II 0.08 - 0.09 (0.088 ± 0.004, n = 10) mm. Cornicles tapering, imbricated, 0.21 - 0.32 (0.261 ± 0.035, n = 10) mm long. Cauda bluntly tapering 0.13 - 0.15 (0.139 ± 0.009, n = 10) mm long, with 5 - 9 (7± 1.33, n = 10) setae. Large and prominent lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 1 - 3 (2.2 ± 0.789, n = 10)

ALATE VIVIPAROUS FEMALE. Colour when alive: bluish green. Colour when macerated: head, thorax, antennae, cornicles, cauda, anal and genital plates dark brown, with black patches on abdominal segments I - V laterally, and dark dorsal bands on VI - VIII.

Morphology. Body length 1.42 - 1.86 (1.68 ± 0.127, n = 10) mm. Antennae six-segmented, imbricated, 0.98 - 1.30 (1.191 ± 0.125, n = 10) mm long. Length of antennal segments (in mm): III, 0.21 - 0.29 (0.266 ± 0.025, n = 10); IV, 0.16 - 0.21 (0.197 ± 0.022, n = 10); V, 0.14 - 0.21 (0.184 ± 0.026, n = 10); VI, 0.08 - 0.13 (0.116 ± 0.015, n = 10) + 0.28 - 0.37 (0.331 ± 0.034, n = 10). Longest setae on antennal

segment III 0.006 - 0.009 (0.009 ± 0.001, n = 10) mm. Secondary sensoria 2 - 4 (3.15 ± 0.875, n = 10) on antennal segment III. Rostrum reaching to abdomen, rostral IV + V 0.14 - 0.16 (0.152 ± 0.008, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.68 - 0.86 (0.818 ± 0.053, n = 10) mm; of hind tarsal II 0.08 - 0.09 (0.089 ± 0.003, n = 10) mm. Cornicles slightly tapering, imbricated, 0.20 - 0.28 (0.24 ± 0.024, n = 10) mm long. Cauda bluntly tapering, 0.09 - 0.13 (0.121 ± 0.014, n = 10) mm long, with 6 - 8 (7.1 ± 0.876, n = 10) setae. Prominent lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 4 (2.2 ± 0.632, n = 10).

OVIPARA. (one specimen) Colour when alive: not observed. Colour when macerated much the same as apterous viviparous female. Body length 1.40 mm. Antennae five-segmented, imbricated, 0.78 mm long. Length of antennal segments (in mm): III + IV, 0.27; V, 0.11; VI, 0.09 + 0.22. Longest setae on antennal segment III 0.012 mm. Rostral IV + V 0.13 mm long, with 2 accessory setae. Length of hind tibiae 0.61 mm; of hind tarsal segment II 0.08 mm. Cornicles cylindrical, imbricated, 0.13 mm long. Cauda cylindrical and round 0.09 mm long, with 6 setae. Lateral tubercles large and prominent on prothorax and abdo-

minal segments I and VII. Setae on abdominal segment VIII dorsally 4.

TYPES. Location not known.

HOST PLANTS. Wild Fragaria spp. (strawberries).

COMMENTS. This species apparently spends its entire life history on the strawberry plant. Summer forms begin new colonies on the small plants at the ends of the runners. A. forbesi has not been found on cultivated strawberries in Manitoba, and apparently is not an economic pest in Manitoba. It is listed by Kennedy et al (1962) as a vector of at least 1 virus disease of plants.

MANITOBA SPECIMENS EXAMINED. 130 apterae, 10 alatae, 1 ovipara.

Birds Hill Park, 14 June 1973; 24 August 1973; 22 August 1974.

Pinawa, 8 August 1974.

Sandilands Provincial Forest, 12 July 1973.

Aphis gossypii Glover

Figs. 163-172

Aphis gossypii Glover 1877, p.36 (in Patch 1925, p. 186); Batchelder 1927, p. 263; Hottes and Frison 1931, p. 195; Gillette and Palmer 1932, p. 392; Palmer 1952, p. 139; Kring 1955, p. 442 and 1959, p. 284; Robinson and Bradley 1965, p. 40 and 1968, p. 60; Russell 1968, p. 116.

Aphis (Cerosipha) gossypii Glover 1854 (in Kloet and Hincks 1964, p. 73).

Aphis frangulae Kaltenbach 1855 (in Russell 1968, p. 117).

Aphis solanina Passerini 1863 (in Kloet and Hincks 1964, p. 73.

Aphis convolvulicola Ferrari 1872 (in Essig 1956, p. 22); Russell 1968, p. 117.

Aphis cucurbitae Buckton 1878 (in Doncaster 1973, p. 49).

Aphis citrulli Ashmead 1882 (in Essig 1956, p. 22).

Aphis cucumeris Forbes 1882 (in Essig 1956, p. 22); Kloet and

Hincks 1964, p. 73.

Aphis oxalis Macchiati 1883 (in Essig 1956, p. 22).

Aphis heliotropii Macchiati 1885 (in Essig 1956, p. 22).

Aphis cooki Essig 1911 (in Essig 1956, p. 22).

Aphis pava Theobald 1915 (in Kloet and Hincks 1964, p. 73).

Aphis malvoides Das 1918 (in Essig 1956, p. 22).

Aphis bauhinia Theobald 1918 (in Essig 1956, p. 22); Kloet and Hincks 1964, p. 73.

Aphis shirakii Takahashi 1912 (in Essig 1956, p. 22).

Toxoptera leonuri Takahashi 1923 (in Essig 1956, p. 22).

Aphis oxalina Theobald 1925 (in Essig 1956, p. 22); Kloet and Hincks 1964, p. 73.

Aphis viridula Nevsky 1929 (in Essig 1956, p. 22).

Cerosipha (Cerosipha) aurantii (Boyer de Fonscolombe) Börner 1952, p. 88; Essig 1956, p. 22.

APTEROUS VIVIPAROUS FEMALE. Colour when alive: pale green, bright green, deep green to black. Colour when macerated: mostly pale except some specimens may have dark brown cornicles.

Morphology. Body length 0.97 - 1.85 (1.317 ± 0.271, n = 15) mm. Antennae six-segmented, often five-segmented, imbricated, 0.53 - 1.16 (0.827 ± 0.186, n = 15) mm long. Length of antennal segments (in mm): III, 0.11 - 0.27 (0.189 ± 0.047, n = 15); IV, 0.06 - 0.20 (0.124 ± 0.046, n = 15) V, 0.08 - 0.17 (0.127 ± 0.029, n = 15); VI, 0.08 - 0.11 (0.094 ± 0.01, n = 15) + 0.12 - 0.29 (0.195 ± 0.049, n = 15) Longest setae on antennal segment III 0.006 - 0.016 (0.010 ± 0.003, n = 15) mm. Rostrum reaching to middle coxae, rostral IV + V 0.07 - 0.12 (0.087 ± 0.013, n = 15) mm long, with usually 2 but rarely 3 accessory setae. Length of hind tibiae 0.40 - 0.90 (0.585 ± 0.153, n = 15) mm; of hind tarsal II 0.07 - 0.09 (0.079 ± 0.008, n = 15) mm. Cornicles tapering, imbricated, 0.10 - 0.33 (0.188 ± 0.066, n = 15) mm long. Cauda elongated, 0.10 - 0.19 (0.151 ± 0.025, n = 15) mm long, with 4 - 7 (5.8 ± 1.01, n = 15) setae. Small lateral tubercles on prothorax and abdominal segments I and VII. Two setae on abdominal segment VIII dorsally.

ALATE VIVIPAROUS FEMALE. Colour when alive: bright green to deep green. Colour when macerated: head, antennae,

thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen pale with dark brown lateral and post-siphuncular sclerites. Light brown transverse dorsal band on abdominal segments VII and VIII.

Morphology. Body length 1.06 - 1.67 (1.253 ± 0.179, n = 15) mm. Antennae six-segmented, imbricated, 0.68 - 1.07 (0.881 ± 0.129, n = 15). Length of antennal segments (in mm): III, 0.17 - 0.29 (0.212 ± 0.029, n = 15): IV, 0.09 - 0.19 (0.137 ± 0.023, n = 15); V, 0.09 - 0.18 (0.143 ± 0.024, n = 15); VI, 0.08 - 0.12 (0.10 ± 0.012, n = 15) + 0.15 - 0.28 (0.20 ± 0.035, n = 15). Secondary sensoria 3 - 9 (5.833 ± 0.177, n = 30) arranged in a single row on antennal segment III, occasionally 1 on IV. Longest setae on antennal segment III 0.006 - 0.014 (0.010 ± 0.002, n = 15) mm. Rostrum reaching to middle coxae; rostral IV + V 0.06 - 0.09 (0.076 ± 0.008, n = 15) mm long, with usually 2 accessory setae, but rarely 3 accessory setae. Length of hind tibiae 0.50 - 0.79 (0.623 ± 0.101, n = 15) mm; of hind tarsal II 0.06 - 0.09 (0.074 ± 0.008, n = 15) mm. Cornicles cylindrical, imbricated, 0.08 - 0.19 (0.129 ± 0.028, n = 15) mm long. Cauda fingertip-shaped, 0.09 - 0.16 (0.119 ± 0.022, n = 15) mm long with 4 - 7 (5.666 ± 0.816, n = 15) setae. Small lateral tubercles prominent on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 3 (2.067 ± 0.258, n = 15).

TYPES. According to Russell (1968) there are no type specimens of this species.

HOST PLANTS. Bidens sp.; Cucumis sp.; Diervilla lonicera; Galium boreale; Monarda fistulosa; Potentilla tridentata.

COMMENTS. This species is variable both in measurements and in colour and it is very difficult to choose any one character by which either live or mounted specimens may be recognized. One useful discussion may be found in Stroyan (1961). Shaposhnikov (1964) in a key to Aphis in the U.S.S.R., in separating gossypii from sedi said that in sedi cornicles are 0.8 - 1.2 times as long as cauda, while in gossypii cornicles are 1.3 - 2.5 times as long as cauda. Also in sedi the third antennal segment is 1.2 - 1.3 times as long as unguis, while in gossypii the third antennal segment is 0.7 - 0.8 times as long as unguis.

Aphis gossypii is not an economic pest in Manitoba, although elsewhere it is often regarded as a serious pest both in population numbers and because it is a vector of more than 55 virus diseases of plants (Kennedy et al 1962).

It is not known how gossypii overwinters in Manitoba.

MANITOBA SPECIMENS EXAMINED. 442 apterae, 117 alatae.
Birds Hill Park, 14 July 1966; 18 June 1973; 22 August 1974.
Carberry, 7 August 1963; 25 July 1974; 22 August 1973.
Grand Beach, 28 August 1973; 2 July 1974.
Holland, 23 July 1974.

Julius, 30 July 1974.

Lake Audy, Riding Mountain National Park, 22 July 1974.

Ox Bow Lake, 22 August 1973.

Sandilands Provincial Forest, 3 August 1971; 18 July 1972; 27 June 1973; 9 July 1973; 13 June 1974; 20 June 1974; 12 July 1974.

West Hawk Lake, 6 July 1974.

Winnipeg, 9 August 1962; 13 September 1972.

Aphis helianthi Monell

Figs. 173-192

Aphis helianthi Monell 1879, p. 26; Gillette 1927,p. 346; Hottes and Frison 1931, p. 196; Gillette and Palmer 1932, p. 402; Palmer 1952, p. 141; Archibald 1958, p. 50; Medler and Ghosh 1969, p. 45; Robinson and Bradley 1965, p. 40 and 1968, p. 60; Robinson and Chen 1969, p. 522.

Aphis oxybaphi Oestlund 1887, p. 62.

Aphis gillettei Cowen (in Gillette and Baker 1895, p. 120).

Aphis cornifoliae Fitch (Misidentification) [in Gillette 1910, p. 407].

Aphis yuccae Cowen (in Hottes 1930, p. 184).

FUNDATRIX. Colour when alive: not observed. Colour when macerated: mostly pale except tip of antennal segment V, antennal segment VI , cornicles, cauda, anal and genital plates dark brown.

Morphology. Body length 1.60 - 1.90 (1.77 ± 0.115, n = 10) mm. Antennae five-segmented, imbricated, 0.59 - 0.75

(0.662 ± 0.058, n = 10) mm long. Length of antennal segments (in mm): III + IV, 0.20 - 0.30 (0.243 ± 0.036, n = 10); V, 0.08 - 0.13 (0.112 ± 0.015, n = 10); VI, 0.08 - 0.10 (0.093 ± 0.007, n = 10) + 0.09 - 0.12 (0.107 ± 0.009, n = 10). Longest setae on antennal segment III + IV 0.007 - 0.012 (0.010 ± 0.002, n = 10) mm. Rostrum reaching between middle and hind coxae; rostral IV + V 0.10 - 0.12 (0.108 ± 0.006, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.56 - 0.70 (0.639 ± 0.05, n = 10) mm; of hind tarsal II 0.09 - 0.10 (0.096 ± 0.005, n = 10) mm. Cornicles cylindrical, imbricated, 0.12 - 0.24 (0.177 ± 0.037, n = 10) mm long. Cauda elongated, 0.14 - 0.17 (0.155 ± 0.012, n = 10) mm long, with 3 - 8 (5.0 ± 1.414, n = 10) setae. Prominent lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 7 (3.5 ± 1.58, n = 10).

APTEROUS VIVIPAROUS FEMALE. Colour when alive: yellowish green with dark green dorsal band on anterior portion of abdominal segment V. Colour when macerated: head, antennae (except antennal segments III, IV and base of V pale), cornicles, cauda, anal and genital plates dark brown. Light brown post-siphuncular sclerites and transverse dorsal bars on abdominal segment VIII.

Morphology. Body length 1.50 - 2.35 (1.90 ± 0.252, n = 10) mm. Antennae six-segmented, imbricated, 0.88 - 1.28

(1.122 ± 0.144, n= 10) mm long. Length of antennal segments (in mm): III, 0.22 - 0.40 (0.318 ± 0.061, n = 10); IV, 0.13 - 0.22 (0.175 ± 0.029, n = 10); V, 0.11 - 0.19 (0.16 ± 0.029, n = 10); VI, 0.08 - 0.14 (0.109 ± 0.021, n = 10) + 0.22 - 0.28 (0.247 ± 0.019, n = 10). Longest setae on antennal segment III 0.002 - 0.034 (0.020 ± 0.011, n = 10) mm. Rostrum reaching to middle coxae; rostral IV + V 0.10 - 0.13 (0.117 ± 0.008, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.72 - 0.96 (0.857 ± 0.103, n = 10) mm; of hind tarsal II 0.09 - 0.13 (0.116 ± 0.014, n = 10) mm. Cornicles tapering, imbricated, 0.22 - 0.31 (0.269 ± 0.032, n = 10) mm long. Cauda slightly fingertip-shaped 0.14 - 0.19 (0.165 ± 0.014, n = 10) mm long, with 5 - 12 (9.6 ± 3.062, n = 10) setae. Prominent lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 6 (4.0 ± 1.563, n = 10).

ALATE VIVIPAROUS FEMALE. Colour when alive: yellowish green to green. Colour when macerated: head, thorax, antennae, cornicles, cauda, anal and genital plates dark brown. Abdomen pale with lateral post-siphuncular sclerites and transverse dorsal band on abdominal segments VI , VII and VIII brown.

Morphology. Body length 1.42 - 2.80 (1.816 ± 0.388, n = 10) mm. Antennae six-segmented, imbricated, 1.09 - 1.51 (1.272 ± 0.129, n = 10) mm long. Length of antennal

segments (in mm): III, 0.29 - 0.48 (0.365 ± 0.057, n = 10); IV, 0.17 - 0.24 (0.20 ± 0.025, n = 10): V, 0.15 - 0.22 (0.182 ± 0.02, n = 10); VI, 0.09 - 0.14 (0.10 ± 0.036, n = 10) + 0.26 - 0.34 (0.286 ± 0.023, n = 10). Longest setae on antennal segment III 0.008 - 0.021 (0.013 ± 0.004, n = 10) mm. Secondary sensoria 16 - 50 (27.75 ± 8.22, n = 20) slightly tuberculate on antennal segment III, occasionally 1 on IV. Rostrum reaching to middle coxae; rostral IV + V 0.09 - 0.15 (0.108 ± 0.018, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.74 - 1.16 (0.919 ± 0.125, n = 10) mm; of hind tarsal II 0.10 - 0.13 (0.114 ± 0.011, n = 10) mm. Cornicles tapering, imbricated, 0.18 - 0.26 (0.215 ± 0.023, n = 10) mm long. Cauda fingertip-shaped 0.12 - 0.17 (0.147 ± 0.018, n = 10) mm long, with 8 - 14 (9.7 ± 1.829, n = 10) setae. Prominent lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 5 (3.5 ± 0.972, n = 10).

OVIPARA. Colour when alive: not observed. Colour when macerated much the same as for apterous viviparous females except hind tibiae swollen with numerous pseudo-sensoria over the whole length. Body length 1.33 - 1.82 (1.546 ± 0.167, n = 10) mm. Antennae six-segmented, imbricated, 0.60 - 0.81 (0.736 ± 0.067, n = 10) mm long.

Length of antennal segments (in mm): III, 0.09 - 0.19 (0.156 ± 0.03, n = 10): IV, 0.07 - 0.13 (0.101 ± 0.022, n = 10); V, 0.09 - 0.13 (0.115 ± 0.015, n = 10); VI, 0.06 - 0.10 (0.082 ± 0.011, n = 10) + 0.15 - 0.20 (0.183 ± 0.014, n = 10). Longest setae on antennal segment III 0.011 - 0.017 (0.014 ± 0.002, n = 10) mm. Rostrum reaching to hind coxae; rostral IV + V 0.09 - 0.12 (0.106 ± 0.010, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.48 - 0.60 (0.562 ± 0.039, n = 10) mm; of hind tarsal II 0.08 - 0.10 (0.088 ± 0.008, n =10) mm long. Cornicles tapering, imbricated, 0.11 - 0.16 (0.133 ± 0.013, n = 10) mm long. Cauda bluntly tapering, 0.10 - 0.14 (0.125 ± 0.014, n = 10) mm long, with 9 - 15 (10.7 ± 2.406, n = 10) setae. Setae on abdominal segment VIII dorsally 4 - 7 (5.4 ± 0.966, n = 10).

ALATE MALE. Colour when alive: not observed. Colour when macerated much the same as for alate viviparous female. Body length 1.20 - 2.20 (1.709 ± 0.339, n = 8) mm. Antennae six-segmented, imbricated, 1.21 - 1.50 (1.357 ± 0.096, n = 8) mm long. Length of antennal segments (in mm): III, 0.33 - 0.48 (0.391 ± 0.057, n = 8); IV, 0.21 - 0.31 (0.241 ± 0.035, n = 8); V, 0.19 - 0.22 (0.197 ± 0.013, n = 8); VI, 0.09 - 0.13 (0.104 ± 0.014, n = 8) + 0.24 - 0.36 (0.299 ± 0.038, n = 8). Longest setae on antennal segment III 0.001 - 0.020 (0.014 ± 0.004, n = 8) mm. Secondary sensoria 36 - 55 (42.92 ± 7.158,

n = 13) irregular in size on antennal segment III; 9 - 16 (12.38 ± 2.53, n = 13) on IV; 6 - 13 (9.33 ± 1.775, n = 13) on V; occasionally 2 on base of VI. Rostrum reaching to middle coxae; rostral IV + V 0.09 - 0.13 (0.113 ± 0.015, n = 8) mm long, with 2 accessory setae. Length of hind tibiae 0.82 - 1.05 (0.914 ± 0.008, n = 8) mm; of hind tarsal II 0.09 - 0.11 (0.10 ± 0.008, n = 8) mm. Cornicles tapering, imbricated, 0.14 - 0.16 (0.153 ± 0.009, n = 8) mm long. Cauda bluntly tapering, 0.11 - 0.12 (0.113 ± 0.005, n = 8) mm long, with 5 - 16 (10.33 ± 4.08, n = 8) setae. Setae on abdominal segment VIII dorsally 2 - 5 (3.8 ± 1.095, n = 8).

TYPES. Syntypes were remounted by H.L.G. Stroyan, and a slide of the remounted material was obtained on loan from the Entomology Research Collection, Purdue University.

HOST PLANTS. Cornus stolonifera; Helianthus sp.

COMMENTS. A lengthy discussion on helianthi was given by Robinson and Chen (1969) and research on helianthi in Manitoba was reported in the M.Sc. Thesis by Chen (1968). I have found nothing further to add to their conclusions. This species is listed by Kennedy et al (1962) as a vector of at least 3 virus diseases of plants.

MANITOBA SPECIMENS EXAMINED. 14 fundatrices, 75 apterae, 47 alatae, 27 oviparae and 7 males.

Birds Hill Park, 14 June 1973.

Birds Lake, 29 May 1964.

Riverton, 10 August 1971

Sandilands Provincial Forest, 20 September 1966.

Winnipeg, 10 June 1963; 25 September 1963; 11 October 1963; 12 October 1963; 15 May 1964; 19 May 1965; 21 May 1965; 28 August 1965; 20 September 1966; 10 July 1967; 11 August 1967; 16 May 1968; 17 May 1968; 20 May 1968; 21 May 1968; 25 May 1968; 4 June 1968; 29 June 1971; 22 June 1973; 19 June 1974.

Aphis heraclella Davis

Figs. 193-202

Aphis heraclii Cowen (in Gillette and Baker 1895, p. 20).

Aphis heraclella Davis 1919, p. 228; Gillette and Palmer 1932, p. 405; Palmer 1952, p. 143; Robinson and Bradley 1965, p. 40 and 1968, p. 60.

APTEROUS VIVIPAROUS FEMALE. Colour when alive: yellowish green to deep green. Colour when macerated: head, antennae (except the base of antennal segment III pale), cornicles, cauda, anal and genital plates dark brown. Brown lateral sclerites on thorax. Abdomen pale with post-siphuncular sclerites and transverse dorsal band on abdominal segments VII and VIII brown.

Morphology. Body length 1.37 - 2.01 (1.59 ± 0.187, n = 10) mm. Antennae six-segmented, imbricated, 0.74 - 1.09 (0.894 ± 0.112, n = 10) mm long. Length of antennal segments (in mm): III, 0.19 - 0.30 (0.233 ± 0.031, n = 10); IV, 0.08 - 0.16 (0.131 ± 0.031, n = 10); V, 0.10 - 0.15 (0.127 ± 0.017, n = 10); VI, 0.09 - 0.11 (0.096 ± 0.008, n = 10) + 0.16 - 0.26 (0.202 ± 0.039, n = 10). Longest setae on antennal segment III 0.020 - 0.035 (0.025 ± 0.005, n = 10) mm. Rostrum reaching to hind coxae rostral IV + V 0.09 - 0.11 (0.105 ± 0.007, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.54 - 0.82

(0.696 ± 0.099, n = 10); of hind tarsal II 0.09 - 0.11 (0.101 ± 0.009, n = 10). Cornicles tapering, imbricated 0.15 - 0.22 (0.188 ± 0.026, n = 10) mm long. Cauda tapering 0.11 - 0.17 (0.14 ± 0.015, n = 10) with 7 - 11 (8.6 ± 1.838, n = 10) setae. Lateral tubercles prominent on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 3 - 6 (4.3 ± 0.823, n = 10).

ALATE VIVIPAROUS FEMALE. Colour when alive: green. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen,pale, with broken dorsal bars on abdominal segment VI, post-siphuncular sclerites, and transverse dorsal bands on VII and VIII dark brown.

Morphology. Body length 1.67 - 1.94 (1.781 ± 0.099, n = 10) mm. Antennae six-segmented, imbricated, 1.07 - 1.26 (1.191 ± 0.072, n = 10) mm long. Length of antennal segments (in mm): III, 0.26 - 0.37 (0.335 ± 0.033, n = 10); IV, 0.16 - 0.21 (0.182 ± 0.018, n = 10); V, 0.15 - 0.19 (0.166 ± 0.013, n = 10); VI, 0.10 - 0.12 (0.115 ± 0.007, n = 10) + 0.24 - 0.30 (0.279 ± 0.017, n = 10). Longest setae on antennal segment III 0.020 - 0.026 (0.021 ± 0.002, n = 10) mm. Secondary sensoria somewhat tuberculate, scattered in two irregular rows, 18 - 30 (25.3 ± 4.028, n = 20) on antennal segment III. Rostrum reaching to middle coxae; rostral IV + V 0.09 - 0.11 (0.101 ± 0.006, n = 10) mm long, with 2 accessory setae.

Length of hind tibiae 0.76 - 0.93 (0.865 ± 0.065, n = 10) mm; of hind tarsal segment II 0.10 - 0.12 (0.114 ± 0.008, n = 10) mm long. Cornicles, cylindrical, imbricated, 0.16 - 0.21 (0.186 ± 0.021, n = 10) mm long. Cauda tapering 0.14 - 0.16 (0.145 ± 0.008, n = 10) mm long, with 7 - 12 (9.6 ± 1.776, n = 10) setae. Lateral tubercles prominent on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 3 - 6 (3.9 ± 0.99, n = 10).

TYPES. The neotype slide is in the United States National Museum.

HOST PLANTS. Cicuta maculata; Heracleum lanatum; Pastinaca sativa; Sium suave; Zizia aurea.

COMMENTS. Comparisons between heraclella and helianthi were made by Robinson and Chen (1969) and in the M.Sc. Thesis by Chen (1968). The life history for heraclella in Manitoba is not yet known. It was originally described as heraclii by Cowen in Gillette and Baker (1895), but this name was preoccupied by heraclei Kaltenbach 1843.

MANITOBA SPECIMENS EXAMINED. 22 apterae; 18 alatae.
Grand Beach, 9 July 1974.
Pinawa, 8 August 1974.
Sandilands Provincial Forest, 21 July 1972.
Winnipeg, 6 July 1967; 11 August 1971.

Aphis knowltoni Hottes and Frison

Figs. 203-216

Aphis knowltoni Hottes and Frison 1931, p. 199; Palmer 1952, p. 146; Robinson and Bradley 1965, p. 40; Robinson and Bradley 1968, p. 60.

Chaitophoroides middletoni (Thomas) (misidentification) [in Knowlton 1929, p. 34].

APTEROUS VIVIPAROUS FEMALE. Colour when alive: greenish blue. Colour when macerated: head, antennae (except base of antennal segment III pale), cornicles, cauda, anal and genital plates dark brown. Dark brown reticulated lateral sclerites on thorax and abdominal segments I - VII. Post-siphuncular sclerites and transverse dorsal band on abdominal segment VIII brown.

Morphology. Body length 1.90 - 2.80 (2.10 ± 0.268, n = 10) mm. Antennae six-segmented, imbricated 1.02 - 1.24 (1.151 ± 0.066, n = 10) mm long. Length of antennal segments (in mm): III, 0.22 - 0.34 (0.292 ± 0.037, n = 10); IV, 0.18 - 0.23 (0.191 ± 0.023, n = 10); V, 0.16 - 0.19 (0.177 ± 0.008, n = 10); VI, 0.12 - 0.14 (0.130 ± 0.007, n = 10) + 0.19 - 0.23 (0.212 ± 0.015, n = 10). Longest setae on antennal segment III 0.03 - 0.04 (0.028 ± 0.009, n = 10) mm. Secondary sensoria

4 -17 (9.4 ± 4.018, n = 20) irregular in size on antennal segment III; 2 - 12 (8.05 ± 2.58, n = 10) on IV; 1 - 7 (4.7 ± 2.08, n = 20) on V. Rostrum reaching to hind coxae; rostral IV + V 0.16 - 0.18 (0.168 ± 0.009, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.80 - 1.02 (0.908 ± 0.072, n = 10) mm; of hind tarsal II 0.11 - 0.13 (0.122 ± 0.006, n = 10) mm long. Cornicles tapering, imbricated, 0.18 - 0.21 (0.19 ± 0.011, n = 10) mm long. Cauda tapering 0.14 - 0.18 (0.154 ± 0.013, n = 10) mm long, with 11 - 18 (14.1 ± 2.025, n = 10) setae. Large lateral tubercles on prothorax and abdominal segments I and VII. Small lateral tubercles occasionally present on other segments. Setae on abdominal segment VIII dorsally 2 - 3 (2.3 ± 0.483, n = 10).

ALATE VIVIPAROUS FEMALE. Colour when alive: greenish blue to pale grey. Colour when macerated: head, antennae (except base of antennal segments III, IV and V pale), thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen pale with lateral, post-siphuncular sclerites and transverse dorsal band on abdominal segments VII and VIII dark brown.

Morphology. Body length 1.76 - 2.08 (1.862 ± 0.126, n = 5) mm. Antennae six-segmented, imbricated, 1.10 - 1.25 (1.17 ± 0.066, n = 5) mm long. Length of antennal segments (in mm): III, 0.31 - 0.38 (0.34 ± 0.029, n = 5): IV, 0.17 -

0.20 (0.180 ± 0.012, n = 5); V, 0.15 - 0.19 (0.166 ± 0.015, n = 5); VI, 0.11 - 0.13 (0.12 ± 0.007, n = 5) + 0.21 - 0.24 (0.224 ± 0.011, n = 5). Longest setae on antennal segment III 0.02 - 0.02 mm. Secondary sensoria 16 - 30 (23.6 ± 4.195, n = 10) irregular in size on antennal segment III; 8 - 11 (9.556 ± 0.882, n = 10) on IV; 1 - 8 (5.444 ± 2.506, n = 10) on V and rarely 1 on base of VI. Rostrum reaching to hind coxae; rostral IV + V 0.16 - 0.17 (0.166 ± 0.005, n = 5) mm long, with 2 accessory setae. Length of hind tibiae 0.83 - 1.0 (0.89 ± 0.068, n = 5) mm; of hind tarsal II 0.12 - 0.12 mm. Cornicles cylindrical, imbricated 0.12 - 0.17 (0.148 ± 0.022, n = 5) mm long. Cauda tapering, 0.13 - 0.15 (0.138 ± 0.008, n = 5) mm long, with 13 - 15 (13.6 ± 0.894, n = 5) setae. Large lateral tubercles prominent on prothorax and abdominal segments I and VII. Small lateral tubercles present on other segments. Setae on abdominal segment VIII dorsally 2.

OVIPARA. (One specimen) Colour when alive: not observed. Colour when macerated much the same as for apterous viviparous female except hind tibiae slightly swollen, without pseudosensoria. Body length 1.70 mm. Antennae six-segmented, imbricated, 1.03 mm long. Length of antennal segments (in mm): III, 0.29; IV, 0.14; V, 0.14; VI, 0.12 + 0.20. Longest setae on antennal segment III 0.30 mm. Rostral IV + V 0.17 mm long, with 2 accessory setae. Length

of hind tibiae 0.76 mm; of hind tarsal II 0.12 mm. Cornicles slightly tapering, imbricated, 0.14 mm long. Cauda bluntly tapering 0.13 mm long, with 18 setae. Setae on abdominal segment VIII dorsally 6.

TYPES. According to Hottes and Frison (1931) cotypes are in Illinois Natural History Survey Collection.

HOST PLANTS. Taraxacum officinale

COMMENTS. As far as could be ascertained, eggs overwinter on root crowns of such plants as Taraxacum officinale (dandelion), and all other forms live on the root crowns during the summer.

MANITOBA SPECIMENS EXAMINED. 50 apterae; 5 alatae and 1 ovipara.
Grand Beach, 9 July 1974.
Winnipeg, 25 July 1963; 25 August 1963; 22 August 1964; 10 June 1965; 16 June 1965; 30 June 1967.

Aphis maculatae Oestlund

Figs. 217-236

Aphis maculatae Oestlund 1887, p. 61; Hottes and Frison 1931, p. 201; Gillette and Palmer 1932, p. 412; Palmer 1952, p. 150; MacGillivray 1952, p. 74; Archibald 1958, p. 51; Robinson and Bradley 1965, p. 40; Quednau 1966, p. 416; Robinson and Bradley 1968, p. 60; Robinson and Chen 1969, p. 522.

Aphis davisi Patch 1917, p. 418.

Chaitophoroides populifoliae (Fitch): Knowlton 1929, p. 36.

FUNDATRIX. (One specimen). Colour when alive: dark brown to black with white patches of powder on lateral areas. Colour when macerated: head, antennae (except antennal segment III + IV pale), thoracic lateral sclerites, cornicles, cauda, anal and genital plates dark brown. Abdomen pale, with post-siphuncular sclerites and transverse dorsal band on abdominal segments VII - VIII brown.

Morphology. Body length 2.24 mm. Antennae five-segmented, imbricated, 1.04 mm. Length of antennal segments (in mm): III + IV, 0.48; V, 0.16; VI, 0.11 + 0.15. Longest

setae on antennal segment III + IV 0.02 mm. Rostrum reaching to middle coxae; rostral IV + V 0.13 mm long with 2 accessory setae. Length of hind tibiae 1.14 mm; of hind tarsal II 0.14 mm. Cornicles tapering, imbricated, 0.39 mm long. Cauda fingertip-shaped 0.22 mm long, with 15 setae. Prominent lateral tubercles on prothorax and abdominal segments I and VII, and other segments. Setae on abdominal segment VIII dorsally 6.

APTEROUS VIVIPAROUS FEMALE. Colour when alive: brownish black with white powder on body. Colour when macerated: head, antennae (except antennal segment III and base of IV pale), lateral sclerites of thorax, cornicles, cauda, anal and genital plates dark brown to black. Abdomen light brown with post- siphuncular sclerites and transverse dorsal band on abdominal segments VII and VIII brown.

Morphology. Body length 2.42 - 2.94 (2.75 ± 0.163, n = 10) mm. Antennae six-segmented, imbricated, 1.86 - 2.20 (2.067 ± 0.109, n = 10) mm long. Length of antennal segments (in mm): III, 0.60 - 0.76 (0.663 ± 0.050, n = 10); IV, 0.22 - 0.40 (0.339 ± 0.052, n = 10); V, 0.22 - 0.35 (0.289 ± 0.044, n = 10); VI, 0.12 - 0.16 (0.15 ± 0.016, n = 10) + 0.41 - 0.52 (0.449 ± 0.033, n = 10). Longest setae on antennal segment III 0.03 - 0.04 (0.039 ± 0.006, n = 10) mm. Secondary sensoria irregular in size and arranged in double

rows 15 - 24 (17.8 ± 2.966, n = 20) on antennal segment III; occasionally 1 on IV. Rostrum reaching between middle and hind coxae; rostral IV + V 0.16 - 0.16 mm long, with 2 accessory setae. Length of hind tibiae 1.58 - 1.86 (1.71 ± 0.133, n = 10) mm; of hind tarsal II 0.14 - 0.16 (0.149 ± 0.012, n = 10) mm. Cornicles tapering, imbricated, 0.66 - 0.74 (0.70 ± 0.032, n = 10) mm long. Cauda fingertip-shaped 0.22 -0.36 (0.305 ± 0.054, n = 10) mm long, with 20 - 28 (23.1 ± 2.644, n = 10) setae. Prominent lateral tubercles on prothorax and abdominal segments I and VII. Small lateral tubercles usually present on other segments. Setae on abdominal segment VIII dorsally 6 - 7 (6.2 ± 0.422, n = 10).

ALATE VIVIPAROUS FEMALE. Colour when alive: dark brown to black with conspicuous patches of white powder on the body. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown to black. Abdomen light brown with lateral, post-siphuncular sclerites and transverse dorsal band on abdominal segments VII and VIII dark brown.

Morphology. Body length 2.14 - 2.76 (2.605 ± 0.236, n = 10) mm. Antennae six-segmented, imbricated, 1.66 - 1.86 (1.812 ± 0.141, n = 10) mm long. Length of antennal segments (in mm): III, 0.44 - 0.64 (0.548 ± 0.063, n = 10): IV, 0.22 - 0.32 (0.273 ± 0.033, n = 10); V, 0.24 - 0.30 (0.257 ± 0.02,

n = 10); VI, 0.13 - 0.16 (0.14 ± 0.009, n = 10) + 0.36 - 0.53 (0.404 ± 0.104, n = 10). Longest setae on antennal segment III 0.030 - 0.050 (0.036 ± 0.009, n = 10) mm. Secondary sensoria 10 - 24 (19.75 ± 3.338, n = 10) irregular in size arranged in double rows on antennal segment III; 0 - 3 (0.55 ± 0.99, n = 20) on IV. Rostrum reaching to middle coxae; rostral IV + V 0.14 - 0.16 (0.158 ± 0.006, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 1.40 - 1.70 (1.581 ± 0.098, n = 10) mm; of hind tarsal II 0.12 - 0.14 (0.138 ± 0.006, n = 10) mm. Cornicles cylindrical, imbricated, 0.36 - 0.59 (0.524 ± 0.089, n = 10) mm long. Cauda fingertip-shaped 0.19 - 0.38 (0.285 ± 0.061, n = 10) mm long, with 17 - 24 (20.5 ± 1.958, n = 10) setae. Prominent lateral tubercles on prothorax and abdominal segments I and VII and often on other abdominal segments. Setae on abdominal segment VIII dorsally 4 - 7 (5.8 ± 0.789, n = 10).

OVIPARA. Colour when alive: not observed. Colour when macerated much the same as for apterous viviparous females, except the hind tibiae swollen with numerous pseudosensoria over the whole length. Body length 2.04 - 2.28 (2.14 ± 0.125, n = 3) mm. Antennae six-segmented, imbricated 1.00 - 1.08 (1.04 ± 0.04, n = 3) mm long. Length of antennal segments (in mm): III, 0.30 - 0.34 (0.32 ± 0.02, n = 3); IV, 0.14 - 0.14; V, 0.12 - 0.16 (0.14 ± 0.02, n = 3); VI, 0.08 - 0.08 + 0.22 - 0.22. Longest setae on antennal segment III 0.07 - 0.07 mm. Rostral IV + V 0.13 - 0.15 (0.137 ± 0.012,

n = 3) mm long, with 2 accessory setae. Length of hind tibiae 0.90 - 0.95 (0.947± 0.023, n = 3) mm; of hind tarsal II 0.10 - 0.12 (0.11 ± 0.01, n = 3) mm. Cornicles tapering, imbricated 0.22 - 0.25 (0.233 ± 0.015, n = 3) mm long. Cauda tapering 0.16 - 0.18 (0.167 ± 0.012, n = 3) mm long, with 17 - 21 (19.33 ± 2.082, n = 3) setae. Setae on abdominal segment VIII dorsally 6.

ALATE MALE. Colour when alive: not observed. Colour when macerated much the same as for alate viviparous female. Body length 1.82 - 2.19 (2.039 ± 0.116, n = 10) mm. Antennae six-segmented, imbricated, 1.54 - 1.86 (1.698 ± 0.11, n = 10) mm long. Length of antennal segments (in mm): III, 0.32 - 0.54 (0.46 ± 0.081, n = 10); IV, 0.23 - 0.34 (0.298 ± 0.031, n = 10); V, 0.20 - 0.26 (0.238 ± 0.019, n = 10); VI, 0.11 - 0.12 (0.119 ± 0.003, n = 10) + 0.39 - 0.44 (0.409 ± 0.017, n = 10). Longest setae on antennal segment III 0.035 - 0.046 (0.039 ± 0.003, n = 10) mm. Secondary sensoria 32 - 45 (37.895 ± 4.319, n = 19) on antennal segment III; 6 - 25 (20.105 ± 4.228, n = 19) on IV; 2 - 14 (9.421 ± 2.65, n = 19) on V. Rostral IV + V 0.14 - 0.14 mm long, with 2 accessory setae. Length of hind tibiae 1.14 - 1.29 (1.217 ± 0.055, n = 10) mm; of hind tarsal II 0.12 - 0.13 (0.121 ± 0.003, n = 10) mm. Cornicles cylindrical, imbricated, 0.22 - 0.26 (0.24 ± 0.015, n = 10) mm long. Cauda tapering 0.14 - 0.17 (0.152 ± 0.010, n = 10) mm long, with 15 - 22 (18.0 ± 2.404,

n = 10) setae. Setae on abdominal segment VIII dorsally 6 - 7 (6.1 ± 0.316, n = 10).

TYPES. According to Palmer (1952) cotypes are in University of Minnesota Collection.

HOST PLANTS. Cornus stolonifera; Populus spp.; Populus tremuloides.

COMMENTS. This is a well-known North American species. In Manitoba it overwinters on Cornus stolonifera Michx.; and in summer it is found on terminal twigs and leaves of Populus tremuloides Michx. and Populus balsamifera L. This species differs from other Aphis spp. by its host association with poplars, by its unusually long cornicles and cauda, and numerous secondary sensoria on third antennal segments of apterous viviparous females.

MANITOBA SPECIMENS EXAMINED. 1 fundatrix; 108 apterae; 40 alatae; 3 oviparae; 12 males.
Beaver Creek, 7 August 1963.
Caddy Lake, 20 July 1963.
Carberry, 7 August 1964.
Duck Mountain Provincial Park, 19 July 1973.
Julius, 30 July 1974.
Whitemouth Lake, 19 August 1974
Winnipeg, 5 July 1963; 24 July 1966; 11 October 1963; 25 September 1963; 16 August 1966; 26 June 1973; 30 August 1973.

Aphis manitobensis Robinson and Rojanavongse new species

Figs. 237-250

APTEROUS VIVIPAROUS FEMALE. Colour when alive: pale green. Colour when macerated: mostly pale except light brown on cauda, anal and genital plates.

Morphology. Body length 1.62 - 2.20 (1.911 ± 0.20, n = 15) mm. Antennae six-segmented, imbricated, 0.81 - 1.14 (0.987 ± 0.106, n = 15) mm long. Length of antennal segments (in mm): III, 0.18 - 0.28 (0.230 ± 0.034, n = 15); IV, 0.11 - 0.20 (0.156 ± 0.030, n = 15); V, 0.13 - 0.19 (0.156 ± 0.019, n = 15); VI, 0.09 - 0.13 (0.106 ± 0.012, n = 15) + 0.19 - 0.25 (0.22 ± 0.016, n = 15). Longest setae on antennal segment III 0.036 - 0.056 (0.045 ± 0.005, n = 15) mm. Rostrum reaching between middle and hind coxae; rostral IV + V 0.13 - 0.14 (0.138 ± 0.004, n = 15) mm long, with 4 - 5 (4.20 ± 0.414, n = 15) accessory setae. Length of hind tibiae 0.64 - 0.87 (0.781 ± 0.077, n = 15) mm; of hind tarsal II 0.09 - 0.10 (0.093 ± 0.004, n = 15) mm. Cornicles cylindrical, imbricated, 0.13 - 0.23 (0.186 ± 0.031, n = 15) mm long. Cauda tapering, 0.16 - 0.24 (0.207 ± 0.025, n = 15) mm long, with 11 - 16 (13.933 ± 1.486, n = 15) setae. Prominent lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 5 (2.867

± 0.990, n = 15).

ALATE VIVIPAROUS FEMALE. Colour when alive: yellowish green to pale green. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen pale with dark brown lateral and postsiphuncular sclerites.

Morphology. Body length 1.32 - 2.16 (1.746 ± 0.185, n = 15) mm. Antennae six-segmented, imbricated, 0.75 - 1.22 (1.057 ± 0.111, n = 15) mm long. Length of antennal segments (in mm): III, 0.18 - 0.30 (0.257 ± 0.032, n = 15); IV, 0.10 - 0.20 (0.166 ± 0. 024, n = 15); V, 0.11 - 0.20 (0.16 ± 0.022, n = 15); VI, 0.09 - 0.13 (0.115 ± 0.01, n = 15)+ 0.17 - 0.27 (0.235 ± 0.029, n = 15). Longest setae on antennal segment III 0.030- 0.050 (0.041 ± 0.006, n = 15) mm. Secondary sensoria 5 - 11 (8.467 ± 1.871, n = 30) in a single row on antennal segment III; 1 - 6 (3.9 ± 1.241, n = 30) on IV; 0 - 3 (1.6 ± 0.77, n = 30) on V. Rostrum reaching to middle coxae; rostral IV + V 0.10 - 0.14 (0.135 ± 0.012, n =15) mm long, with 4 accessory setae. Length of hind tibiae 0.58 - 0.95 (0.748 ± 0.20, n = 15) mm; of hind tarsal II 0.08 - 0.10 (0.093 ± 0.007, n = 30) mm. Cornicles cylindrical, imbricated, 0.09 - 0.18 (0.138 ± 0.023, n = 15) mm long. Cauda tapering, 0.12 - 0.22 (0.163 ± 0.026, n = 15) mm long, with 9 - 17 (13.8 ± 2.426, n = 15) setae. Prominent lateral tubercles on prothorax

and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 4 (2.533 ± 0.743, n = 15).

OVIPARA. Colour when alive: pale green. Colour when macerated much the same as for apterous viviparous female, except hind tibiae swollen with few pseudosensoria mostly on the swollen portion. Body length 1.36 - 1.52 (1.446 ± 0.054, n = 10) mm. Antennae six-segmented, imbricated, 0.65 - 0.72 (0.68 ± 0.025, n = 10) mm long. Length of antennal segments (in mm): III, 0.11 - 0.14 (0.127 ± 0.010, n = 10); IV, 0.09 - 0.11 (0.097 ± 0.007, n = 10); V, 0.08 - 0.11 (0.098 ± 0.009, n = 10); VI, 0.08 - 0.10 (0.088 ± 0.006, n = 10) + 0.16 - 0.18 (0.170 ± 0.007, n = 10). Longest setae on antennal segment III 0.018 - 0.030 (0.027 ± 0.005, n = 10) mm. Rostral IV + V 0.12 - 0.13 (0.124 ± 0.005, n = 10) mm long, with 4 - 5 (4.20 ± 0.422, n = 10) accessory setae. Length of hind tibiae 0.51 - 0.55 (0.531 ± 0.016, n = 10) mm; of hind tarsal II 0.07 - 0.09 (0.08 ± 0.005, n = 10) mm. Cornicles cylindrical, imbricated, 0.09 - 0.12 (0.106 ± 0.010, n = 10) mm long. Cauda tapering 0.15 - 0.18 (0.167 ± 0.008, n = 10) mm long, with 18 - 22 (18.6 ± 1.838, n = 10) setae. Setae on abdominal segment VIII dorsally 5 - 8 (6.4 ± 1.075, n = 10).

TYPES. Holotype, alate viviparous female, right specimen of two on one slide, Winnipeg, Manitoba, 28 June 1974. (Valuli Rojanavongse), on Ribes sp. (currant), No. 13918

in Canadian National Collection, Ottawa. Paratypes: about 30 slides of alate and apterous viviparous females, and oviparae, all collected in Manitoba on "Ribes sp." or "Ribes sp. (currants)".

HOST PLANTS. Ribes sp. (currants).

COMMENTS. Aphis manitobensis has apparently not been collected on gooseberry, and no alternate summer host is known. The species differs from varians by the characters shown in the key.

MANITOBA SPECIMENS EXAMINED. 148 apterae; 83 alatae; 18 oviparae.

Birds Hill Park, 15 July 1971.

Camp Morton, 10 August 1971.

Grand Beach, 28 August 1973; 9 July 1974.

Portage la Prairie, 25 June 1974

St. Ambroise Beach, 13 August 1974.

Winnipeg, 6 June 1973; 7 June 1973; 13 June 1973; 30 August 1973; 18 June 1974; 28 June 1974; 17 July 1974.

Aphis masoni Richards

Figs. 251-256

Aphis masoni Richards 1963, p. 454.

APTEROUS VIVIPAROUS FEMALE. Colour when alive: reddish brown. Colour when macerated: head, antennae, cornicles, cauda, anal and genital plates dark brown. Abdomen pale with transverse dorsal band on abdominal segments VII and VIII dark brown.

Morphology. Body length 2.01 - 2.53 (2.243 ± 0.187, n = 9) mm. Antennae six-segmented, imbricated, 1.03 - 1.35 (1.222 ± 0.133, n = 9) mm long. Length of antennal segments (in mm): III, 0.28 - 0.36 (0.327 ± 0.033, n = 9); IV, 0.13 - 0.24 (0.207 ± 0.035, n = 9); V, 0.17 - 0.23 (0.202 ± 0.022, n = 9); VI, 0.11 - 0.14 (0.123 ± 0.014, n = 9) + 0.21 - 0.25 (0.23 ± 0.014, n = 9). Longest setae on antennal segment III 0.021 - 0.030 (0.024 ± 0.003, n = 9) mm. Rostrum reaching to middle coxae; rostral IV + V 0.12 - 0.13 (0.127 ± 0.005, n = 9) mm long, with 2 accessory setae. Length of hind tibiae 0.86 - 1.10 (0.960 ± 0.076, n = 9) mm; of hind tarsal II 0.11 - 0.14 (0.127 ± 0.009, n = 9) mm. Cornicles tapering, imbricated, 0.14 - 0.19 (0.162 ± 0.018, n = 9) mm long. Cauda tapering, 0.21 - 0.27 (0.241 ± 0.020, n = 9) mm long, with 10 - 14 (11.667 ±

1.414, n = 10) setae. Lateral tubercles present on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 4 (2.444 ± 0.726, n = 10).

TYPES. According to Richards (1963) holotype is in Canadian National Collection.

HOST PLANTS. Oxytropis campestris.

COMMENTS. One specimen from Churchill was submitted to W.R. Richards, who stated (in litt.) "Specimen within range of variation of masoni except that it is a little larger and antennae and legs are noticeably paler."

MANITOBA SPECIMENS EXAMINED. 9 apterae.
Fort Churchill, 16 July, 1974.

Aphis nasturtii Kaltenbach

Figs. 257-269

Aphis nasturtii Kaltenbach 1843, p. 76; Theobald 1927, p. 139; Palmer 1936, p. 738 and 1952, p. 154; Hille Ris Lambers and MacGillivray 1959, p. 321; Kloet and Hincks 1964, p. 72; Robinson and Bradley 1965, p. 40 and 1968, p. 61.

Aphis transiens Walker 1849 (in Doncaster 1961, p. 135); Kloet and Hincks 1964, p. 72.

Aphis rhamni Koch 1854, nec Boyer de Fonscolombe 1841 (in Kloet and Hincks 1964, p. 72).

Aphis acetosae Koch 1865, nec Linnaeus 1767 (in Kloet and Hincks 1964, p. 72).

Aphis pedicularis Buckton 1879 (in Kloet and Hincks 1964, p. 72); Doncaster 1973, p. 74.

Aphis polygoni van der Goot 1912 nec Walker 1848 (in Kloet and Hincks 1964, p. 72).

Aphis abbreviata Patch 1912, p. 170 and 1924, p. 42; Kloet and Hincks 1964, p. 72.

Aphis acetosella Thoebald 1918 (in Kloet and Hincks 1964,

p. 72).

Aphis solanina Theobald 1919, nec Passerini 1863 (in Kloet and Hincks 1964, p. 72).

Aphis githaginella Theobald 1927 (in Kloet and Hincks 1964, p. 73).

Aphis neopolygonii Theobald 1927 (in Kloet and Hincks 1964, p. 73).

APTEROUS VIVIPAROUS FEMALE. Colour when alive: pale to yellowish green. Colour when macerated: mostly pale except on antennal segments V and VI, tips of cornicles, cauda, anal and genital plates light brown.

Morphology. Body length 1.35-2.11 (1.755 ± 0.224, n = 15) mm. Antennae normally six-segmented but often five-segmented, imbricated, 0.77 - 1.22 (1.045 ± 0.143, n = 15) mm long. Length of antennal segments (in mm): III, 0.18 - 0.33 (0.263 ± 0.051, n = 15); IV, 0.11 - 0.23 (0.183 ± 0.042, n = 15); V, 0.08 - 0.19 (0.151 ± 0.030, n = 15), VI, 0.09 - 0.12 (0.103 ± 0.012, n = 15) + 0.20 - 0.28 (0.237 ± 0.022, n = 15). Longest setae on antennal segment III 0.010 - 0.020 (0.014 ± 0.004, n = 15) mm. Rostrum reaching between middle and hind coxae; rostral IV + V 0.09 - 0.12 (0.105 ±

0.011, n = 15) mm long, with 2 - 3 (2.067 ± 0.258, n = 15) accessory setae. Length of hind tibiae 0.58 - 0.89 (0.779 ± 0.103, n = 15) mm; of hind tarsal II 0.08 - 0.10 (0.091 ± 0.004, n = 15) mm. Cornicles tapering, imbricated, 0.15 - 0.30 (0.246 ± 0.056, n = 15) mm long. Cauda fingertip-shaped 0.15 - 0.22 (0.189 ± 0.023, n = 15) with 6 - 13 (7.467 ± 2.134, n = 15) setae. Lateral tubercles prominent on prothorax and abdominal segments I and VII, occasionally on other segments. Setae on abdominal segment VIII dorsally 2.

ALATE VIVIPAROUS FEMALE. Colour when alive: green. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen pale, with lateral, post-siphuncular sclerites and transverse dorsal band on abdominal segment VIII brown.

Morphology. Body length 1.23 - 1.94 (1.565 ± 0.192, n = 15) mm. Antennae six-segmented, imbricated, 0.81 - 1.15 (1.021 ± 0.088, n = 15) mm long. Length of antennal segments (in mm): III, 0.20 - 0.30 (0.258 ± 0.036, n = 15); IV, 0.13 - 0.22 (0.170 ± 0.027, n = 15); V, 0.11 - 0.16 (0.143 ± 0.016, n = 15); VI, 0.08 - 0.12 (0.100 ± 0.010, n = 15) + 0.20 - 0.25 (0.232 ± 0.017, n = 15). Longest setae on antennal segment III 0.010 - 0.020 (0.016 ± 0.003, n = 15) mm. Secondary sensoria 8 - 16 (10.533 ± 1.833, n = 30) on antennal segment III; 2 - 16 (3.767 ±

1.278, n = 30) on IV; 0 - 3 (1.067 ± 0.740, n = 30) on V. Rostrum reaching to middle coxae; rostral IV + V 0.09 - 0.10 (0.933 ± 0.005, n = 15) mm long, with 2 accessory setae. Cornicles slightly tapering, imbricated, 0.14 - 0.21 (0.171 ± 0.025, n = 15) mm long. Cauda fingertip-shaped 0.12 - 0.16 (0.146 ± 0.013, n = 15) mm long, with 5 - 10 (6.867 ± 1.457, n = 15) setae. Lateral tubercles prominent on prothorax and abdominal segments I and VII and occasionally on other segments. Setae on abdominal segment VIII dorsally 2.

ALATE MALE. (One specimen) Colour when alive: not observed. Colour when macerated much the same as for alate viviparous female. Body length 1.76 mm. Antennae six-segmented, imbricated, 1.26 mm long. Length of antennal segments (in mm): III, 0.31; IV, 0.25; V, 0.19; VI, 0.11 + 0.29. Secondary sensoria 25 - 30 on antennal segment III; 23 - 25 on IV; 10 - 11 on V and 0 - 1 on VI. Longest setae on antennal segment III 0.010 mm. Rostral IV + V 0.09 mm long, with 2 accessory setae. Length of hind tibiae 0.79 mm; of hind tarsal II 0.08 mm. Cornicles cylindrical, imbricated, 0.13 mm long. Cauda tapering, 0.10 mm, with 4 setae. Setae on abdominal segment VIII dorsally 2.

TYPES. Location not known.

HOST PLANTS. Alisma sp.; Bidens sp.; Polygonum sp.; Polygonum aviculare; Rhamnus alnifolia; Rhamnus cathartica; Rorippa sp.; Rumex sp.; Sagittaria sp.

COMMENTS. Aphis nasturtii overwinters in Manitoba on Rhamnus spp. (Buckthorn) and migrates to several summer hosts. In some areas of North America it is regarded as an economic pest, especially on potatoes. It has been incriminated as a vector of 12 virus diseases of plants (Kennedy et al 1962).

MANITOBA SPECIMENS EXAMINED. 120 apterae; 77 alatae; and 1 male.

Birds Hill Park, 22 August, 1974.

Pine Grove Halt, 19 August, 1974.

Winnipeg, 30 August 1962; 31 July 1962; 24 June 1963; 17 June 1965; 29 August 1966; 11 July 1967; 29 June 1971; 22 July 1971; 6 June 1973; 6 August 1973; 30 August 1973.

Aphis neogillettei Palmer

Figs. 270-289

Aphis neogillettei Palmer 1938, p. 352 and 1952, p. 155; Archibald 1958, p. 51; Robinson and Bradley 1965, p. 40 and 1968, p. 61; Robinson and Chen 1969, p. 524.

Aphis cornifoliae Fitch (in Gillette and Palmer 1932, p. 394).

FUNDATRIX. Colour when alive: dark olive green. Colour when macerated: head, antennae (except antennal segments III and IV pale), cornicles, cauda, anal and genital plates dark brown. Abdomen pale with post-siphuncular sclerites and dorsal bars on abdominal segments VII and VIII brown.

Morphology. Body length 1.63 - 2.00 (1.810 ± 0.110, n = 10) mm. Antennae five-segmented, imbricated, 0.67 - 0.85 (0.760 ± 0.054, n = 10) mm long. Length of antennal segments (in mm): III + IV, 0.21 - 0.33 (0.287 ± 0.041, n = 10); V, 0.11 - 0.16 (0.133 ± 0.017, n = 10); VI, 0.10 - 0.14 (0.118 ± 0.012, n = 10) + 0.09 - 0.12 (0.103 ± 0.012, n = 10). Longest setae on antennal segment III + IV 0.045 - 0.066 (0.053 ± 0.008, n = 10) mm. Rostrum reaching to

middle coxae; rostral IV + V 0.09 - 0.11 (0.103 ± 0.007, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.58 - 0.76 (0.679 ± 0.059, n = 10) mm; of hind tarsal II 0.09 - 0.11 (0.103 ± 0.007, n = 10) mm. Cornicles tapering, imbricated, 0.19 - 0.24 (0.206 ± 0.014, n = 10) mm long. Cauda cylindrical, 0.14 - 0.26 (0.164 ± 0.038, n = 10) mm long, with 4 - 8 (6.60 ± 1.430, n = 10) setae. Prominent lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 3 - 5 (4.2 ± 0.789, n = 10).

APTEROUS VIVIPAROUS FEMALE. Colour when alive: dark olive green. Colour when macerated: head, antennae (except antennal segments III and IV pale), cornicles, cauda, anal and genital plates dark brown. Abdomen pale with small post-siphuncular sclerites and dorsal bars on abdominal segments VII and VIII brown.

Morphology. Body length 1.20 - 1.90 (1.55 ± 0.259, n = 10) mm. Antennae normally six-segmented but often five-segmented, imbricated, 0.78 - 1.22 (1.046 ± 0.160, n = 10) mm long. Length of antennal segments (in mm): III, 0.24 - 0.34 (0.312 ± 0.040, n = 10); IV, 0.15 - 0.21 (0.189 ± 0.021, n = 10); V, 0.12 - 0.19 (0.161 ± 0.025, n = 10); VI, 0.11 - 0.15 (0.135 ± 0.011, n = 10) + 0.16 - 0.22 (0.194 ± 0.021, n = 10). Longest setae on antennal segment III 0.045 - 0.066 (0.057 ± 0.007, n = 10) mm. Rostrum reaching to hind

coxae; rostral IV + V 0.10 - 0.12 (0.109 ± 0.009, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.50 - 0.88 (0.72 ± 0.138, n = 10) mm; of hind tarsal II 0.08 - 0.13 (0.092 ± 0.038, n = 10) mm long. Cornicles tapering, imbricated, slightly curved outward, 0.14 - 0.30 (0.23 ± 0.056, n = 10) mm long. Cauda tapering, 0.12 - 0.19 (0.155 ± 0.025, n = 10) mm long, with 6 - 9 (7.6 ± 0.699, n = 10) setae. Large lateral tubercles on prothorax and abdominal segments I and VII; occasionally present on other segments. Setae on abdominal segment VIII dorsally 4 - 5 (4.2 ± 0.422, n = 10).

ALATE VIVIPAROUS FEMALE. Colour when alive: dark olive green. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen pale with large post-siphuncular sclerites and transverse dorsal bar on abdominal segments VII and VIII brown.

Morphology. Body length 1.56 - 1.85 (1.730 ± 0.079, n = 10) mm. Antennae six-segmented, imbricated, 1.03 - 1.30 (1.159 ± 0.078, n = 10) mm long. Length of antennal segments (in mm): III, 0.29 - 0.36 (0.318 ± 0.026, n = 10); IV, 0.16 - 0.22 (0.195 ± 0.021, n = 10); V, 0.15 - 0.19 (0.168 ± 0.014, n = 10); VI, 0.12 - 0.16 (0.137 ± 0.012, n = 10) + 0.17 - 0.26 (0.216 ± 0.023, n = 10). Longest setae on antennal segment III 0.035 - 0.051 (0.043 ± 0.006, n = 10) mm. Secondary sensoria 11 - 19 (14.9 ± 2.59, n =

20) on antennal segment III. Rostrum reaching between middle and hind coxae; rostral IV + V 0.09 - 0.12 (0.10 ± 0.009, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.78 - 0.96 (0.85 ± 0.056, n = 10) mm; of hind tarsal II 0.10 - 0.12 (0.110 ± 0.005, n = 10) mm. Cornicles tapering, imbricated, 0.16 - 0.25 (0.22 ± 0.026, n = 10) mm long. Cauda tapering 0.12 - 0.16 (0.141 ± 0.011, n = 10) mm long, with 9 - 12 (10.1 ± 0.99, n = 10) setae. Lateral tubercles present on prothorax and abdominal segments I and VII, occasionally on other segments. Setae on abdominal segment VIII dorsally 4 - 5 (4.3 ± 0.483, n = 10).

OVIPARA. Colour when alive: not observed. Colour when macerated much the same as for apterous viviparous female except hind tibiae slightly swollen with very few pseudosensoria on distal half. Body length 1.32 - 1.56 (1.498 ± 0.078, n = 10) mm. Antennae five-segmented, imbricated, 0.77 - 0.92 (0.835 ± 0.051, n = 10) mm long. Length of antennal segments (in mm): III + IV, 0.28 - 0.37 (0.326 ± 0.031, n = 10); V, 0.12 - 0.14 (0.129 ± 0.007, n = 10); VI, 0.10 - 0.13 (0.107 ± 0.011, n = 10) + 0.15 - 0.18 (0.17 ± 0.009, n = 10). Longest setae on antennal segment III 0.045 - 0.066 (0.052 ± 0.007, n = 10) mm. Rostral IV + V 0.09 - 0.11 (0.100 ± 0.005, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.50 - 0.62 (0.572 ± 0.035, n = 10) mm; of hind tarsal II 0.09 - 0.10 (0.096 ± 0.005, n = 10) mm. Cornicles tapering, imbricated, 0.14 -

0.20 (0.175 ± 0.016, n = 10) mm long. Cauda bluntly tapering, 0.13 - 0.15 (0.143 ± 0.007, n = 10) mm long, with 9 - 12 (11.111 ± 1.453, n = 9) setae. Setae on abdominal segment VIII dorsally 3 - 6 (4.4 ± 0.966, n = 10).

APTEROUS MALE. Colour when alive: not observed. Colour when macerated the same as for alate viviparous female. Body length 1.16 - 1.28 (1.22 ± 0.05, n = 9) mm. Antennae six-segmented, imbricated, 0.88 - 0.96 (0.918 ± 0.036, n = 9)mm long. Length of antennal segments (in mm): III, 0.22 - 0.26 (0.241 ± 0.011, n = 9); IV, 0.12 - 0.17 (0.155 ± 0.022, n = 9); V, 0.14 - 0.16 (0.154 ± 0.005, n = 9); VI, 0.09 - 0.11 (0.102 ± 0.007, n = 9) + 0.14 - 0.17 (0.161 ± 0.009, n = 9). Longest setae on antennal segment III 0.041 - 0.060 (0.049 ± 0.006, n = 9) mm. Secondary sensoria 0 - 8 (2.56 ± 2.065, n = 16) on antennal segment III; 3 - 4 (3.375 ± 0.50, n = 16) on IV; 2 - 6 (3.867 ± 1.356, n = 15) on V and occasionally 1 on base of VI. Rostrum reaching to hind coxae; rostral IV + V 0.09 - 0.11 (0.100 ± 0.005, n = 9) mm long, with 2 accessory setae. Length of hind tibiae 0.54 - 0.58 (0.559 ± 0.016, n = 9) mm; of hind tarsal II 0.08 - 0.10 (0.092 ± 0.008, n = 9) mm. Cornicles cylindrical, imbricated 0.09 - 0.12 (0.10 ± 0.011, n = 9) mm long. Cauda bluntly tapering, 0.08 - 0.12 (0.110 ± 0.010, n = 9) mm long, with 7 - 10 (7.89 ± 1.36, n = 9) setae. Setae on abdominal segment VIII dorsally 3 - 6 (4.22 ± 1.09, n = 9).

TYPES. According to Palmer (1952) the type slide no. 52348 is in the USNM.

HOST PLANTS. Cornus stolonifera.

COMMENTS. Aphis neogillettei was discussed by Robinson and Chen (1969). It remains on Cornus spp., especially Cornus stolonifera, in Manitoba all summer, often curling terminal leaves very badly. The most useful character to separate neogillettei from corniella (which also occurs on Cornus) is that neogillettei has 4 - 6 setae on abdominal tergite VIII, whereas corniella has 6 - 12.

MANITOBA SPECIMENS EXAMINED. 40 fundatrices; 140 apterae; 34 alatae; 17 oviparae; 9 males.

Ox Bow Lake, 22 August 1973.

Portage la Prairie, 25 June 1974.

Winnipeg, 28 June 1963; 20 September 1963; 25 September 1963; 6 June 1967; 17 June 1971; 26 June 1973; 12 July 1973; 6 September 1973; 28 May 1973; 29 May 1973; 19 June 1974.

Aphis neomexicana (Cockerell)

Figs. 290-299

Myzus neomexicanus W.P. and T.D.A. Cockerell 1901, p. 227.

Aphis sanborni Patch 1914, p. 52. New name for Aphis n. sp. Sanborn 1904. New synonymy.

Aphis (Myzus) neomexicanus Davis 1919, p. 232.

Aphis neomexicanus Quaintance and Baker 1920, p. 33.

Aphis ribigillettei Knowlton and Allen (in Allen and Knowlton 1939, p. 128). New synonymy.

Aphis neomexicana (Cockerell) Gillette and Palmer 1932, p. 423 Palmer 1952, p. 156; Robinson and Bradley 1965, p. 40 and 1968, p. 61.

APTEROUS VIVIPAROUS FEMALE. Colour when alive: pale green to yellowish-green. Colour when macerated: mostly pale except tip of antennal segment VI, cauda, anal and genital plates light brown.

Morphology. Body length 1.57 - 2.10 (1.742 ± 0.211, n = 14) mm. Antennae six-segmented, imbricated, 0.86 - 1.21 (1.006 ± 0.129, n = 14) mm long. Length of antennal segments (in mm): III, 0.16 - 0.29(0.216 ± 0.035, n = 14); IV, 0.13 - 0.22 (0.166 ± 0.034, n = 14); V, 0.12 - 0.20 (0.155 ± 0.034, n = 14); VI, 0.09 - 0.14 (0.112 ± 0.016, n = 14) + 0.21 - 0.31 (0.256 ± 0.03, n = 14). Longest setae on antennal segment III 0.01 - 0.04 (0.021 ± 0.007, n = 14) mm. Rostrum reaching to middle coxae; rostral IV + V 0.12 - 0.14 (0.129 ± 0.007, n = 14) mm long, with 4 - 8 (5.643 ± 0.929, n = 14) accessory setae. Length of hind tibiae 0.69 - 0.92 (0.779 ± 0.10, n = 14) mm; of hind tarsal II 0.08 - 0.09 (0.086 ± 0.005, n = 14) mm. Cornicles tapering, imbricated, 0.16 - 0.28 (0.219 ± 0.046, n = 14) mm long. Cauda fingertip-shaped 0.18 - 0.24 (0.216 ± 0.019, n = 14) mm long, with 10 - 17 (13 ± 2.184, n = 14) setae. Prominent lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 3 (2.071 ± 0.267, n = 14).

ALATE VIVIPAROUS FEMALE. Colour when alive: green. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen pale with dark brown lateral and post-siphuncular sclerites.

Morphology. Body length 1.25 - 2.0 (1.588 ± 0.238, n = 12) mm. Antennae six-segmented, imbricated, 0.92 -

1.18 (1.09 ± 0.112, n = 12) mm long. Length of antennal segments (in mm): III, 0.19 - 0.31 (0.239 ± 0.046, n = 12); IV, 0.14 - 0.22 (0.173 ± 0.037, n = 12); V, 0.10 - 0.20 (0.159 ± 0.03, n = 12); VI, 0.09 - 0.13 (0.112 ± 0.015, n = 12) + 0.24 - 0.35 (0.303 ± 0.031, n = 12). Longest setae on antennal segment III 0.02 - 0.03 (0.023 ± 0.005, n = 12) mm. Secondary sensoria 5 - 13 (9.25 ± 2.633, n = 23) on antennal segment III; 2 - 7 (4.583 ± 2.065, n = 23) on IV; 0 - 3 (1.084 ± 1.083, n = 23) on V. Rostrum reaching to middle coxae; rostral IV + V 0.11 - 0.13 (0.118 ± 0.006, n = 12) mm long, with 4 - 7 (5.25 ± 0.566, n = 12) accessory setae. Length of hind tibiae 0.58 - 1.06 (0.806 ± 0.13, n = 12) mm; of hind tarsal II 0.08 - 0.10 (0.084 ± 0.007, n = 12) mm. Cornicles cylindrical, imbricated, 0.13 - 0.22 (0.167 ± 0.03, n = 12) mm long. Cauda fingertip-shaped 0.12 - 0.21 (0.166 ± 0.025, n = 12) mm long, with 10 - 15 (12.75 ± 1.545, n = 12) setae. Prominent lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 3 (2.167 ± 0.389, n = 12).

TYPES. According to Palmer (1952) cotypes are in the USNM.

HOST PLANTS. Ribes spp.

COMMENTS. Aphis neomexicana has been found in Manitoba on both wild and cultivated currants and gooseberries, includ-

ing the ornamentals Ribes alpinum and Ribes aureum. It is the most common species found on wild gooseberry.

Specimens were obtained on loan from G.F. Knowlton which were labelled as determined by M.A. Palmer, and others determined by Hille Ris Lambers were examined.

Sanborn (1904) described and figured a new species of Aphis from wild gooseberry, but did not give the species a name. Patch (1914) gave the name sanborni to this aphid and to specimens collected by her in Maine, apparently without seeing any of Sanborn's specimens. Several slides of Aphis sanborni Patch from the Patch Collection have been cleared and remounted, and no consistent taxonomic differences can be found between sanborni and neomexicana. Aphis ribigillettei was described in Knowlton and Allen (1939), mainly on the basis of having shorter cornicles than either sanborni or neomexicana. Paratypes of ribigillettei are mostly smaller aphids, with shorter cornicles. When large numbers of this neomexicana - ribigillettei - sanborni complex are examined, no consistent differences can be found. Host transfer experiments would likely be unproductive, because the live aphids tend to all be a similar green colour, and to thrive on most Ribes spp., usually but not necessarily curling the terminal leaves. It is my opinion that sanborni and ribigillette are synonyms of neomexicana.

MANITOBA SPECIMENS EXAMINED. 71 apterae; 71 alatae.

Caddy Lake, 25 June 1967.

Duck Mountain Provincial Park, 20 July 1973.

Grand Beach, 3 July 1973.

Holland, 23 July 1974, 25 June 1974.

Julius, 30 July 1974.

Pine Grove Halt, 11 June 1973; 10 June 1974.

Winnipeg, 7 July 1965,

Aphis neomonardae Rojanayongse and Robinson

new species

Figs. 300-309

APTEROUS VIVIPAROUS FEMALE. Colour when alive: brownish to bluish-green. Colour when macerated: head, antennae (except antennal segment III and base of IV pale), cornicles and genital plate light brown. Abdomen pale with cauda, anal plate and transverse dorsal bar on abdominal segment VIII dark brown.

Morphology. Body length 1.23 - 2.02 (1.607 ± 0.226, n = 15) mm. Antennae six-segmented, imbricated, 0.52 - 0.93 (0.684 ± 0.119, n = 15) mm long. Length of antennal segments (in mm); III, 0.09 - 0.24 (0.151 ± 0.042, n = 15); IV, 0.06 - 0.16 (0.103 ± 0.029, n = 15); V, 0.07 - 0.13 (0.093 ± 0.020, n = 15); VI, 0.08 - 0.11 (0.086 ± 0.010, n = 15) + 0.13 - 0.18 (0.151 ± 0.014, n = 15). Longest setae on antennal segment III 0.022 - 0.040 (0.030 ± 0.006, n = 15) mm. Rostrum reaching to middle coxae; rostral IV + V 0.08 - 0.11 (0.095 ± 0.007, n = 15) mm long, with 4 - 7 (5.467 ± 1.125, n = 15) accessory setae. Length of hind tibiae 0.44 - 0.72 (0.577 ± 0.079, n = 15) mm; of hind tarsal II 0.07 - 0.08 (0.077 ± 0.005, n = 15) mm. Cornicles slightly tapering, imbricated, 0.08 - 0.16

(0.117 ± 0.022, n = 15) mm long. Cauda tapering, 0.11 - 0.15 (0.133 ± 0.013, n = 15) mm long, with 6 - 11 (7.80 ± 1.521, n = 15) setae. Large lateral tubercles prominent on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 4 (2.733 ± 0.884, n = 15).

ALATE VIVIPAROUS FEMALE. Colour when alive: light green to bluish-green. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates brown to dark brown. Abdomen pale with lateral, post-siphuncular sclerites and transverse dorsal bars on abdominal segments VII and VIII brown.

Morphology. Body length 1.35 - 1.94 (1.703 ± 0.174, n = 15) mm. Antennae six-segmented, imbricated, 0.74 - 1.06 (0.915 ± 0.88, n = 15) mm long. Length of antennal segments (in mm): III, 0.17 - 0.30 (0.237 ± 0.036, n = 15); IV, 0.09 - 0.18 (0.150 ± 0.023, n = 15); V, 0.10 - 0.15 (0.134 ± 0.019, n = 15); VI, 0.09 - 0.11 (0.099 ± 0.009, n = 15) + 0.16 - 0.20 (0.183 ± 0.013, n = 15). Longest setae on antennal segments III 0.028 - 0.038 (0.031 ± 0.003, n = 15) mm. Secondary sensoria 6 - 14 (10.067 ± 2.083, n = 30) on antennal segment III; 2 - 6 (3.70 ± 1.055, n = 30) on IV, 0 - 3 (1.30 ± 0.794, n = 30) on V. Rostrum reaching to middle coxae; rostral IV + V 0.09 - 0.10 (0.092 ± 0.005, n = 15) mm long, with 5 - 6 (5.87 ± 0.35, n = 15) accessory

setae. Length of hind tibiae 0.60 - 0.85 (0.748 ± 0.070, n = 15) mm; of hind tarsal II 0.08 - 0.09 (0.081 ± 0.003, n = 15) mm. Cornicles cylindrical, imbricated, 0.08 - 0.14 (0.119 ± 0.018, n = 15) mm long. Cauda tapering 0.09 - 0.13 (0.118 ± 0.017, n = 15) mm long, with 7 - 11 (9.867 ± 1.51, n = 15) setae. Large lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 4 (2.40 ± 0.632, n = 15).

TYPES. Holotype will be deposited in the Canadian National Collection.

HOST PLANTS. Agastache foeniculum; Monarda fistulosa.

COMMENTS. We at first believed that all our collections of Aphis from Monarda fistulosa and Agastache foeniculum were Aphis monardae Oestlund 1887. However, there is no known type material of monardae in the USNM or in the British Museum (Natural History), and no specimens of monardae in Oestlund's collection at the University of Minnesota collected earlier than 1891. Slides of monardae were borrowed from Oestlund's collection, all identified by Oestlund as monardae, collected 1891 and 1896. These, and other slides marked monardae from the Oestlund collection, are all Aphis gossypii. There is therefore no way of knowing what species Oestlund had in front of him when he des-

cribed monardae in 1887, and in view of his later determinations, it was apparently gossypii. Aphis monardae Oestlund 1887 becomes a synonym of Aphis gossypii Glover 1877.

MANITOBA SPECIMENS EXAMINED. 123 apterae; 64 alatae.

Cooks Creek, 29 June 1974.

Patricia Beach, 3 July 1973.

Sandilands Provincial Forest, 20 June 1974; 12 July 1974.

Whitemouth Lake, 19 August 1974.

Aphis nivalis Hille Ris Lambers

Figs. 310-315

Aphis nivalis Hille Ris Lambers 1960, p. 14.

APTEROUS VIVIPAROUS FEMALE. (one specimen) Colour when alive: not observed. Colour when macerated: mostly pale except antennal segments V and VI, cornicles, cauda, anal and genital plates light brown.

Morphology. Body length 1.64 mm. Antennae six-segmented, imbricated, 0.81 mm long. Length of antennal segments (in mm): III, 0.18; IV, 0.13; V, 0.14; VI, 0.12 + 0.13. Longest setae on antennal segment III 0.014 mm. Rostrum reaching to middle coxae; rostral IV + V 0.09 mm long, with 2 accessory setae. Length of hind tibiae 0.63 mm; of hind tarsal II 0.09 mm. Cornicles slightly tapering, 0.13 mm long. Cauda tapering 0.15 mm long, with 8 setae. Very small lateral tubercles present on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2.

TYPES. The types are in Hille Ris Lambers collection.

HOST PLANTS. Epilobium angustifolium L.

COMMENTS. The slide of nivalis from Churchill was sent to Hille Ris Lambers who stated (in litt) that the specimen was indistinguishable from paratype material of nivalis in his collection.

MANITOBA SPECIMENS EXAMINED. One aptera.

Churchill, 15 July 1974.

Aphis oenotherae Oestlund

Figs. 316-325

Aphis oenotherae Oestlund 1887, p. 62; Gillette 1927, p. 344 and 346; Palmer 1952, p. 158; Robinson and Bradley 1965, p. 40, and 1968, p. 61; Hille Ris Lambers 1974, p. 121.

Aphis oenotherae var. rufa Gillette and Palmer 1932, p. 424.

APTEROUS VIVIPAROUS FEMALE. Colour when alive: pale green. Colour when macerated: mostly pale except at tips of antennal segments V and VI, cauda, anal and genital plates light brown.

Morphology. Body length 1.50 - 2.02 (1.796 ± 0.166, n = 10) mm. Antennae normally six-segmented but often five-segmented, 0.78 - 1.09 (0.931 ± 0.094, n = 10) mm long. Length of antennal segments (in mm): III, 0.15 - 0.29 (0.220 ± 0.043, n = 10); IV, 0.10 - 0.18 (0.146 ± 0.022, n = 10); V, 0.12 - 0.15 (0.135 ± 0.012, n = 10); VI, 0.09 - 0.11 (0.099 ± 0.009, n = 10) + 0.20 - 0.24 (0.218 ± 0.014, n = 10). Longest setae on antennal segment III 0.020 - 0.034 (0.030 ± 0.005, n = 10) mm. Rostrum reaching to hind coxae; rostral IV + V 0.13 - 0.17 (0.157 ± 0.012, n = 10) mm long, with 5 - 9 (6.200 ± 1.229, n = 10)

accessory setae. Length of hind tibiae 0.68 - 0.89 (0.792 ± 0.076, n = 10) mm; of hind tarsal II 0.08 - 0.09 (0.089 ± 0.006, n = 10) mm. Cornicles tapering, imbricated, 0.22 - 0.36 (0.295 ± 0.005, n = 10) mm long. Cauda tapering and rather constricted near base, 0.16 - 0.19 (0.178 ± 0.015, n = 10) mm long, with 10 - 18 (13.20 ± 2.044, n = 10) setae. Large lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 6 (3.5 ± 1.269, n = 10).

ALATE VIVIPAROUS FEMALE. Colour when alive: green. Colour when macerated: head, antennae (except base of antennal segment III pale), thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen pale with lateral and post-siphuncular sclerites, transverse dorsal band on abdominal segments VII and VIII dark brown.

Morphology. Body length 1.43 - 1.85 (1.672 ± 0.124, n = 10) mm. Antennae six-segmented, imbricated, 0.88 - 1.08 (0.972 ± 0.062, n = 10) mm long. Length of antennal segments (in mm): III, 0.21 - 0.26 (0.233 ± 0.016, n = 10); IV, 0.13 - 0.17 (0.155 ± 0.011, n = 10); V, 0.12 - 0.16 (0.144 ± 0.014, n = 10); VI, 0.09 - 0.12 (0.101 ± 0.010, n = 10) + 0.22 - 0.31 (0.234 ± 0.027, n = 10). Longest setae on antennal segment III 0.020 - 0.030 (0.027 ± 0.004, n = 10) mm. Secondary sensoria 7 - 16 (12.2 ± 2.375, n = 20)

on antennal segment III; 2 - 7 (4.80 ± 1.673, n = 20) on IV; 0 - 3 (0.850 ± 0.933, n = 20) on V. Rostrum reaching to hind coxae; rostral IV + V 0.13 - 0.15 (0.145 ± 0.007, n = 10) mm long, with 5 - 10 (6.60 ± 1.776, n = 10) accessory setae. Length of hind tibiae 0.76 - 0.88 (0.821 ± 0.059, n = 10) mm; of hind tarsal II 0.08 - 0.09 (0.085 ± 0.005, n = 10) mm. Cornicles very slightly tapering, imbricated, 0.17 - 0.24 (0.216 ± 0.024, n = 10) mm long. Cauda tapering, 0.12 - 0.17 (0.152 ± 0.016, n = 10) mm long, with 11 - 15 (12.30 ± 1.418, n = 10) setae. Large lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 1 - 2 (1.9 ± 0.316, n = 10).

TYPES. According to Palmer (1952) cotypes are in the University of Minnesota Collection.

HOST PLANTS. Epilobium angustifolium; Oenothera biennis; Oenothera parviflora.

COMMENTS. Aphis oenotherae is very similar to neomexicana, but I prefer to regard each of them as valid species. Kennedy et al (1962) list oenotherae as being a vector of 1 virus disease of plants.

MANITOBA SPECIMENS EXAMINED. 104 apterae; 58 alatae.

Grand Beach, 9 July 1974.

Julius, 30 July 1974.

Moose Lake, 9 July 1973.

Sandilands Provincial Forest, 16 August 1973.

Spruce Woods, 5 August 1971; 26 July 1973.

Aphis oestlundi Gillette

Figs. 326-342

Aphis oestlundi Gillette 1927, p. 345; Hottes and Frison 1931, p. 208; Gillette and Palmer 1932, p. 425; Palmer 1952, p. 159; Robinson and Bradley 1965, p. 40 and 1968, p. 61.

Aphis oenotherae Oestlund (misidentification), Oestlund 1922, p. 130.

APTEROUS VIVIPAROUS FEMALE. Colour when alive: pale green to light green. Colour when macerated: mostly pale except antennal segment VI, cornicles, cauda, anal and genital plates brown.

Morphology. Body length 1.40 - 1.85 (1.531 ± 0.218, n = 10) mm. Antennae normally six-segmented but often five-segmented, imbricated, 0.54 - 0.99 (0.846 ± 0.149, n = 10) mm long. Length of antennal segments (in mm): III, 0.17 - 0.24 (0.213 ± 0.028, n = 10); IV, 0.10 - 0.18 (0.141 ± 0.026, n = 10); V, 0.07 - 0.16 (0.123 ± 0.026, n = 10); VI, 0.06 - 0.10 (0.085 ± 0.013, n = 10) + 0.14 - 0.25 (0.208 ± 0.03, n = 10). Longest setae on antennal segment III 0.006 - 0.012 (0.008 ± 0.002, n = 10) mm. Rostrum reaching to hind coxae; rostral IV + V 0.12

- 0.15 (0.129 ± 0.011, n = 10) mm long. Length of hind tibiae 0.45 - 0.71 (0.599 ± 0.097, n = 10) mm; of hind tarsal II, 0.07 - 0.09 (0.081 ± 0.006, n = 10) mm. Cornicles tapering, imbricated, 0.18 - 0.35 (0.254 ± 0.051, n = 10) mm long. Cauda tapering, 0.11 - 0.16 (0.143 ± 0.017, n = 10) mm long, with 4 - 5 (4.3 ± 0.483, n = 10) setae. Lateral tubercles present on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2.

ALATE VIVIPAROUS FEMALE. Colour when alive: yellowish green to light green. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen pale with lateral and post-siphuncular sclerites dark brown.

Morphology. Body length 1.20 - 1.56 (1.401 ± 0.128, n = 10) mm. Antennae six-segmented, imbricated, 0.83 - 1.07 (0.974 ± 0.074, n = 10) mm long. Length of antennal segments (in mm): III, 0.20 - 0.27 (0.231 ± 0.021, n = 10); IV, 0.11 - 0.18 (0.15 ± 0.022, n = 10); V, 0.10 - 0.16 (0.137 ± 0.019, n = 10); VI, 0.08 - 0.12 (0.096 ± 0.014, n = 10) + 0.22 - 0.26 (0.214 ± 0.076, n = 10). Longest setae on antennal segment III 0.006 - 0.012 (0.009 ± 0.003, n = 10) mm. Secondary sensoria 3 - 6 (4.6 ± 0.94, n = 20) on antennal segment III; occasionally

1 on IV. Rostrum reaching to hind coxae; rostral IV + V 0.10 - 0.14 (0.12 ± 0.012, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.58 - 0.76 (0.661 ± 0.071, n = 10) mm; of hind tarsal II 0.06 - 0.09 (0.076 ± 0.008, n = 10) mm. Cornicles cylindrical, imbricated, 0.16 - 0.24 (0.193 ± 0.027, n = 10) mm long. Cauda tapering, 0.09 - 0.12 (0.107 ± 0.012, n = 10) mm long, with 4 - 6 (4.4 ± 0.699, n = 10) setae. Lateral tubercles prominent on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2.

OVIPARA. Colour when alive: deep green. Colour when macerated much the same as for apterous viviparous female except hind tibiae slightly swollen with few pseudo-sensoria. Body length 1.23 - 1.56 (1.407 ± 0.092, n = 10) mm. Antennae five-segmented, imbricated, 0.60 - 0.80 (0.707 ± 0.06, n = 10) mm long. Length of antennal segments (in mm): III + IV, 0.19 - 0.28 (0.229 ± 0.023, n = 10); V, 0.09 - 0.18 (0.112 ± 0.027, n = 10); VI, 0.08 + 0.09 (0.087 ± 0.005, n = 10) + 0.15 - 0.20 (0.182 ± 0.015, n = 10). Longest setae on antennal segment III 0.006 - 0.010 (0.01 - 0.001, n = 10) mm. Rostral IV + V 0.09 - 0.12 (0.102 ± 0.008, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.42 - 0.51 (0.462 ± 0.029, n = 10) mm; of hind tarsal II 0.06 - 0.08 (0.071 ± 0.007, n = 10) mm. Cornicles slightly tapering, imbricated, 0.13

- 0.18 (0.158 ± 0.018, n = 10) mm long. Cauda bluntly tapering, 0.11 - 0.13 (0.122 ± 0.006, n = 10) mm long, with 4 - 5 (4.3 ± 0.483, n = 10) setae. Setae on abdominal segment VIII dorsally 4 - 7 (5.7 ± 1.059, n = 10).

APTEROUS MALE. Colour when alive: yellowish green. Colour when macerated much the same as for alate viviparous female.

Morphology. Body length 0.97 - 1.15 (1.066 ± 0.065, n = 10) mm. Antennae six-segmented, imbricated, 0.65 - 0.82 (0.734 ± 0.049, n = 10) mm long. Length of antennal segments (in mm): III, 0.15 - 0.19 (0.167 ± 0.016, n = 10); IV, 0.11 - 0.16 (0.125 ± 0.014, n = 10); V, 0.09 - 0.13 (0.108 ± 0.011, n = 10); VI, 0.07 - 0.08 (0.078 ± 0.004, n = 10) + 0.15 - 0.18 (0.165 ± 0.011, n = 10). Longest setae on antennal segment III 0.006 - 0.012 (0.010 ± 0.01, n = 10) mm. Secondary sensoria 19 - 26 (22.3 ± 1.976, n = 20) on antennal segment III; 8 - 17 (12.05 ± 2.502, n = 20) on IV; 4 - 11 (7.05 ± 1.849, n = 20) on V. Rostrum reaching to hind coxae; rostral IV + V 0.09 - 0.10 (0.091 ± 0.003, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.45 - 0.51 (0.487 ± 0.025, n = 10) mm; of hind tarsal II 0.06 - 0.07 (0.061 ± 0.003, n = 10) mm. Cornicles tapering, imbricated, 0.09 - 0.12 (0.107 ± 0.013, n = 10) mm long. Cauda tapering,

slightly round at apex, 0.08 - 0.09 (0.088 ± 0.044, n = 10) mm long, with 4 - 5 (4.1 ± 0.316, n = 10) setae. Setae on abdominal segment VIII dorsally 2.

TYPES. Type slide reported by Palmer (1952) to be No. 41967 in the USNM.

HOST PLANTS. Oenothera spp.; Oenothera parviflora.

COMMENTS. This species apparently spends its entire life cycle on Oenothera spp., and presumably the eggs would be laid on the rosette crowns of first year plants of the biennial Oenothera spp. I obtained males and oviparae by rearing oestlundi in a growth cabinet. Kennedy et al (1962) list oestlundi as being a vector of 1 virus disease of plants.

MANITOBA SPECIMENS EXAMINED. 120 apterae; 86 alatae; 181 oviparae; 71 males.
Birds Hill Park, 14 June 1973.
Caddy Lake, 16 July 1973.
Grand Beach, 28 August 1973, 9 July 1974.
Julius, 30 July 1974.
Pinawa, 8 August 1974.
Sandilands Provincial Forest, 12 July 1973; 8 August 1974.
Whitemouth Lake, 19 August 1974.

Aphis pomi De Geer

Figs. 343-359

Aphis pomi De Geer 1773, p. 53; Gillette 1908, p. 303; Gillette and Taylor 1908, p. 23; Baker and Turner 1916, p. 955; Matheson 1919, p. 686; Patch 1923a, p. 45 and 1929, p. 698; Theobald 1927, p. 133; Hottes and Frison 1931, p. 210; Gillette and Palmer 1932a, p. 433; Palmer 1952, p. 164; MacGillivray 1952, p. 75; Archibald 1956, p. 53; Robinson and Bradley 1965, p. 40 and 1968, p. 61.

Aphis (Aphidula) pomi De Geer 1773 (in Kloet and Hincks 1964, p. 73).

Aphis mali Fabricius 1794, p. 216 (in Smith 1900, p. 3).

FUNDATRIX. Colour when alive: light apple green. Colour when macerated: head, antennae (except antennal segments III, IV and base of V pale), cornicles, cauda, anal and genital plates dark brown.

Morphology. Body length 1.41 - 1.85 (1.73 $\pm$ 0.209, n = 8) mm. Antennae five-segmented, imbricated, 0.63 - 0.86 (0.788 $\pm$ 0.074, n = 8) mm long. Length of antennal

segments (in mm): III + IV, 0.28 - 0.38 (0.333 ± 0.033, n = 10); V, 0.13 - 0.16 (0.141 ± 0.011, n = 8); VI, 0.10 - 0.11 (0.103 ± 0.005, n = 8) + 0.11 - 0.15 (0.133 ± 0.016, n = 8). Longest setae on antennal segment III 0.022 - 0.032 (0.030 ± 0.007, n = 8) mm. Rostrum reaching to middle coxae; rostral IV + V 0.13 - 0.15 (0.138 ± 0.007, n = 8) mm long, with 2 accessory setae. Length of hind tibiae 0.70 - 1.02 (0.789 ± 0.129, n = 8) mm; of hind tarsal II 0.10 - 0.10 mm. Cornicles slightly tapering, imbricated, 0.21 - 0.32 (0.26 ± 0.037, n = 8) mm long. Cauda fingertip-shaped 0.17 - 0.20 (0.18 ± 0.014, n = 8) mm long, with 11 - 16 (13 ± 1.773, n = 8) setae. Lateral tubercles present on prothorax and all abdominal segments except VIII. Setae on abdominal segment VIII dorsally 2 - 4 (2.37 ± 0.744, n = 8).

APTEROUS VIVIPAROUS FEMALE. Colour when alive: light yellowish green, apple green and deep green. Colour when macerated: head, antennae (except antennal segments III, IV and base of V pale), cornicles, cauda, anal and genital plates dark brown to black.

Morphology. Body length 1.23 - 1.94 (1.679 ± 0.26, n = 10) mm. Antennae normally six-segmented, often five-segmented, 0.77 - 1.27 (1.016 ± 0.159, n = 10) mm long.

Length of antennal segments (in mm); III, 0.15 - 0.33 (0.235 ± 0.058, n = 10); IV, 0.12 - 0.22 (0.168 ± 0.033, n = 10); V, 0.11 - 0.19 (0.154 ± 0.025, n = 10); VI, 0.08 - 0.12 (0.105 ± 0.015, n = 10) + 0.20 - 0.27 (0.23 ± 0.022, n = 10). Longest setae on antennal segment III 0.012 - 0.050 (0.035 ± 0.012, n = 10) mm. Rostrum reaching between middle and hind coxae; rostral IV + V 0.11 - 0.15 (0.134 ± 0.018, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.58 - 0.97 (0.792 ± 0.126, n = 10) mm; of hind tarsal II 0.08 - 0.11 (0.094 ± 0.008, n = 10) mm. Cornicles tapering, imbricated, 0.20 - 0.46 (0.342 ± 0.089, n = 10) mm long. Cauda fingertip-shaped, 0.15 - 0.23 (0.19 ± 0.023, n = 10) mm long, with 9 - 17 (13.6 ± 2.914, n = 10) setae. Lateral tubercles present on prothorax and all abdominal segments except VIII. Setae on abdominal segment VIII dorsally 2.

ALATE VIVIPAROUS FEMALE. Colour when alive: yellowish green to bright apple green. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown to black. Abdomen pale with lateral post-siphuncular sclerites and transverse dorsal bars on abdominal segments VII and VIII light brown.

Morphology. Body length 1.32 - 2.02 (1.78 ± 0.214, n = 13) mm. Antennae six-segmented, imbricated 0.97 - 1.29

(1.162 ± 0.110, n = 13) mm long. Length of antennal segments (in mm): III, 0.20 - 0.30 (0.259 ± 0.037, n = 13); IV, 0.15 - 0.22 (0.199 ± 0.026, n = 13); V, 0.15 - 0.21 (0.181 ± 0.022, n = 13); VI, 0.09 - 0.13 (0.115 ± 0.013, n = 13) + 0.25 - 0.30 (0.277 ± 0.017, n = 13). Longest setae on antennal segment III 0.030 - 0.050 (0.039 ± 0.006, n = 13) mm. Secondary sensoria 5 - 10 (7.538 ± 1.208, n = 26) in a single row on antennal segment III; rarely 2 on IV. Rostrum reaching between middle and hind coxae; rostral IV + V 0.10 - 0.15 (0.133 ± 0.016, n = 13) mm long, with 2 accessory setae. Length of hind tibiae 0.70 - 1.06 (0.908 ± 0.106, n = 13) mm; of hind tarsal II 0.09 - 0.11 (0.099 ± 0.009, n = 13) mm. Cornicles tapering, imbricated, 0.20 - 0.32 (0.266 ± 0.039, n = 13) mm long. Cauda fingertip-shaped, constricted near base, 0.11 - 0.19 (0.155 ± 0.021, n = 13) mm long, with 9 - 16 (13.231 ± 2.386, n = 13) setae. Lateral tubercles present on prothorax and all abdominal segments except VIII. Setae on abdominal segment VIII dorsally 2.

OVIPARA. Colour when alive: green to deep green. Colour when macerated much the same as for apterous viviparous female. Body length 0.97 - 1.32 (1.138 ± 0.138, n = 7) mm. Antennae normally six-segmented, imbricated 0.57 - 0.78 (0.663 ± 0.085, n = 7) mm long. Length of antennal segments (in mm): III, 0.10 - 0.16 (0.136 ± 0.031, n = 7);

IV, 0.08 - 0.12 (0.091 ± 0.015, n = 7); V, 0.09 - 0.13 (0.100 ± 0.016, n = 7); VI, 0.08 - 0.09 (0.084 ± 0.005, n = 7) + 0.15 - 0.20 (0.173 ± 0.021, n = 7). Longest setae on antennal segment III 0.012 - 0.028 (0.019 ± 0.005, n = 7) mm. Rostral IV + V 0.09 - 0.15 (0.111 ± 0.021, n = 7) mm long, with 2 accessory setae. Length of hind tibiae 0.38 - 0.56 (0.479 ± 0.068, n = 7) mm; of hind tarsal II 0.07 - 0.08 (0.079 ± 0.004, n = 7) mm long. Cornicles tapering, imbricated, 0.09 - 0.17 (0.13 + 0.038, n = 7) mm long. Cauda tapering, 0.09 - 0.13 (0.109 ± 0.020, n = 7) mm long, with 9 - 12 (10.857 ± 1.464, n = 7) setae. Setae on abdominal segment VIII dorsally 3 - 4 (3.857 ± 0.387, n = 7).

TYPES. Location not known.

HOST PLANTS. Amelanchier sp.; Cotoneaster sp.; Crataegus sp.; Malus sp.; Prunus sp.; Rhamnus sp.; Spiraea sp.; Sorbus sp.

COMMENTS. Aphis pomi may be confused with spiraecola, especially as they occur on many of the same host plants. A. pomi usually has lateral tubercles on most abdominal segments, and this character helps to distinguish it easily from spiraecola. A. pomi is often an economic pest. In Manitoba it causes considerable damage to the terminal

growth of the ornamental Cotoneaster acutifolia. It is listed by Kennedy et al as a vector of 2 virus diseases of plants.

MANITOBA SPECIMENS EXAMINED. 6 fundatrices; 166 apterae; 77 alatae; 8 oviparae.

Winnipeg, 7 June 1971; 29 June 1971; 24 July 1971; 24 September 1971; 16 June 1973; 21 June 1973; 22 June 1973; 28 June 1973; 6 July 1973; 30 July 1973; 11 June 1974; 28 June 1974.

Aphis ribiensis Gillette and Palmer

Figs. 360-369

Aphis ribiensis Gillette and Palmer 1929, p. 20 and 1932, p. 435; Allen and Knowlton 1939, p. 126; Palmer 1952, p. 167; Robinson and Bradley 1965, p. 40 and 1968, p. 61; Hille Ris Lambers 1974, p. 124.

Aphis nasturtii Kaltenbach (in Palmer 1936, p. 768).

APTEROUS VIVIPAROUS FEMALE. Colour when alive: pale green. Colour when macerated: mostly pale except head, antennae (except base antennal segment III pale), legs, tips of cornicles, cauda, anal and genital plates light brown.

Morphology. Body length 1.46 - 2.08 (1.692 ± 0.191, n = 10) mm. Antennae six-segmented, imbricated, 0.67 - 1.09 (0.763 ± 0.124, n = 10) mm long. Length of antennal segments (in mm): III, 0.13 - 0.26 (0.157 ± 0.039, n = 10); IV, 0.09 - 0.21 (0.116 ± 0.035, n = 10); V, 0.09 - 0.16 (0.107 ± 0.020, n = 10); VI, 0.09 - 0.12 (0.101 ± 0.010, n = 10) + 0.14 - 0.20 (0.166 ± 0.018, n = 10). Longest setae on antennal segment III 0.009 - 0.021 (0.013 ± 0.003, n = 10) mm. Rostrum not quite reaching to

hind coxae; rostral IV + V 0.12 - 0.14 (0.122 ± 0.006, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.52 - 0.80 (0.597 ± 0.086, n = 10) mm; of hind tarsal II 0.09 - 0.10 (0.091 ± 0.003, n = 10) mm. Cornicles tapering, imbricated, 0.11 - 0.21 (0.133 ± 0.029, n = 10) mm long. Cauda tapering, 0.14 - 0.17 (0.155 ± 0.008, n = 10) mm long, with 4 - 8 (5.4 ± 1.265, n = 10) setae. Small lateral tubercles present on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 4 (2.7 ± 0.675, n = 10).

ALATE VIVIPAROUS FEMALE. Colour when alive: greenish yellow. Colour when macerated: head, antennae, thorax, legs, cornicles, cauda, anal and genital plates and lateral sclerites dark brown.

Morphology. Body length 1.32 - 1.60 (1.531 ± 0.118, n = 10) mm. Antennae six-segmented, imbricated, 0.81 - 0.91 (0.886 ± 0.036, n = 10) mm long. Length of antennal segments (in mm): III, 0.18 - 0.23 (0.211 ± 0.016, n = 10); IV, 0.13 - 0.16 (0.145 ± 0.008, n = 10); V, 0.12 - 0.14 (0.126 ± 0.007, n = 10); VI, 0.09 - 0.11 (0.10 ± 0.006, n = 10) + 0.16 - 0.20 (0.181 ± 0.012, n = 10). Longest setae on antennal segment III 0.009 - 0.014 (0.012 ± 0.002, n = 10) mm. Secondary sensoria 8 - 15 (11.9 ± 2.125, n = 20) on antennal segment III; 2 - 6 (4.25 ± 0.967, n = 20)

on IV; 0 - 1 (0.15 ± 0.366, n = 20) on V. Rostrum reaching to middle coxae, rostral IV + V 0.11 - 0.12 (0.114 ± 0.005, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.64 - 0.75 (0.687 ± 0.041, n = 10) mm; of hind tarsal II 0.08 - 0.09 (0.087 ± 0.005, n = 10) mm. Cornicles tapering, imbricated, 0.08 - 0.11 (0.10 ± 0.008, n = 10) mm long. Cauda fingertip-shaped 0.11 - 0.14 (0.126 ± 0.010, n = 10) mm long, with 4 - 6 (5.2 ± 0.789, n = 10) setae. Small lateral tubercles present on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 5 (3.7 ± 1.059, n = 10).

TYPES. According to Palmer (1952), no. 41463 in the USNM.

HOST PLANTS. Ribes spp.; Bidens cernua L.

COMMENTS. In Manitoba ribiensis has been found overwintering on Ribes aureum, and on summer host Bidens cernua growing in a marshy area off Lake Winnipeg. Hille Ris Lambers (1974, p. 124) has given an excellent discussion on taxonomic problems of ribiensis, and in particular its resemblance to nasturtii. A slide of ribiensis from Veronica americana, Colorado, was kindly supplied by Hille Ris Lambers, for comparisons.

MANITOBA SPECIMENS EXAMINED. 56 apterae; 24 alatae.

Delta Field Station, 26 July 1967.

Grand Beach, 28 August 1973.

Aphis rubicola Oestlund

Figs. 370-389

Aphis rubicola Oestlund 1887, p. 60; Winter 1929a, p. 193 and 1929b, p. 7; Hottes and Frison 1931, p. 215; Gillette and Palmer 1932a, p. 438; Palmer 1952, p. 170.

Aphis rubiphila Patch 1914b, p. 269.

FUNDATRIX. Colour when alive: pale green. Colour when macerated: mostly pale except antennal segments III, VI, cauda and anal plates light brown.

Morphology. Body length 1.62 - 1.85 (1.731 ± 0.074, n = 10) mm. Antennae five-segmented, imbricated, 0.52 - 0.58 (0.548 ± 0.021, n = 10) mm long. Length of antennal segments (in mm): III + IV, 0.17 - 0.20 (0.190 ± 0.011, n = 10); V, 0.07 - 0.09 (0.085 ± 0.007, n = 10); VI, 0.07 - 0.08 (0.078 ± 0.004, n = 10) + 0.09 - 0.11 (0.101 ± 0.009, n = 10). Longest setae on antennal segment III 0.020 - 0.028 (0.023 ± 0.002, n = 10) mm. Rostrum reaching to middle coxae; rostral IV + V 0.10 - 0.11 (0.103 ± 0.005, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.44 - 0.50 (0.482 ± 0.021, n = 10) mm; of

hind tarsal II 0.07 - 0.08 (0.078 ± 0.004, n = 10) mm. Cornicles tapering, imbricated, 0.19 - 0.23 (0.214 ± 0.013, n = 10) mm long. Cauda tapering, 0.12 - 0.15 (0.141 ± 0.010, n = 10) mm long, with 8 - 16 (11.30 ± 2.54, n = 10) setae. Very small lateral tubercles present on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 4 - 8 (5.4 ± 1.35, n = 10).

APTEROUS VIVIPAROUS FEMALE. Colour when alive: pale green. Colour when macerated: mostly pale except antennal segments V and VI, cauda and anal plate light brown.

Morphology. Body length 1.23 - 1.94 (1.674 ± 0.224, n = 10) mm. Antennae normally six-segmented but often five-segmented, imbricated, 0.66 - 0.88 (0.745 ± 0.069, n = 10) mm long. Length of antennal segments (in mm): III, 0.14 - 0.20 (0.178 ± 0.021, n = 10); IV, 0.07 - 0.13 (0.097 ± 0.017, n = 10); V, 0.09 - 0.12 (0.10 ± 0.011, n = 10), VI, 0.08 - 0.11 (0.087 ± 0.007, n = 10) + 0.15 - 0.20 (0.17 ± 0.018, n = 10). Longest setae on antennal segment III 0.020 - 0.030 (0.024 ± 0.003, n = 10) mm. Rostrum reaching to middle coxae; rostral IV + V 0.11 - 0.12 (0.116 ± 0.005, n = 10) mm long, with 2 - 4 (2.8 ± 0.789, n = 10) accessory setae. Length of hind tibiae 0.58 - 0.70 (0.654 ± 0.053, n = 10) mm; of hind

tarsal II 0.07 - 0.09 (0.079 ± 0.007, n = 10) mm. Cornicles tapering, imbricated, 0.15 - 0.28 (0.237 ± 0.044, n = 10) mm long. Cauda tapering 0.11 - 0.17 (0.147 ± 0.019, n = 10) mm long, with 9 - 15 (11.3 ± 1.767, n = 10) setae. Very small lateral tubercles prominent on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 5 (3.8 ± 1.033, n = 10).

ALATE VIVIPAROUS FEMALE. Colour when alive: green. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen pale with lateral and post-siphuncular sclerites and transverse dorsal bars on abdominal segments VII and VIII light brown.

Morphology. Body length 1.30 - 1.78 (1.61 ± 0.14, n = 10) mm. Antennae six-segmented, imbricated, 0.76 - 0.99 (0.914 ± 0.072, n = 10) mm long. Length of antennal segments (in mm): III, 0.20 - 0.27 (0.23 ± 0.022, n = 10); IV, 0.11 - 0.19 (0.154 ± 0.024, n = 10); V, 0.10 - 0.16 (0.142 ± 0.019, n = 10); VI, 0.08 - 0.11 (0.095 ± 0.008, n = 10) + 0.16 - 0.21 (0.186 ± 0.019, n = 10). Longest setae on antennal segment III 0.022 - 0.032 (0.026 ± 0.003, n = 10) mm. Secondary sensoria 3 - 6 (4.7 ± 0.923, n = 20) arranged in a single row on antennal segment III; 0 - 2 (0.45 ± 0.686, n = 20) on IV. Rostrum reaching between middle and hind coxae; rostral IV + V 0.09 - 0.12

(0.109 ± 0.007, n = 10) mm long, with 2 - 4 (2.9 ± 0.114, n = 10) accessory setae. Length of hind tibiae 0.70 - 0.88 (0.80 ± 0.069, n = 10) mm; of hind tarsal II 0.06 - 0.08 (0.077 ± 0.007, n = 10) mm. Cornicles slightly tapering and slightly bulged at apex, imbricated, 0.14 - 0.21 (0.19 ± 0.024, n = 10) mm long. Cauda tapering, 0.11 - 0.15 (0.132 ± 0.013, n = 10) mm long, with 9 - 12 (11.1 ± 1.37, n = 10) setae. Very small lateral tubercles present on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 3 - 5 (4.0 ± 0.471, n = 10).

OVIPARA. Colour when alive: pale green. Colour when macerated much the same as for apterous viviparous female except hind tibiae with few pseudosensoria. Body length 0.80 - 1.30 (1.04 ± 0.13, n = 10) mm. Antennae five-segmented, imbricated, 0.38 - 0.51 (0.478 ± 0.037, n = 10) mm long. Length of antennal segments (in mm); III + IV, 0.10 - 0.15 (0.13 ± 0.015, n = 10); V, 0.05 - 0.08 (0.064 ± 0.008, n = 10); VI, 0.06 - 0.08 (0.073 ± 0.007, n = 10) + 0.11 - 0.15 (0.136 ± 0.014, n = 10). Longest setae on antennal segment III 0.016 - 0.020 (0.019 ± 0.002, n = 10) mm. Rostral IV + V 0.07 - 0.09 (0.081 ± 0.007, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.27 - 0.42 (0.347 ± 0.038, n = 10) mm; of hind tarsal II 0.05 - 0.06 (0.053 ± 0.005, n = 10) mm.

Cornicles tapering, imbricated, 0.08 - 0.11 (0.10 ± 0.012, n = 10) mm long. Cauda bluntly tapering 0.06 - 0.09 (0.078 ± 0.008, n = 10) mm long, with 5 - 9 (6.8 ± 1.476, n = 10) setae. Setae on abdominal segment VIII dorsally 4 - 7 (5.8 ± 0.919, n = 10).

APTEROUS MALE. Colour when alive: not observed. Colour when macerated much the same as for alate viviparous female. Body length 0.63 - 0.70 (0.663 ± 0.028, n = 7) mm. Antennae five-segmented, imbricated, 0.39 - 0.47 (0.435 ± 0.030, n = 7) mm long. Length of antennal segments (in mm): III + IV, 0.13 - 0.14 (0.131 ± 0.004, n = 7); V, 0.05 - 0.07 (0.062 ± 0.008, n = 7); VI, 0.05 - 0.06 (0.058 ± 0.004, n = 7) + 0.10 - 0.14 (0.118 ± 0.016, n = 7). Longest setae on antennal segment III 0.012 - 0.018 (0.015 ± 0.003, n = 7) mm. Secondary sensoria 6 - 11 (8.634 ± 1.206, n = 14) on antennal segment III + IV; 0 - 3 (0.571 ± 0.570, n = 14) on V. Rostral IV + V 0.07 - 0.07 mm long, with 2 accessory setae. Cornicles slightly tapering, imbricated, 0.08 - 0.10 (0.089 ± 0.007, n = 7) mm long. Cauda bluntly tapering, 0.05 - 0.06 (0.056 ± 0.005, n = 7) mm long, with 4 - 6 (5.0 ± 1.0, n = 7) setae. Setae on abdominal segment VIII dorsally 3 - 4 (3.714 ± 0.488, n = 7).

TYPES. Oestlund Collection, University of Minnesota.

HOST PLANTS. Rubus spp.

COMMENTS. For several years the type material of rubicola was believed to be lost. Miss Louise Russell has recently found in her possession material from a slide labelled 1105 (55), legend Aphis rubicola Oestl., Hennepin Co., 7/20/1885 on underside of leaves of Rubus strigosus Mx, Minnesota. The original material was apparently remounted to 8 separate slides by Miss Russell. One alate vivipara has been designated as LECTOTYPE and the remainder of the slides as PARALECTOTYPES. The original slide had a red star on it, to indicate "type".

For many years rubicola was confused in Manitoba Collections with Aphis rubifolii (Thomas) which has five-segmented antennae in summer forms. I have discovered that so far rubifolii has not been collected in Manitoba, and that rubicola usually has dwarf summer forms with five-segmented antennae which are mistakenly considered to be rubifolii. A. rubicola can be distinguished from rubifolii by the longer setae on rubicola. Kennedy et al (1962) list rubicola as being a vector of at least 1 virus disease of plants.

MANITOBA SPECIMENS EXAMINED. 17 fundatrices; 170 apterae; 91 alatae; 167 oviparae; 9 males.

Beaver Creek, 20 August 1973.

Birds Hill Park, 14 June 1973; 23 October 1974.

Caddy Lake, 4 September 1974.

Holland, 23 July 1974.

Pine Grove Halt, 11 June 1973; 3 October 1973; 11 October 1974.

Sandilands Provincial Forest, 16 August 1973; 16 October 1973; 13 June 1974.

Winnipeg, 26 September 1966; 12 June 1973; 14 June 1973; 25 June 1973; 20 August 1973; 1 October 1973; 16 October 1973; 19 October 1973; 23 October 1973; 12 June 1974; 19 June 1974; 5 July 1974; 17 July 1974; 10 September 1974.

Aphis rumicis Linnaeus

Figs. 390-399

Aphis rumicis Linnaeus 1758, p. 451 (in Oestlund 1886, p. 47); Sanborn 1905, p. 47; Gillette 1908, p. 178 and 180; Williams 1910, p. 54; Patch 1912, p. 177; Das 1918, p. 203; Börner and Janisch 1922, p. 65; Oestlund 1922, p. 129; Hottes and Frison 1931, p. 215; Hille Ris Lambers 1934, p. 27; Knowlton 1940, p. 196; Jones 1942, p. 5; Jacob 1945, p. 102; MacGillivray 1952, p. 75; Palmer 1952, p. 172; Essig 1953, p. 93; Connell 1954, p. 88; Kloet and Hincks 1964, p. 72; Heie 1969, p. 88.

Aphis carbocolor Gillette 1907, p. 391; Gillette and Palmer 1932, p. 386; Kloet and Hincks 1964, p. 72.

Aphis (Doralis) rumicis Börner 1952, p. 77.

APTEROUS VIVIPAROUS FEMALE. Colour when alive: dark green to black. Colour when macerated: head, antennae (except base of antennal segment III pale), cornicles, cauda, anal and genital plates dark brown to black. Heavy, reticulated markings on tergum of body with lateral, post-

siphuncular sclerites and transverse dorsal bars on abdominal segments VII and VIII dark brown.

Morphology. Body length 1.50 - 2.11 (1.80 ± 0.216, n = 8) mm. Antennae six-segmented, imbricated, 1.07 - 1.18 (1.11 ± 0.041, n = 8) mm long. Length of antennal segments (in mm): III, 0.28 - 0.33 (0.297 ± 0.017, n = 8); IV, 0.16 - 0.19 (0.18 ± 0.011, n = 8); V, 0.16 - 0.19 (0.171 ± 0.011, n = 8); VI, 0.10 - 0.13 (0.11 ± 0.01, n = 8) + 0.17 - 0.26 (0.22 ± 0.027, n = 8). Longest setae on antennal segment III 0.024 - 0.035 (0.03 ± 0.005, n = 8) mm. Rostrum reaching to middle coxae; rostral IV + V 0.13 - 0.15 (0.141 ± 0.006, n = 8) mm long, with 2 accessory setae. Length of hind tibiae 0.87 - 1.03 (0.89 ± 0.301, n = 8) mm; of hind tarsal II 0.10 - 0.11 (0.106 ± 0.005, n = 8) mm. Cornicles slightly tapering, imbricated, 0.16 - 0.19 (0.173 ± 0.012, n = 8) mm long. Cauda tapering, 0.16 - 0.18 (0.169 ± 0.008, n = 8) mm long, with 11 - 19 (13.87 ± 2.36, n = 8) setae. Large lateral tubercles prominent on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 3 - 7 (5.0 ± 1.309, n = 8).

ALATE VIVIPAROUS FEMALE. Colour when alive: dark green to black. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates black.

Abdomen with black dorsal markings, lateral and post-siphuncular sclerites and transverse band on abdominal segments VII and VIII.

Morphology. Body length 1.76 - 1.93 (1.855 ± 0.071, n = 8) mm. Antennae six-segmented, imbricated, 1.08 - 1.23 (1.175 ± 0.051, n = 8) mm long. Length of antennal segments (in mm): III, 0.26 - 0.33 (0.302 ± 0.024, n = 8); IV, 0.18 - 0.22 (0.206 ± 0.015, n = 8); V, 0.16 - 0.20 (0.18 ± 0.013, n = 8); VI, 0.11 - 0.13 (0.116 ± 0.007, n = 8) + 0.22 - 0.24 (0.229 ± 0.008, n = 8). Longest setae on antennal segment III 0.028 - 0.042 (0.036 ± 0.004, n = 8) mm. Secondary sensoria 7 - 10 (8.375 ± 1.258, n = 16) on antennal segment III; occasionally 1 on IV. Rostrum reaching to middle coxae; rostral IV + V 0.12 - 0.14 (0.134 ± 0.007, n = 8) mm long, with 2 accessory setae. Length of hind tibiae 0.99 - 1.01 (0.998 ± 0.007, n = 8) mm; of hind tarsal II 0.10 - 0.11 (0.106 ± 0.005, n = 8) mm. Cornicles cylindrical, imbricated, 0.14 - 0.16 (0.155 ± 0.008, n = 8) mm long. Cauda fingertip-shaped, 0.14 - 0.16 (0.146 ± 0.007, n = 8) mm long, with 11 - 17 (13.38 ± 1.923, n = 8) setae. Prominent lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 3 - 6 (4.375 ± 0.916, n = 8).

TYPES. Linnaeus left no types.

HOST PLANTS. Rumex crispus.

COMMENTS. Aphis rumicis has often been confused with fabae. A publication by Jones (1942) is helpful in separating these two species. The life history of rumicis in Manitoba is not known.

MANITOBA SPECIMENS EXAMINED. 12 apterae; 27 alatae. La Salle, 11 August 1974.

Aphis saniculae Williams

Figs. 400-409

Aphis saniculae Williams 1911, p. 56; Davis 1911, p. 18.

Aphis luridis Hottes and Frison 1931, p. 200. New synonymy.

APTEROUS VIVIPAROUS FEMALE. Colour when alive: yellowish green to green. Colour when macerated: antennae (except base of antennal segment III pale), cornicles, cauda, anal and genital plates dark brown.

Morphology. Body length 1.24 - 1.96 (1.60 ± 0.230, n = 24) mm. Antennae six-segmented, imbricated, 0.64 - 1.31 (0.895 ± 0.250, n = 24) mm long. Length of antennal segments (in mm): III, 0.18 - 0.33 (0.271 ± 0.050, n = 24); IV, 0.08 - 0.16 (0.130 ± 0.033, n = 24); V, 0.07 - 0.16 (0.121 ± 0.024, n = 24); VI, 0.07 - 0.12 (0.091 ± 0.013, n = 24) + 0.15 - 0.37 (0.224 ± 0.060, n = 24). Longest setae on antennal segment III 0.004 - 0.038 (0.021 ± 0.010, n = 24) mm. Secondary sensoria 0 - 14 (4.04 ± 3.76, n = 46) somewhat tuberculate, with fairly wide rims, varying in size on antennal segment III; 0 - 12 (5.13 ± 2.4, n = 46) on IV; 0 - 8 (2.15 ± 1.93, n = 46) on V. Rostrum reaching to hind coxae; rostral IV + V 0.09 - 0.14 (0.106 ± 0.021, n = 24) mm long, with 2

accessory setae. Length of hind tibiae 0.45 - 0.88 (0.671 ± 0.122, n = 24) mm; of hind tarsal II, 0.08 - 0.11 (0.094 ± 0.008, n = 24) mm. Cornicles tapering, imbricated, 0.11 - 0.28 (0.191 ± 0.060, n = 24) mm long. Cauda tapering 0.10 - 0.16 (0.141 ± 0.021, n = 24) mm long, with 6 - 12 (8.423 ± 1.470, n = 24) setae. Large lateral tubercles on prothorax and abdominal segment I and VII. Setae on abdominal segment VIII dorsally 2 - 4 (3.291 ± 0.912, n = 24).

ALATE VIVIPAROUS FEMALE. Colour when alive: yellowish green to green. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen pale with lateral, postsiphuncular sclerites and dorsal band on abdominal segments VII and VIII brown.

Morphology. Body length 1.25 - 2.06 (1.55 ± 0.266, n = 17) mm. Antennae six-segmented, occasionally five-segmented, imbricated, 0.84 - 1.36 (1.026 ± 0.195, n = 17) mm long. Length of antennal segments (in mm): III, 0.28 - 0.38 (0.322 ± 0.054, n = 17); IV, 0.10 - 0.21 (0.111 ± 0.021, n = 17); V, 0.10 - 0.18 (0.120 ± 0.020, n = 17); VI, 0.08 - 0.13 (0.095 ± 0.013, n = 17) + 0.19 - 0.40 (0.24 ± 0.06, n = 17). Longest setae on antennal segment III 0.010 - 0.027 (0.018 ± 0.005, n = 17) mm. Secondary sensoria 21 - 50 (27.15 ± 5.45, n = 34), tuber-

culate, with fairly wide rims, irregular in size on antennal segment III; 6 - 15 (9.18 ± 2.47, n = 34) on IV; 1 - 7 (3.55 ± 1.56, n = 34) on V. Rostrum reaching between middle and hind coxae; rostral IV + V 0.09 - 0.14 (0.099 ± 0.015, n = 17) mm long, with 2 accessory setae. Length of hind tibiae 0.57 - 0.97 (0.716 ± 0.149, n = 17) mm; of hind tarsal II 0.09 - 0.12 (0.094 ± 0.010, n = 17) mm. Cornicles tapering, imbricated, 0.11 - 0.29 (0.167 ± 0.057, n = 17) mm long. Cauda fingertip-shaped 0.10 - 0.17 (0.125 ± 0.021, n = 17) mm long, with 7 - 12 (8.53 ± 1.28, n = 17) setae. Large lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 4 (2.41 ± 0.62, n = 17).

TYPES. University of Nebraska Collection and USNM.

HOST PLANTS. Cicuta maculata; Sanicula marilandica; Zizia aurea.

COMMENTS. There are apparently only two type slides of saniculae available, one in the University of Nebraska collection which contains 3 winged and 3 alatoid nymphs (Davis, 1911), and one in the USNM with 2 alate viviparous females, 1 apterous viviparous female, and 3 alatoid immatures. The latter slide was obtained on loan, and compared with type material of Aphis luridis Hottes and

Frison borrowed from the USNM, British Museum (National History) and Illinois Natural History Survey. There seems little doubt that luridis is a synonym of saniculae. Characteristic is the tendency in both alate and apterous viviparous females towards coalescence of antennal segments III and IV in many specimens, and the weak but distinct secondary sensoria on antennal segments III, IV and V of apterous viviparous females. It is possible that Hottes and Frison (1931) had not seen specimens of saniculae, as they did not mention this species.

In Manitoba specimens of saniculae there is a tendency towards shorter cornicles, and one or two samples were more greenish than yellow in body colour. Further studies may show subspecific differences, but at the moment all are regarded as one variable species.

MANITOBA SPECIMENS EXAMINED. 76 apterae; 26 alatae.
Holland, 23 July 1974.
Winnipeg, 26 June 1973.

Aphis sedi Kaltenbach

Figs. 410-426

Aphis sedi Kaltenbach 1843. Kring 1955, p. 442; Doncaster 1961, p. 151; Kloet and Hincks 1964, p. 73; Shaposhnikov 1964, p. 738; Szelegiewicz 1965, p. 185; Heie and Heikinheimo 1966, p. 121; Szelegiewicz 1968, p. 77; Heie 1969, p. 90; Ilharco 1969, p. 27; Szelegiewicz 1972, p. 224; Doncaster 1973, p. 95.

Cerosipha (Cerosipha) sedi (Kaltenbach 1843) Börner 1952, p. 88.

APTEROUS VIVIPAROUS FEMALE. Colour when alive: yellowish green, deep green to black. Colour when macerated: head, antennae (except antennal segments III, IV and base of V pale), thoracic lateral sclerites, cornicles, cauda, anal and genital plates dark brown. Abdomen pale with post-siphuncular sclerites and dorsal bar on abdominal segments VII and VIII brown.

Morphology. Body length 1.44 - 1.83 (1.59 ± 0.106, n = 10) mm. Antennae usually six-segmented, imbricated, 0.73 - 1.09 (0.91 ± 0.13, n = 10) mm long. Length

of antennal segments (in mm): III, 0.18 - 0.26 (0.22 ± 0.033, n = 10); IV, 0.09 - 0.18 (0.14 ± 0.029, n = 10); V, 0.12 - 0.19 (0.147 ± 0.021, n = 10); VI, 0.09 - 0.14 (0.11 ± 0.013, n = 10) + 0.13 - 0.23 (0.184 ± 0.037, n = 10). Longest setae on antennal segment III 0.012 - 0.014 (0.013 ± 0.001, n = 10) mm. Rostrum reaching to hind coxae; rostral IV + V 0.11 - 0.12 (0.117 ± 0.005, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.61 - 0.77 (0.695 ± 0.059, n = 10) mm; of hind tarsal II 0.09 - 0.12 (0.107 ± 0.009, n = 10) mm. Cornicles tapering, imbricated, 0.16 - 0.25 (0.21 ± 0.032, n = 10) mm long. Cauda fingertip-shaped, 0.15 - 0.19 (0.167 ± 0.015, n = 10) mm long, with 5 - 7 (5.8 ± 0.789, n = 10) setae. Lateral tubercles prominent on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2.

ALATE VIVIPAROUS FEMALE. Colour when alive: yellowish green, deep green to black. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen pale with lateral postsiphuncular sclerites and dorsal bars on abdominal segments VII and VIII dark brown.

Morphology. Body length 1.41 - 1.76 (1.578 ± 0.127, n = 10) mm. Antennae six-segmented, imbricated,

0.97 - 1.09 (1.03 ± 0.52, n = 10) mm long. Length of antennal segments (in mm): III, 0.25 - 0.29 (0.27 ± 0.015, n = 10); IV, 0.15 - 0.18 (0.166 ± 0.013, n = 10); V, 0.13 - 0.18 (0.156 ± 0.016, n = 10); VI, 0.10 - 0.13 (0.115 ± 0.008, n = 10) + 0.20 - 0.24 (0.215 ± 0.14, n = 10). Longest setae on antennal segment III 0.010 - 0.014 (0.012 ± 0.001, n = 10) mm. Secondary sensoria 6 - 11 (8.6 ± 1.50, n = 20) in a single row on antennal segment III. Rostrum reaching to hind coxae; rostral IV + V 0.10 - 0.11 (0.107 ± 0.005, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.74 - 0.87 (0.795 ± 0.035, n = 10) mm; of hind tarsal II 0.09 - 0.11 (0.102 ± 0.008, n = 10) mm. Cornicles slightly tapering, imbricated, 0.14 - 0.18 (0.157 ± 0.013, n = 10) mm long. Cauda fingertip-shaped, 0.12 - 0.14 (0.129 ± 0.009, n = 10) mm long, with 4 - 6 (5.4 ± 0.699, n = 10) setae. Lateral tubercles prominent on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2.

OVIPARA. Colour when alive: deep yellowish green to blackish green. Colour when macerated much the same for apterous viviparous female except hind tibiae swollen, with pseudosensoria. Body length 1.32 - 1.584 (1.375 ± 0.082, n = 10) mm. Antennae six-segmented, imbricated, 0.658 - 0.777 (0.711 ± 0.042, n = 10) mm long. Length of

antennal segments (in mm): III, 0.112 - 0.154 (0.133 ± 0.013, n = 10); IV, 0.070 - 0.098 (0.088 ± 0.011, n = 10); V, 0.084 - 0.126 (0.108 ± 0.008, n = 10); VI, 0.091 - 0.112 (0.102 ± 0.006, n = 10) + 0.165 - 0.210 (0.181 ± 0.012, n = 10). Longest setae on antennal segment III 0.008 - 0.012 (0.009 ± 0.001, n = 10) mm. Rostral IV + V 0.098 - 0.112 (0.104 ± 0.006, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.399 - 0.476 (0.438 ± 0.026, n = 10) mm; of hind tarsal II 0.070 - 0.098 (0.090 ± 0.009, n = 10) mm. Cornicles slightly tapering, imbricated, 0.098 - 0.126 (0.111 ± 0.011, n = 10) mm long. Cauda bluntly tapering, 0.105 - 0.126 (0.119 ± 0.007, n = 10) mm long, with 5 - 8 (6.400 ± 1.174, n = 10) setae. Setae on abdominal segment VIII dorsally 4 - 5 (4.600 ± 0.516, n = 10).

APTEROUS MALE. Colour when alive: deep yellowish green to deep green or black. Colour when macerated much the same as for alate viviparous female. Body length 1.144 - 1.302 (1.216 ± 0.051, n = 10) mm. Antennae six-segmented, imbricated, 1.001 - 1.059 (1.022 ± 0.018, n = 10) mm long. Length of antennal segments (in mm): III, 0.224 - 0.259 (0.239 ± 0.011, n = 10); IV, 0.168 - 0.196 (0.178 ± 0.008, n = 10); V, 0.154 - 0.184 (0.172 ± 0.010, n = 10); VI, 0.105 - 0.133 (0.118 ± 0.009, n = 10) + 0.179 - 0.224 (0.208 ± 0.012, n = 10). Longest setae on antennal seg-

ment III 0.014 - 0.020 (0.018 ± 0.002, n = 10) mm. Secondary sensoria 15 - 29 (22.700 ± 4.041, n = 20) on antennal segment III; 9 - 18 (14.700 ± 3.147, n = 20) on IV; 2 - 10 (6.000 ± 3.147, n = 20) on V. Rostral IV + V 0.105 - 0.105 mm long, with 2 accessory setae. Length of hind tibiae 0.561 - 0.651 (0.610 ± 0.044, n = 10) mm; of hind tarsal II 0.091 - 0.098 (0.097 ± 0.002, n = 10) mm. Cornicles slightly tapering, imbricated, 0.091 - 0.126 (0.107 ± 0.011, n = 10) mm long. Cauda bluntly tapering, 0.098 - 0.119 (0.104 ± 0.008, n = 10) mm long, with 4 - 6 (5.600 ± 0.843, n = 10) setae. Setae on abdominal segment VIII dorsally 2.

TYPES. Location of types unknown.

HOST PLANTS. Sedum oreganum.

COMMENTS. Kring (1955) showed conclusively that Aphis sedi exists in North America, and presented useful characters which could be used to separate sedi from gossypii, one of which is that males in sedi are apterous and in gossypii they are alate. He found that one winter host in Connecticut for sedi is the tree Catalpa, Catalpa sp. But in Manitoba I have found males and oviparae on Sedum oreganum, a low rock-garden type of ornamental, which indicates that the entire life history of sedi in Manitoba is

spent on Sedum.

MANITOBA SPECIMENS EXAMINED. 30 apterae; 26 alatae; 31 oviparae; 23 males.

Winnipeg 22 May 1975; 27 May 1975; 10 September 1975; 17 September 1975; 19 September 1975.

Aphis spiraecola Patch

Figs. 427-440

Aphis spiraecola Patch 1914 b, p. 270 and 1923 a, p. 55, and 1929, p. 698; Hottes and Frison 1931, p. 220; Gillette and Palmer 1932, p. 447; Palmer 1952, p. 179; MacGillivray 1959, p. 639; Smith et al 1963, p. 33; Hille Ris Lambers 1963, p. 1; Heie 1963, p. 120; Robinson and Bradley 1965, p. 40; Calilung 1967, p. 162; Szelegiewicz 1968, p. 460; Ghosh and Raychaudhuri 1968, p. 180; Robinson and Bradley 1968, p. 61.

Aphis spiraeella Schouteden [in Gillette 1910, p. 404 (misidentification)].

Aphis malvoides van der Goot 1917 (in Hille Ris Lambers 1963, p. 1); Szelegiewicz 1968, p. 460; Calilung 1967, p. 162.

APTEROUS VIVIPAROUS FEMALE. Colour when alive: bright yellow to yellowish green or apple green. Colour when macerated: head, antennae (except antennal segments III, IV and base of V pale) and genital plates light brown. Abdomen pale with cornicles, cauda and anal plates dark

brown.

Morphology. Body length 1.60 - 1.82 (1.713 ± 0.089, n = 10) mm. Antennae six-segmented, imbricated, 0.75 - 1.30 (1.044 ± 0.168, n = 10) mm long. Length of antennal segments (in mm): III, 0.15 - 0.28 (0.238 ± 0.053, n = 10); IV, 0.10 - 0.22 (0.179 ± 0.034, n = 10); V, 0.10 - 0.20 (0.163 ± 0.029, n = 10); VI, 0.09 - 0.12 (0.105 ± 0.011, n = 10) + 0.13 - 0.32 (0.227 ± 0.068, n = 10). Longest setae on antennal segment III 0.026 - 0.039 (0.030 ± 0.010, n = 10) mm. Rostrum reaching to middle coxae; rostral IV + V 0.11 - 0.12 (0.117 ± 0.005, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.55 - 0.90 (0.76 ± 0.106, n = 10) mm: of hind tarsal II 0.08 - 0.11 (0.10 ± 0.009, n = 10) mm. Cornicles tapering, imbricated 0.21 - 0.44 (0.316 ± 0.076, n = 10) mm long. Cauda fingertip-shaped 0.17 - 0.26 (0.222 ± 0.024, n = 10) mm long, with 6 - 13 (9.90 ± 2.23, n = 10) setae. Large lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal VIII dorsally 2.

ALATE VIVIPAROUS FEMALE. Colour when alive: yellowish green to bright green. Colour when macerated: head, antennae, thorax, cornicles, cauda and anal plate dark brown to black. Abdomen pale with lateral, post-siphuncular sclerites and genital plate brown.

Morphology. Body length 1.58 - 1.98 (1.802 ± 0.142, n = 10) mm. Antennae six-segmented, imbricated, 1.01 - 1.42 (1.172 ± 0.140, n = 10) mm long. Length of antennal segments (in mm): III, 0.20 - 0.34 (0.25 ± 0.042, n = 10); IV, 0.15 - 0.24 (0.188 ± 0.032, n = 10); V, 0.14 - 0.20 (0.176 ± 0.025, n = 10); VI, 0.10 - 0.12 (0.105 ± 0.007, n = 10) + 0.21 - 0.35 (0.287 ± 0.041, n = 10). Longest setae on antennal segment III 0.012 - 0.035 (0.029 ± 0.012, n = 10) mm. Secondary sensoria 5 - 11 (7.95 ± 1.731, n = 20) almost flat, on antennal segment III; 0 - 6 (2.55 ± 1.73, n = 20) on IV. Rostrum reaching to middle coxae; rostral IV + V 0.11 - 0.13 (0.116 ± 0.007, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.71 - 1.00 (0.838 ± 0.108, n = 10) mm; of hind tarsal II, 0.09 - 0.10 (0.098 ± 0.004, n = 10) mm. Cornicles slightly tapering, imbricated, 0.19 - 0.30 (0.233 ± 0.036, n = 10) mm long. Cauda fingertip-shaped, 0.14 - 0.19 (0.168 ± 0.015, n = 10) mm long, with 8 - 13 (10.7 ± 1.499, n = 10) setae. Large lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 1 - 3 (2.0 ± 0.471, n = 10).

OVIPARA. Colour when alive: not observed. Colour when macerated the same as for apterous viviparous female

except hind tibiae swollen with numerous pseudosensoria over the whole length. Body length 1.36 - 1.85 (1.470 ± 0.160, n = 8) mm. Antennae usually six-segmented, imbricated, 0.69 -0.82 (0.746 ± 0.053, n = 8) mm long. Length of antennal segments (in mm): III, 0.13 - 0.19 (0.148 ± 0.029, n = 8); IV, 0.08 - 0.13 (0.098 ± 0.024, n = 8); V, 0.11 - 0.14 (0.12 ± 0.01, n = 8); VI, 0.08 - 0.11 (0.089 ± 0.01, n = 8) + 0.18 - 0.22 (0.195 ± 0.015, n = 8). Longest setae on antennal segment III 0.009 - 0.018 (0.011 ± 0.003, n = 8) mm. Rostrum reaching between middle and hind coxae; rostral IV + V 0.08 - 0.10 (0.098 ± 0.036, n = 8) mm long, with 2 accessory setae. Length of hind tibiae 0.49 - 0.58 (0.515 ± 0.032, n = 8) mm; of hind tarsal II, 0.08 - 0.09 (0.085 ± 0.005, n = 8) mm. Cornicles tapering, imbricated, 0.11 - 0.14 (0.13 ± 0.008, n = 8) mm long. Cauda fingertip-shaped, 0.11 - 0.16 (0.135 ± 0.015, n = 8) mm long, with 7 - 11 (9.37 ± 1.408, n = 8) setae. Setae on abdominal segment VIII dorsally 3 - 5 (4.0 ± 0.926, n = 8).

TYPES. Location not known.

HOST PLANTS. Chrysanthemum sp.; Cosmos sp.; Cotoneaster acutifolia; Matricaria matricarioides; Prunus sp.; Spiraea sp.; Sorbus americana; Thalictrum sp.; Urtica dioica; Viburnum opulus; Zinnia sp.

COMMENTS. This is a cosmopolitan and polyphagous species, which apparently overwinters in the egg stage on Spiraea spp. (and perhaps other plants) and migrates in the spring to a great diversity of summer host plants. It is occasionally of economic importance, causing injury to terminal growth of Spiraea spp., and it is listed as a vector of at least 3 virus diseases of plants by Kennedy et al (1962).

MANITOBA SPECIMENS EXAMINED. 107 apterae; 82 alatae; 8 oviparae.

Birds Hill Park, 17 August 1962; 18 June 1974.

Carberry, 25 July 1974.

Holland, 25 June 1974.

Winnipeg, 1 October 1964; 31 October 1965; 17 September 1966; 24 July 1972; 22 June 1973; 26 June 1973; 30 August 1973; 28 June 1974; 19 July 1974.

Aphis spiraephila Patch

Figs. 441-454

Aphis spiraephila Patch 1914, p. 270; Gillette and Palmer 1932, p. 448; Palmer 1952, p. 179; Archibald 1958, p. 58; Robinson and Bradley 1965, p. 40 and 1968, p. 61.

APTEROUS VIVIPAROUS FEMALE. Colour when alive: yellowish brown, reddish brown to grayish blue with a little of white powder on the body. Colour when macerated: head, antennae (except antennal segments III and base of IV pale), cornicles, cauda, anal and genital plates dark brown. Abdomen pale with brown transverse dorsal band on abdominal segment VIII.

Morphology. Body length 1.10 - 2.60 (1.681 ± 0.422, n = 10) mm. Antennae six-segmented, imbricated, 0.59 - 1.25 (0.903 ± 0.192, n = 10) mm long. Length of antennal segments (in mm): III, 0.12 - 0.36 (0.242 ± 0.067, n = 10); IV, 0.08 - 0.21 (0.137 ± 0.044, n = 10); V, 0.09 - 0.20 (0.139 ± 0.033, n = 10); VI, 0.09 - 0.14 (0.115 ± 0.017, n = 10) + 0.11 - 0.20 (0.148 ± 0.027, n = 10). Longest setae on antennal segment III 0.021 - 0.044 (0.034 ± 0.006, n = 10) mm. Rostrum reaching to middle

coxae; rostral IV + V, 0.09 - 0.11 (0.100 ± 0.005, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.45 - 0.98 (0.708 ± 0.159, n = 10) mm; of hind tarsal II 0.08 - 0.13 (0.112 ± 0.016, n = 10) mm. Cornicles tapering, imbricated, 0.05 - 0.18 (0.115 ± 0.039, n = 10) mm long. Cauda fingertip-shaped, 0.15 - 0.30 (0.223 ± 0.051, n = 10) mm long, with 10 - 16 (12.5 ± 1.650, n = 10) setae. Lateral tubercles prominent on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 4 - 6 (4.70 ± 0.675, n = 10).

ALATE VIVIPAROUS FEMALE. Colour when alive: yellowish brown to greenish brown. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen pale with lateral, postsiphuncular sclerites and transverse dorsal bar on abdominal segment VIII brown.

Morphology. Body length 1.16 - 2.0 (1.792 ± 0.24, n = 10) mm. Antennae six-segmented, imbricated, 0.75 - 1.19 (1.078 ± 0.125, n = 10) mm long. Length of antennal segments (in mm); III, 0.21 - 0.34 (0.308 ± 0.039, n = 10); IV, 0.10 - 0.21 (0.180 ± 0.031, n = 10); V, 0.11 - 0.20 (0.169 ± 0.026, n = 10); VI, 0.09 - 0.14 (0.124 ± 0.013, n = 10) + 0.14 - 0.19 (0.172 ± 0.018, n = 10). Longest setae on antennal segment III 0.029 - 0.036 (0.032

± 0.003, n = 10) mm. Secondary sensoria 4 - 8 (6.0 ± 1.124, n = 20) arranged in a single row on antennal segment III, 0 - 3 (0.550 ± 0.945, n = 20) on IV; occasionally 1 on V. Rostrum reaching to middle coxae ; rostral IV + V, 0.10 - 0.12 (0.107 ± 0.008, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.57 - 0.96 (0.861 ± 0.108, n = 10) mm; of hind tarsal II 0.10 - 0.13 (0.119 ± 0.009, n = 10) mm. Cornicles tapering, imbricated, 0.06 - 0.16 (0.123 ± 0.026, n = 10) mm long. Cauda fingertip-shaped 0.15 - 0.23 (0.211 ± 0.023, n = 10) mm long, with 11 - 18 (14.5 ± 1.841, n = 10) setae. Large lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 4 - 6 (5.2 ± 0.789, n = 10).

OVIPARA. Colour when alive: reddish brown to dark brown. Colour when macerated much the same as for apterous viviparous female except hind tibiae slightly swollen with a few pseudosensoria mostly on the proximal half. Body length 1.86 - 1.96 (1.905 ± 0.078, n = 2) mm. Antennae six-segmented, imbricated, 0.83 - 1.10 (0.965 ± 0.191, n = 2) mm long. Length of antennal segments (in mm): III, 0.21 - 0.22 (0.215 ± 0.007, n = 2); IV, 0.11 - 0.15 (0.13 ± 0.028, n = 2); V, 0.14 - 0.15 (0.145 ± 0.007, n = 2); VI, 0.10 - 0.11 (0.105 ± 0.007, n = 2) + 0.15 - 0.15. Longest setae on antennal segment III 0.030 - 0.030 mm.

Rostral IV + V 0.10 - 0.11 (0.105 ± 0.007, n = 2) mm long, with 2 accessory setae. Length of hind tibiae 0.69 - 0.71 (0.70 ± 0.014, n = 2) mm; of hind tarsal II, 0.11 - 0.12 (0.115 ± 0.007, n = 2) mm. Cornicles tapering, imbricated, 0.08 - 0.10 (0.090 ± 0.014, n = 2) mm long. Cauda bluntly tapering, 0.19 - 0.20 (0.195 ± 0.007, n = 2), mm long, with 11 - 14 (12.50 ± 2.121, n = 2) setae. Setae on abdominal segment VIII dorsally 7 - 8 (7.5 ± 0.707, n = 2).

TYPES. According to Palmer (1952) cotypes are in the Patch Collection in Orono, Maine.

HOST PLANTS. Spiraea sp.

COMMENTS. A. spiraephila is found commonly on tender terminal growth of wild Spiraea spp. in Manitoba, more often than in ornamental planting, and it apparently spends its complete life cycle on Spiraea. It can be distinguished by its brownish colour when alive, long spoon-shaped cauda with many setae, and shorter than normal cornicles.

MANITOBA SPECIMENS EXAMINED. 152 apterae; 60 alatae; 2 oviparae.

Caddy Lake, 16 July 1973.

Pine Grove Halt, 20 September 1974.

Sandilands Provincial Forest, 19 June 1963; 15 June 1967;

3 August 1971; 21 July 1972, 9 July 1973, 12 July 1973, 12 July 1974.

Spruce Woods Provincial Forest, 5 August 1971.

Winnipeg, 11 July 1967; 9 June 1971; 29 June 1971; 26 June 1973; 28 June 1974.

Aphis thaspii Oestlund

Figs. 455 - 471

Aphis thaspii Oestlund 1887, p. 58.

Aphis signatis Hottes and Frison 1931, p. 219. New synonymy.

APTEROUS VIVIPAROUS FEMALE. Colour when alive: brownish green to dark green. Colour when macerated: head, antennae (except antennal segments III, IV and base of V pale), thoracic lateral sclerites, cornicles, cauda, anal and genital plates dark brown. Abdomen pale with post-siphuncular sclerites and transverse dorsal band on abdominal segment VIII brown.

Morphology. Body length 0.97 - 1.58 (1.371 ± 0.169, n = 16) mm. Antennae six-segmented, imbricated, 0.58 - 1.02 (0.799 ± 0.122, n = 16) mm long. Length of antennal segments (in mm): III, 0.13 - 0.30 (0.215 ± 0.047, n = 16); IV, 0.06 - 0.15 (0.095 ± 0.024, n = 16); V, 0.06 - 0.14 (0.103 ± 0.019, n = 16); VI, 0.08 - 0.11 (0.093 ± 0.008, n = 16) + 0.15 - 0.22 (0.186 ± 0.023, n = 16). Longest setae on antennal segment III 0.010 - 0.020 (0.014 ± 0.011, n = 16) mm. Rostrum reaching to middle coxae; rostral IV + V 0.08 - 0.10 (0.093 ± 0.006, n = 16) mm long, with 2

accessory setae. Length of hind tibiae 0.41 - 0.70 (0.56 ± 0.078, n = 16) mm; of hind tarsal II, 0.08 - 0.09 (0.086 ± 0.005, n = 16) mm. Cornicles tapering, imbricated, 0.11 - 0.20, (0.149 ± 0.024, n = 16) mm long. Cauda tapering, 0.10 - 0.16 (0.126 ± 0.018, n = 16) mm long, with 6 - 11 (8.5 ± 1.366, n = 16) setae. Large lateral tubercles prominent on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 3 (2.125 ± 0.342, n = 16).

ALATE VIVIPAROUS FEMALE. Colour when alive: brownish green to dark green. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen pale with lateral, post-siphuncular sclerites, broken dorsal bars on abdominal segment VI and transverse dorsal band on VII and VIII dark brown.

Morphology. Body length 1.32 - 2.64 (1.719 ± 0.383, n = 10) mm. Antennae six-segmented, imbricated, 0.90 - 1.34 (1.107 ± 0.142, n = 10) mm long. Length of antennal segments (in mm): III, 0.28 - 0.43 (0.364 ± 0.046, n = 10); IV, 0.10 - 0.19 (0.152 ± 0.026, n = 10); V, 0.12 - 0.18 (0.145 ± 0.017, n = 10); VI, 0.09 - 0.13 (0.108 ± 0.012, n = 10) + 0.20 - 0.29 (0.240 ± 0.032, n = 10). Longest setae on antennal segment III 0.012 - 0.018 (0.014 ± 0.003, n = 10) mm. Secondary sensoria 28 - 56 (41.80 ± 8.173,

n = 20) somewhat tuberculated on antennal segment III; 5 - 11 (9.10 ± 2.245, n = 20) on IV; 0 - 6 (1.90 ± 1.52, n = 20) on V. Rostrum reaching to middle coxae; rostral IV + V 0.08 - 0.10 (0.087 ± 0.008, n = 10) mm long, with 2 accessory setae. Length of hind tibiae 0.62 - 0.93 (0.786 ± 0.105, n = 10) mm; of hind tarsal II 0.08 - 0.10 (0.089 ± 0.009, n = 10) mm. Cornicles tapering, imbricated, 0.10 - 0.21 (0.155 ± 0.037, n = 10) mm long. Cauda fingertip-shaped 0.10 - 0.16 (0.136 ± 0.018, n = 10) mm long, with 8 - 11 (9.10 ± 0.876, n = 10) setae. Lateral tubercles prominent on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 2 - 3 (2.3 ± 0.483, n = 10).

OVIPARA. Colour when alive: not observed. Colour when macerated: much the same as for apterous viviparous female except basal half of hind tibiae swollen with numerous pseudosensoria. Body length 1.33 - 1.35 (1.34 ± 0.014, n = 2) mm. Antennae six-segmented, imbricated, 0.76 - 0.80 (0.78 ± 0.028, n = 2) mm long. Length of antennal segments (in mm): III, 0.19 - 0.21 (0.20 ± 0.014, n = 2); IV, 0.09 - 0.09; V, 0.08 - 0.11 (0.095 ± 0.021, n = 2); VI, 0.09 - 0.09 + 0.20 - 0.20. Longest setae on antennal segment III 0.006 - 0.010 (0.008 ± 0.003, n = 2) mm long. Rostral IV + V 0.09 - 0.09 mm long with 2 accessory setae. Length of hind tibiae 0.49 - 0.50

(0.495 ± 0.007, n = 2) mm; of hind tarsal II 0.08 - 0.08 mm. Cornicles tapering, imbricated 0.13 - 0.13 mm long. Cauda bluntly tapering, 0.12 - 0.12 mm long, with 13 setae. Setae on abdominal segment VIII dorsally 8 - 10 (9.0 ± 1.414, n = 2).

ALATE MALE. Colour when alive: not observed. Colour when macerated much the same as for alate viviparous female. Body length 1.14 - 1.37 (1.255 ± 0.084, n = 6) mm. Antennae six-segmented, imbricated, 0.91 - 1.03 (0.958 ± 0.04, n = 6) mm long. Length of antennal segments (in mm): III, 0.27 - 0.32 (0.293 ± 0.019, n = 6); IV, 0.13 - 0.15 (0.142 ± 0.008, n = 6); V, 0.13 - 0.15 (0.137 ± 0.010, n = 6); VI, 0.09 - 0.11 (0.093 ± 0.008, n = 6) + 0.19 - 0.22 (0.21 ± 0.013, n = 6). Longest setae on antennal segment III, 0.012 - 0.016 (0.013 ± 0.002, n = 6) mm. Secondary sensoria 36 - 43 (40 ± 2.486, n = 12) on antennal segment III; 8 - 15 (12.417 ± 2.234, n = 12) on IV; 3 - 11 (7.417 ± 2.353, n = 12) on V; occasionally 1 on base of VI. Rostral IV + V 0.08 - 0.09 (0.087 ± 0.005, n = 6) mm long, with 2 accessory setae. Length of hind tibiae 0.50 - 0.62 (0.567 ± 0.042, n = 6) mm; of hind tarsal II 0.08 - 0.09 (0.082 ± 0.004, n = 6) mm. Cornicles cylindrical, imbricated, 0.08 - 0.09 (0.082 ± 0.004, n = 6) mm long. Cauda tapering 0.08 - 0.09 (0.082 ± 0.004, n = 6) mm long, with 7 - 11 (9.0 ± 1.41, n = 6) setae. Setae on abdominal

segment VIII dorsally 2.

TYPES. Lectotype is in the Oestlund Collection, University of Minnesota.

HOST PLANTS. Cicuta maculata; Thaspium barbinode; Zizia aurea.

COMMENTS. Hottes and Frison (1931) apparently were unaware of thaspii when they described Aphis signatis. Two slides of thaspii collected as "23/86, Hennepin Co., Minn. 1886" by O.W. Oestlund, one of them marked with a red star, were borrowed from the University of Minnesota. The specimens were cleared and remounted, and one slide containing one alate viviparous female from the slide with the red star has been designated as a lectotype slide. Paratypes of signatis were borrowed from the USNM, British Museum (Natural History) and Illinois Natural History Survey. No reliable differences could be found between signatis and thaspii, and it is our opinion that signatis is a synonym of thaspii.

The life history in Manitoba has not been studied, but it probably spends the winter in the egg stage on one of its biennial or perennial umbelliferous host plants, because males and oviparae have been collected on them.

MANITOBA SPECIMENS EXAMINED. 50 apterae; 11 alatae; 2 oviparae; 6 males.

Birds Hill Park, 22 August 1974.

Winnipeg, 11 July 1967; 28 June 1974.

Aphis varians Patch

Figs. 472-484

Aphis varians Patch 1914, p. 50, and 1927, p. 4; Gillette and Palmer 1932, p. 452; Allen and Knowlton 1939, p. 129; Palmer 1952, p. 183; Robinson and Bradley 1965, p. 40, and 1968, p. 61; Hille Ris Lambers 1974, p. 121.

FUNDATRIX. Colour when alive: green. Colour when macerated: head, antennae (except antennal segments III + IV and base of V pale), tips of cornicles, cauda, anal and genital plates brown.

Morphology. Body length 1.60 - 1.85 (1.77 ± 0.115, n = 4) mm. Antennae five-segmented, imbricated 0.65 - 0.70 (0.67 ± 0.022, n = 4) mm long. Length of antennal segments (in mm): III + IV, 0.22 - 0.22; V, 0.11 - 0.12 (0.113 ± 0.005, n = 4); VI, 0.09 - 0.10 (0.093 ± 0.005, n = 4) + 0.13 - 0.15 (0.138 ± 0.010, n = 4). Longest setae on antennal segment III 0.038 - 0.051 (0.045 ± 0.006, n = 4) mm. Rostrum reaching to middle coxae; rostral IV + V 0.12 - 0.14 (0.133 ± 0.010, n = 4) mm long, with 4 - 6 (5.25 ± 0.957, n = 4) accessory setae. Length of hind tibiae 0.64 - 0.69 (0.663 ± 0.021, n = 4); of

hind tarsal II 0.08 - 0.08 mm. Cornicles tapering, imbricated, 0.21 - 0.22 (0.215 ± 0.006, n = 4) mm long. Cauda tapering 0.18 - 0.21 (0.198 ± 0.015, n = 4) mm long, with 10 - 11 (10.5 ± 0.577, n = 4) setae. Prominent lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 4 - 5 (4.75 ± 0.50, n = 4).

APTEROUS VIVIPAROUS FEMALE. Colour when alive: yellowish brown to yellowish green to deep green. Colour when macerated: head, antennae (except antennal segments III and base of IV pale), thoracic lateral sclerites, tips of cornicles, cauda, anal and genital plates brown. Abdomen pale with lateral, post-siphuncular sclerites and transverse dorsal bar on abdominal segment VIII light brown.

Morphology. Body length 1.76 - 2.16 (2.0 ± 0.13, n = 9) mm. Antennae six-segmetned, imbricated, 1.02 - 1.32 (1.184 ± 0.094, n = 9) mm long. Length of antennal segments (in mm): III, 0.23 - 0.32 (0.292 ± 0.033, n = 9); IV, 0.16 - 0.26 (0.208 ± 0.032, n = 9); V, 0.14 - 0.21 (0.186 ± 0.022, n = 9); VI, 0.11 - 0.15 (0.126 ± 0.012, n = 9) + 0.18 - 0.26 (0.236 ± 0.024, n = 9) longest setae on antennal segment III 0.045 - 0.065 (0.054 ± 0.008, n = 9) mm. Rostrum reaching between middle and

hind coxae; rostral IV + V 0.13 - 0.16 (0.150 ± 0.011, n = 9) mm long, with 5 - 7 (5.556 ± 0.726, n = 9) accessory setae. Length of hind tibiae 0.84 - 1.03 (0.931 ± 0.070, n = 9) mm; of hind tarsal II, 0.10 - 0.11 (0.107 ± 0.005, n = 9) mm. Cornicles tapering, imbricated, 0.29 - 0.40 (0.344 ± 0.040, n = 9) mm long. Cauda slightly fingertip-shaped, 0.21 - 0.26 (0.232 ± 0.018, n = 9) mm long, with 10 - 17 (13.00 ± 2.345, n = 9) setae. Lateral tubercles large and prominent on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 4 - 7 (6.333 ± 1.414, n = 9).

ALATE VIVIPAROUS FEMALE. Colour when alive: deep green to dark brown. Colour when macerated: head, antennae, thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen pale, with lateral, post-siphuncular sclerites and transverse dorsal band on abdominal segments VII and VIII dark brown.

Morphology. Body length 1.43 - 2.22 (1.988 ± 0.243, n = 10) mm. Antennae six-segmented, imbricated, 1.16 - 1.48 (1.332 ± 0.103, n = 10) mm long. Length of antennal segments (in mm): III, 0.27 - 0.37 (0.335 ± 0.036, n = 10); IV, 0.19 - 0.30 (0.240 ± 0.040, n = 10); V, 0.17 - 0.24 (0.205 ± 0.029, n = 10); VI, 0.12 - 0.16 (0.142 ± 0.014, n = 10) + 0.23 - 0.31 (0.279 ± 0.279, n

= 10). Longest setae on antennal segment III 0.045 - 0.056 (0.052 ± 0.006, n = 10) mm. Secondary sensoria 14 - 25 (20.0 ± 2.741, n = 20) irregular in size on antennal segment III; 7 - 12 (9.450 ± 1.468, n = 20) on IV; 0 - 7 (2.95 ± 2.089, n = 20) on V. Rostrum reaching to middle coxae; rostral IV + V 0.14 - 0.16 (0.146 ± 0.007, n = 10) mm long, with 5 - 6 (5.7 ± 0.483, n = 10) accessory setae. Length of hind tibiae 0.87 - 1.14 (1.030 ± 0.085, n = 10) mm; of hind tarsal II 0.10 - 0.11 (0.103 ± 0.005, n = 10) mm. Cornicles slightly tapering, imbricated, 0.20 - 0.28 (0.253 ± 0.031, n = 10) mm long. Cauda fingertip-shaped, 0.16 - 0.20 (0.188 ± 0.014, n = 10) mm long, with 11 - 17 (13.7 ± 2.003, n = 10) setae. Prominent lateral tubercles on prothorax and abdominal segment I and VII. Setae on abdominal segment VIII dorsally 5 - 9 (6.6 ± 1.578, n = 10).

TYPES. According to Palmer (1952) cotypes are in the Patch Collection, Orono, Maine.

HOST PLANTS. Epilobium angustifolium; Ribes sp.; Ribes oxyacanthoides.

COMMENTS. The characters given in the key were given by Hille Ris Lambers (in litt.) and they are referred to again in part by Hille Ris Lambers (1974, p. 121). If the

following characters are used it is not difficult to separate varians from other Aphis spp. on Ribes: 4 to 8 setae on abdominal tergite VIII, with the distance between the spinal pair very much greater than that to the nearest setae laterally; more than 3 accessory setae on rostral segment IV + V; longest setae on antennal segment III 0.035 - 0.070 mm. In Manitoba varians overwinters on both wild and cultivated Ribes spp., and in the summer may be commonly found on Epilobium angustifolium.

MANITOBA SPECIMENS EXAMINED. 4 fundatrices, 129 apterae; 51 alatae.

Caddy Lake, 16 July 1973.

Duck Mountain Provincial Park, 20 July 1973; 21 July 1973.

Julius, 30 July 1974.

Pinawa, 8 August 1974.

Sandilands Provincial Forest, 12 July 1973; 16 August 1973.

Winnipeg, 19 May 1964; 7 July 1965.

Aphis whiteshellensis Rojanavongse and Robinson new species

Figs. 485-504

FUNDATRIX. Colour when alive: reddish brown. Colour when macerated: head, antennae (except antennal segments III, IV and base of V pale), thoracic lateral sclerites, cornicles, cauda, anal and genital plates dark brown. Abdomen pale with transverse dorsal bar on abdominal segments VII and VIII brown.

Morphology. Body length 1.50 - 1.94 (1.767 ± 0.110, n = 15) mm. Antennae five-segmented, imbricated, 0.66 - 0.86 (0.757 ± 0.063, n = 15) mm long. Length of antennal segments (in mm): III + IV, 0.29 - 0.34 (0.309 ± 0.016, n = 15); V, 0.13 - 0.15 (0.136 ± 0.008, n = 15); VI, 0.09 - 0.12 (0.104 ± 0.009, n = 15) + 0.11 - 0.13 (0.121 ± 0.008, n = 15). Longest setae on antennal segment III 0.050 - 0.060 (0.056 ± 0.006, n = 15) mm. Rostrum reaching to middle coxae; rostral IV + V 0.11 - 0.13 (0.121 ± 0.005, n = 15) mm long, with 2 accessory setae. Length of hind tibiae 0.72 - 0.79 (0.759 ± 0.018, n = 15) mm; of hind tarsal II 0.09 - 0.11 (0.099 ± 0.006, n = 15) mm. Cornicles tapering, imbricated, 0.10 - 0.13 (0.117 ± 0.008, n = 15) mm long. Cauda tapering, 0.11 -

0.14 (0.124 ± 0.009, n = 15) mm long, with 8 - 12 (9.47 ± 0.743, n = 15) setae. Large lateral tubercles prominent on prothorax and abdominal segments I and VII. Small lateral tubercles usually present on other abdominal segments. Setae on abdominal segment VIII dorsally 2 - 5 (4.13 ± 0.743, n = 15).

APTEROUS VIVIPAROUS FEMALE. Colour when alive: reddish brown. Colour when macerated: head, antennae (except antennal segments III, IV and base of V pale), thoracic lateral sclerites, cornicles, cauda. anal and genital plates dark brown. Abdomen pale with transverse dorsal bars on abdominal segments VII and VIII brown.

Morphology. Body length 1.50 - 1.79 (1.743 ± 0.099, n = 15) mm. Antennae six-segmented, imbricated, 0.90 - 1.13 (1.019 ± 0.067, n = 15) mm long. Length of antennal segments (in mm): III, 0.21 - 0.32 (0.256 ± 0.034, n = 15); IV, 0.13 - 0.19 (0.151 ± 0.016, n = 15); V, 0.15 - 0.18 (0.157 ± 0.000, n = 15); VI, 0.11 - 0.13 (0.117 ± 0.007, n = 15) + 0.18 - 0.22 (0.203 ± 0.011, n = 15). Longest setae on antennal segment III 0.050 - 0.070 (0.064 ± 0.007, n = 15) mm. Rostrum reaching between middle and hind coxae; rostral IV + V 0.12 - 0.13 (0.125 ± 0.005, n = 15) mm long, with 2 accessory setae. Length of hind tibiae 0.74 - 0.93 (0.827 ± 0.052, n = 15) mm;

of hind tarsal II 0.10 - 0.10 mm. Cornicles slightly tapering, imbricated, 0.11 - 0.15 (0.133 ± 0.014, n = 15) mm long. Cauda tapering 0.11 - 0.16 (0.141 ± 0.014, n = 15) mm long, with 7 - 11 (9.27 ± 1.16, n = 15) setae. Large lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 3 - 6 (4.33 ± 0.724, n = 15).

ALATE VIVIPAROUS FEMALE. Colour when alive: reddish brown to dark brown. Colour when macerated: head, antennae (except base of antennal segments IV and V pale), thorax, cornicles, cauda, anal and genital plates dark brown. Abdomen pale with lateral, post-siphuncular sclerites, broken dorsal bars on abdominal segments VI and VII, and transverse dorsal band on abdominal segment VIII brown.

Morphology. Body length 1.50 - 1.93 (1.681 ± 0.146, n = 15) mm. Antennae six-segmented, imbricated, 1.04 - 1.21 (1.133 ± 0.06, n = 15) mm long. Length of antennal segments (in mm): III, 0.28 - 0.35 (0.311 ± 0.22, n = 15); IV, 0.16 - 0.20 (0.178 ± 0.013, n = 15); V, 0.15 - 0.20 (0.171 ± 0.016, n = 15); VI, 0.11 - 0.13 (0.125 ± 0.006, n = 15) + 0.19 - 0.24 (0.210 ± 0.013, n = 15). Longest setae on antennal segment III 0.040 - 0.060 (0.050 ± 0.005, n = 15) mm. Secondary sensoria 9 - 16

(12.2 ± 1.79, n = 30) irregular in size on antennal segment III; 0 - 2 (0.722 ± 0.752, n = 30) on IV. Rostrum reaching between middle and hind coxae; rostral IV + V 0.12 - 0.13 (0.121 ± 0.004, n = 15) mm long, with 2 - 3 (2.4 ± 0.507, n = 15) accessory setae. Length of hind tibiae 0.79 - 0.96 (0.88 ± 0.057, n = 15) mm; of hind tarsal II 0.10 - 0.11 (0.104 ± 0.005, n = 15) mm long. Cornicles tapering, imbricated, 0.08 - 0.14 (0.119 ± 0.018, n = 15) mm long. Cauda tapering, 0.10 - 0.14 (0.120 ± 0.014, n = 15) mm long, with 7 - 9 (8.533 ± 0.639, n = 15) setae. Large lateral tubercles on prothorax and abdominal segments I and VII. Setae on abdominal segment VIII dorsally 4 - 6 (4.4 ± 0.63, n = 15).

OVIPARA. Colour when alive: reddish brown. Colour when macerated much the same as for apterous viviparous female except hind tibiae with few pseudosensoria on distal portion. Body length 1.67 - 1.94 (1.81 ± 0.107, n = 15) mm. Antennae six-segmented, imbricated, 0.93 - 1.08 (0.984, ± 0.051, n = 15) mm long. Length of antennal segments (in mm): III, 0.22 - 0.28 (0.247 ± 0.019, n = 15); IV, 0.12 - 0.16 (0.147 ± 0.012, n = 15); V, 0.13 - 0.17 (0.152 ± 0.01, n = 15); VI, 0.11 - 0.13 (0.116 ± 0.006, n = 15) + 0.17 - 0.21 (0.185 ± 0.015, n = 15). Longest setae on antennal segment III 0.068 - 0.090 (0.081 ± 0.007, n = 15) mm. Rostral IV + V 0.12 - 0.13

(0.125 ± 0.005, n = 15) mm long, with 2 accessory setae. Length of hind tibiae 0.70 - 0.82 (0.751 ± 0.038, n = 15) mm; of hind tarsal II 0.10 - 0.12 (0.105 ± 0.007, n = 15) mm. Cornicles tapering, imbricated, 0.10 - 0.13 (0.11 ± 0.01, n = 15) mm long. Cauda tapering, 0.12 - 0.15 (0.135 ± 0.007, n = 15) mm long, with 7 - 11 (9.6 ± 1.40, n = 15) setae. Setae on abdominal segment VIII dorsally 5 - 8 (6.07 ± 0.88, n = 15).

APTEROUS MALE. Colour when alive: reddish brown. Colour when macerated much the same as for alate viviparous female. Body length 1.15 - 1.40 (1.26 ± 0.103, n = 4) mm. Antennae six-segmented, imbricated, 0.84 - 0.92 (0.863, ± 0.039, n = 4) mm long. Length of antennal segments (in mm); III, 0.22 - 0.25 (0.233 ± 0.013, n = 4); IV, 0.14 - 0.15 (0.145 ± 0.006, n = 4); V, 0.13 - 0.15 (0.135 ± 0.01, n = 4); VI, 0.08 - 0.10 (0.088 ± 0.01, n = 4) ± 0.15 - 0.16 (0.155 ± 0.006, n = 4). Longest setae on antennal segment III 0.036 - 0.054 (0.049 ± 0.009, n = 4) mm. Secondary sensoria 7 - 16 (12 ± 3.16, n = 8) on antennal segment III; 4 - 10 (6.0 ± 2.56, n = 8) on IV; 0 - 2 (1.0 ± 0.93, n = 8) on V. Rostral IV + V 0.10 - 0.11 (0.108 ± 0.005, n = 4) mm long, with 2 accessory setae. Length of hind tibiae 0.50 - 0.70 (0.595 ± 0.08, n = 4) mm; of hind tarsal II 0.09 - 0.09 mm. Cornicles cylindrical, imbricated, 0.07 - 0.09 (0.075 ± 0.010, n = 4) mm long. Cauda tapering, 0.08

- 0.09 (0.085 ± 0.006, n = 4) mm long, with 6 - 8 (7.0 ± 0.82, n = 4) setae. Setae on abdominal segment VIII dorsally 3 - 5 (4.25 ± 0.957, n = 4).

TYPES. Holotype will be deposited in the Canadian National Collection.

HOST PLANTS. Amelanchier alnifolia.

COMMENTS. This new species is found in tightly curled leaves at the end of small branches of the host plants, often in mixed colonies with a lace bug, Corythucha sp. It apparently spends its life cycle on Amelanchier.

MANITOBA SPECIMENS EXAMINED. 43 fundatrices; 98 apterae; 87 alatae; 70 oviparae; 4 males.

Caddy Lake, 16 July 1973; 10 June 1974; 4 September 1974; 5 September 1975.

Pinawa, 12 July 1971.

Red Rock Lake, 28 August 1963.

Chapter VIII

HOST INDEX OF MANITOBA PLANTS

Agastache foeniculum (Pursh) Ktze.

Aphis neomonardae Rojanavongse and Robinson new species

Achillea millefolium L.

Aphis armoraciae Cowen

Aphis fabae Scopoli

Alisma sp.

Aphis nasturtii Kaltenbach

Amelanchier sp.

Aphis pomi De Geer

Amelanchier alnifolia Nutt

Aphis whiteshellensis Rojanavongse and Robinson new species

Apocynum androsaemifolium L.

Aphis asclepiadis Fitch

Apocynum sibiricum Jacq.

Aphis asclepiadis Fitch

Arctium minus L.

Aphis fabae Scopoli

Artemisia sp.

Aphis armoraciae Cowen

Artemisia frigida Willd.

Aphis armoraciae Cowen

Asclepias sp.

Aphis asclepiadis Fitch

Aster sp.

Aphis fabae Scopoli

Bidens sp.

Aphis gossypii Glover

Aphis nasturtii Kaltenbach

Bidens cernua L.

Aphis ribiensis Gillette and Palmer

Bidens frondosa L.

Aphis fabae Scopoli

Ceanothus ovatus Desf.

Aphis ceanothi Clarke

Cirsium arvense L.

Aphis fabae Scopoli

Chrysanthemum sp.

Aphis spiraecola Patch

Cicuta maculata L.

Aphis heraclella Davis

Aphis saniculae Williams

Aphis thaspii Oestlund

Cornus stolonifera Michx.

Aphis corniella (Hille Ris Lambers)

Aphis helianthi Monell

Aphis maculatae Oestlund

Aphis neogillettei Palmer

Cosmos sp.

Aphis spiraecola Patch

Cotoneaster acutifolia Turcz.

Aphis pomi De Geer

Aphis spiraecola Patch

Crataegus sp.

Aphis pomi De Geer

Cucumis sp.

Aphis gossypii Glover

Dahlia sp.

Aphis fabae Scopoli

Diervilla lonicera Mill.

Aphis gossypii Glover

Epilobium angustifolium L.

Aphis corniella (Hille Ris Lambers)

Aphis oenotherae Oestlund

Aphis varians Patch

Epilobium latifolium L.

Aphis nivalis Hille Ris Lambers

Fragaria sp.

Aphis forbesi Weed

Galium boreale L.

Aphis gossypii Glover

Gladiolus sp.

Aphis fabae Scopoli

Hedysarum alpinum L. var. americanum Michx.

Aphis astragalina Hille Ris Lambers

Helianthus sp.

Aphis helianthi Monell

Heracleum lanatum Michx.

Aphis decepta Hottes and Frison

Aphis heraclella Davis

Lilium sp.

Aphis fabae Scopoli

Malus spp.

Aphis pomi De Geer

Matricaria matricarioides (Less) Porter

Aphis spiraecola Patch

Monarda fistulosa L.

Aphis gossypii Glover

Aphis neomonardae Rojanavongse and Robinson new species

Oenothera spp.

Aphis oestlundi Gillette

Oenothera biennis L.

Aphis oenotherae Oestlund

Oenothera parviflora L.

Aphis oenotherae Oestlund

Aphis oestlundi Gillette

Oxytropis campestris L.

Aphis masoni Richards

Pastinaca sativa L.

Aphis heraclella Davis

Philadelphus sp.

Aphis fabae Scopoli

Philadelphus coronarius L.

Aphis fabae Scopoli

Polygonum sp.

Aphis nasturtii Kaltenbach

Polygonum aviculare L.

Aphis nasturtii Kaltenbach

Populus spp.

Aphis maculatae Oestlund

Populus tremuloides Michx.

Aphis maculatae Oestlund

Potentilla tridentata Ait.

Aphis gossypii Glover

Prunus sp.

Aphis pomi De Geer

Aphis spiraecola Patch

Rhamnus sp.

Aphis pomi De Geer

Rhamnus alnifolia L'Hér

Aphis nasturtii Kaltenbach

Rheum rhaponticum L.

Aphis fabae Scopoli

Ribes sp. (gooseberry)

Aphis neomexicana (Cockerell)

Ribes sp. (currants)

Aphis bulleri Robinson and Rojanavongse new species

Aphis manitobensis Robinson and Rojanavongse new species

Aphis ribiensis Gillette and Palmer

Aphis varians Patch

Ribes oxyacanthoides L.

Aphis varians Patch

Rubus sp.

Aphis rubicola Oestlund

Rudbeckia serotina Nutt.

Aphis armoraciae Cowen

Rumex sp.

Aphis nasturtii Kaltenbach

Rumex crispus L.

Aphis fabae Scopoli

Aphis rumicis Linnaeus

Rorippa sp.

Aphis nasturtii Kaltenbach

Sagittaria sp.

Aphis nasturtii Kaltenbach

Salix spp.

Aphis farinosa Gmelin

Sanicula marilandica L.

Aphis saniculae Williams

Sedum oreganum Nutt.

Aphis sedi Kaltenbach

Senecio pauperculus Michx.

Aphis duckmountainensis Rojanavongse and Robinson new species.

Senecio vulgaris L.

Aphis fabae Scopoli

Sium sp.

Aphis heraclella Davis

Sium suave Walt.

Aphis heraclella Davis

Spiraea sp.

Aphis pomi De Geer

Aphis spiraecola Patch

Aphis spiraephila Patch

Sorbus sp.

Aphis pomi De Geer

Sorbus americana Marsh

Aphis spiraecola Patch

Taraxacum officinale Weber

Aphis armoraciae Cowen

Aphis knowltoni Hottes and Frison

Thalictrum sp.

Aphis spiraecola Patch

Thaspium barbinode (Michx.) Nutt.

Aphis thaspii Oestlund

Tropaeolum majus L.

Aphis fabae Scopoli

Urtica dioica L.

Aphis spiraecola Patch

Viburnum opulus L.

Aphis fabae Scopoli

Aphis spiraecola Patch

Vicia cracca L.

Aphis craccae L.

Zinnia sp.

Aphis fabae Scopoli

Aphis spiraecola Patch

Zizia aurea (L.) Koch

Aphis heraclella Davis

Aphis saniculae Williams

Aphis thaspii Oestlund

Chapter IX

SUMMARY

Chapter I mentions briefly the economic importance of aphids, especially those belonging to the genus Aphis L. The purpose and scope of the study are also discussed.

In Chapter II the literature on the genus Aphis L. and some genera closely related to Aphis are reviewed.

Chapter III outlines collecting, clearing and mounting techniques that were used to obtain specimens and prepare them for study. The methods of drawings and measurements are discussed.

In Chapter IV polymorphism, biological variation, life history of a typical aphid and feeding sites of species of Aphis L. are discussed.

In Chapter V the external morphology of Aphis and terms used are described.

Chapter VI gives a key to the species of Aphis L. so far known for Manitoba.

Chapter VII reports in detail all the taxonomic information available for 37 species of Aphis from Manitoba. Five species are described as new: Aphis bulleri Robinson and Rojanavongse new species on Ribes sp., Aphis duckmountainensis Rojanavongse and Robinson new species on Senecio pauperculus Michx., Aphis manitobensis Robinson and Rojana-

vongse new species on Ribes sp., Aphis neomonardae Rojanavongse and Robinson new species on Agastache foeniculum (Pursh) Ktze. and Monarda fistulosa L., and Aphis whiteshellensis Rojanavongse and Robinson new species on Amelanchier alnifolia Nutt.

Other species of Aphis L. which are described are armoraciae Cowen, asclepiadis Fitch, astragalina Hille Ris Lambers, ceanothi Clarke, corniella (Hille Ris Lambers), craccae Linnaeus, decepta Hottes and Frison, fabae Scopoli, farinosa Gmelin, forbesi Weed, gossypii Glover, helianthi Monell, heraclella Davis, knowltoni Hottes and Frison, maculatae Oestlund, masoni Richards, nasturtii Kaltenbach, neogillettei Palmer, neomexicana (Cockerell), nivalis Hille Ris Lambers, oenotherae Oestlund, oestlundi Gillette, pomi DeGeer, ribiensis Gillette and Palmer, rubicola Oestlund, rumicis Linnaeus, saniculae Williams, sedi Kaltenbach, spiraecola Patch, spiraephila Patch, thaspii Oestlund and varians Patch.

Other important findings are as follows:

1. Aphis rubifolii (Thomas) has not yet been collected in Manitoba, and previous reports of its occurrence by Robinson and Bradley (1965, 1968) are erroneous. Collections reported as rubifolii should be properly referred to as Aphis rubicola Oestlund. A lectotype has been designated for rubicola, and several other slides as paralectotypes, in the University of Minnesota Collection.

2. Aphis monardae Oestlund is a synonym of Aphis gossypii Glover.

3. Aphis sanborni Patch and Aphis ribigillettei Knowlton and Allen are synonyms of Aphis neomexicana (Cockerell).

4. Aphis luridis Hottes and Frison is a synonym of Aphis saniculae Williams.

5. Aphis signatis Hottes and Frison is a synonym of Aphis thaspii Oestlund.

Many of the previous descriptions of fundatrices, alate and apterous viviparous females, and males and oviparae were inadequate. Some of these are described in this thesis in detail for the first time, from Manitoba material.

Chapter VIII gives a host plant list for the 37 species.

Illustrations for each of the species described in Chapter VII are placed together at the end of the Thesis.

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PLATE I

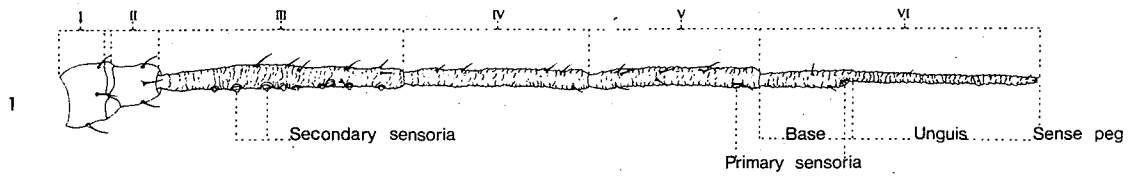
External morphology of alate viviparous female of *Aphis craccae* Linnaeus

Fig. 1. Antenna

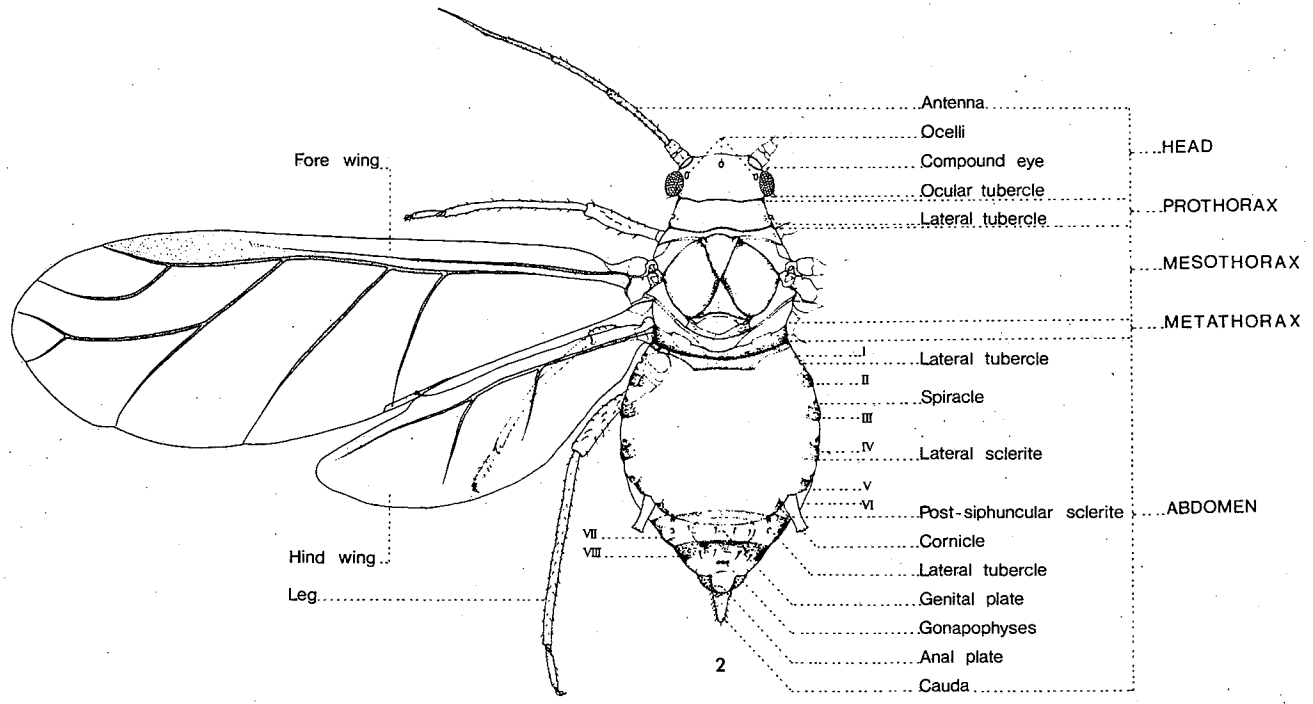
2. Dorsal view

3. Rostrum

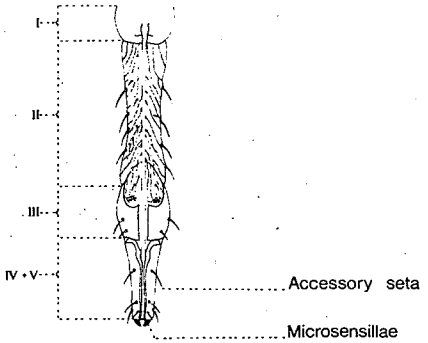
4. Hind tarsal segments


I
II
III
IV
V
VI
Secondary sensoria
Base
Unguis
Sense peg
Primary sensoria

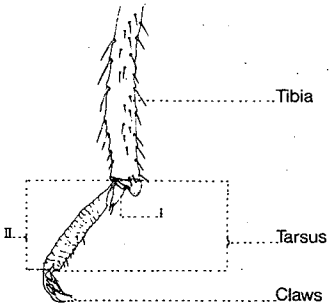
1


Antenna
Ocelli
Compound eye
Ocular tubercle
Lateral tubercle
Fore wing
Hind wing
Leg
HEAD
PROTHORAX
MESOTHORAX
METATHORAX
I
II
III
IV
V
VI
VII
VIII
Lateral tubercle
Spiracle
Lateral sclerite
Post-siphuncular sclerite
Cornicle
Lateral tubercle
Genital plate
Gonapophyses
Anal plate
Cauda
ABDOMEN

2


I
II
III
IV + V
Accessory seta
Microsensillae

3


Tibia
I
II
Tarsus
Claws

4

PLATE II

Aphis armoraciae Cowen

Apterous viviparous female

Figs. 5. Antenna

8. Hind leg

10. Dorsum

12. Cornicle

15. Rostral segment IV + V

16. Cauda

Alate viviparous female

6. Antenna

11. Dorsum

13. Cornicle

17. Cauda

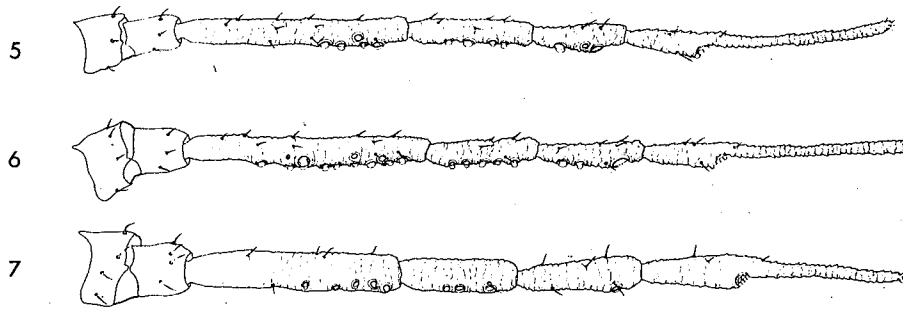
Ovipara

7. Antenna

9. Hind leg

14. Cornicle

18. Cauda



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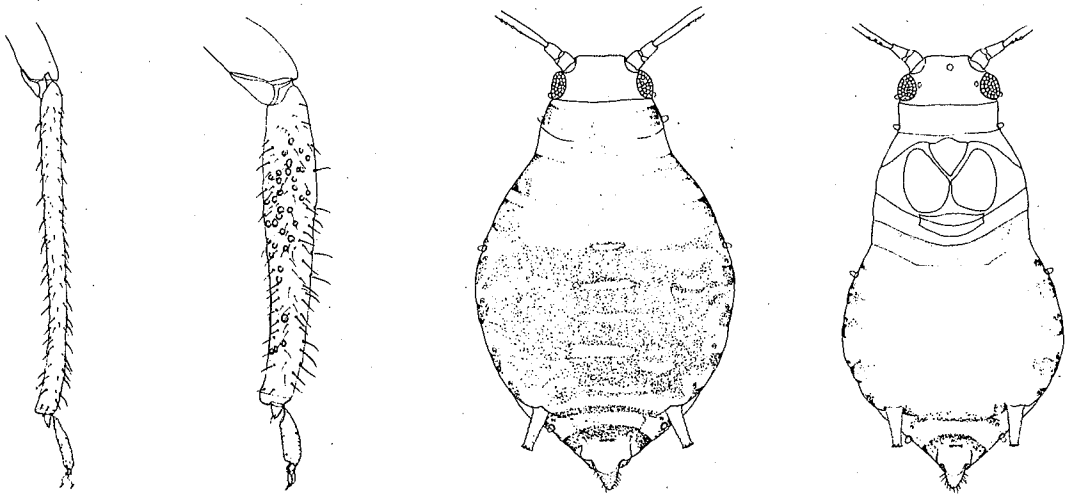
7

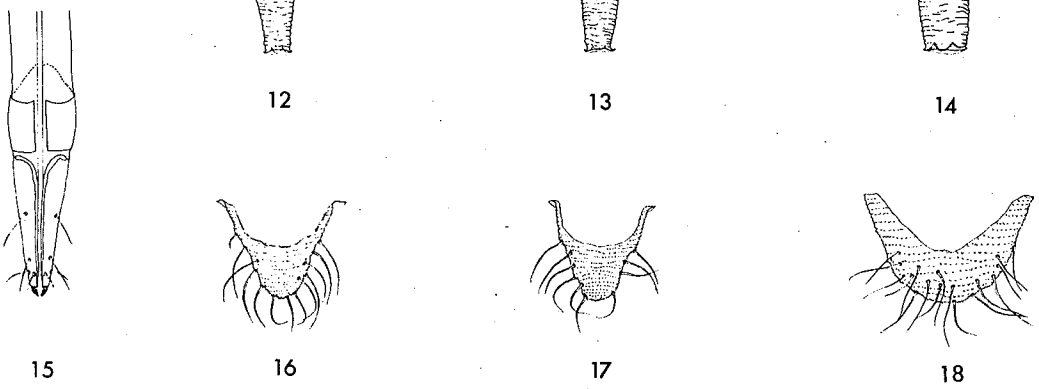


8

9

10

11



12

13

14

15

16

17

18

PLATE III

Aphis asclepiadis Fitch

Apterous viviparous female

Figs. 19. Antenna

21. Hind leg

22. Dorsum

24. Cornicle

26. Rostral segment IV + V

27. Cauda

Alate viviparous female

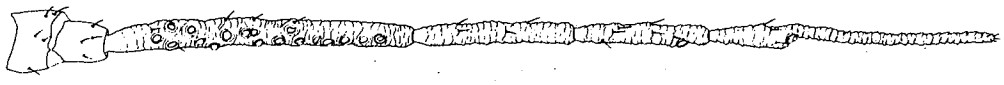
20. Antenna

23. Dorsum

25. Cornicle

28. Cauda

19



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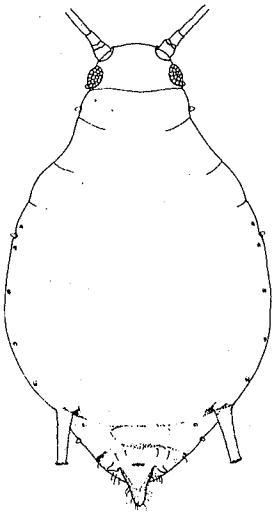

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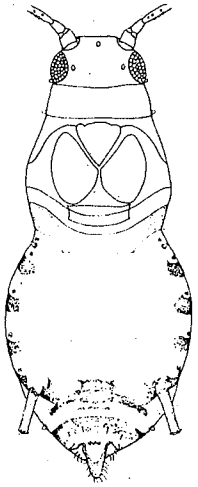

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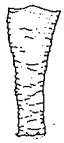

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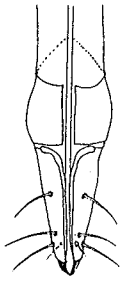

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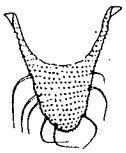

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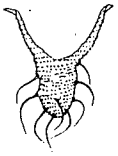


28

PLATE IV

Aphis astragalina Hille Ris Lambers

Apterous viviparous female

Figs. 29. Antenna

31. Hind leg

32. Dorsum

34. Cornicle

36. Rostral segment IV + V

37. Cauda

Alate viviparous female

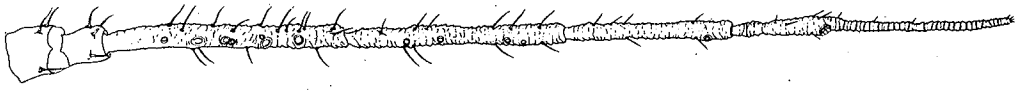
30. Antenna

33. Dorsum

35. Cornicle

38. Cauda

29



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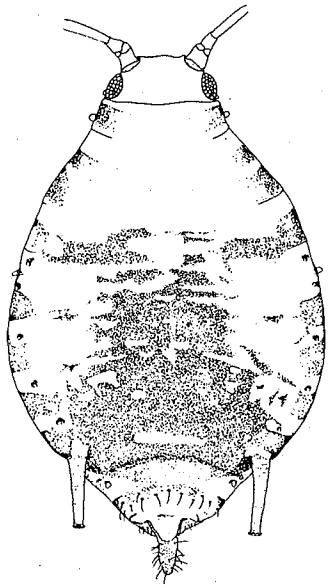

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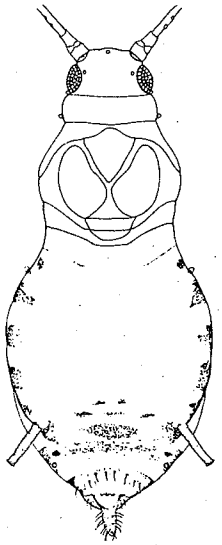

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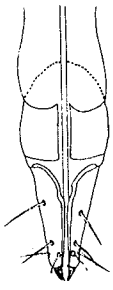

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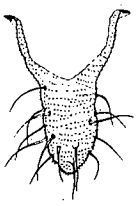

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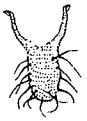


38

PLATE V

Aphis bulleri Robinson and Rojanavongse new species

Apterous viviparous female

Figs. 39. Antenna

41. Hind leg

42. Dorsum

44. Cornicle

46. Rostral segment IV + V

47. Cauda

Alate viviparous female

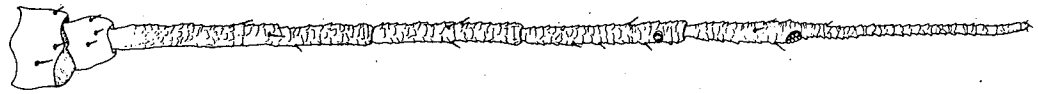
40. Antenna

43. Dorsum

45. Cornicle

48. Cauda

39



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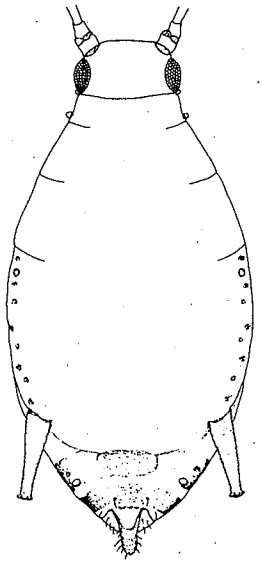

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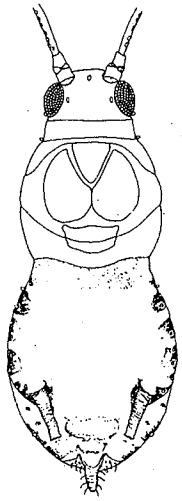

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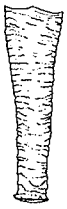

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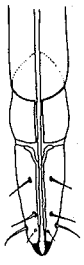

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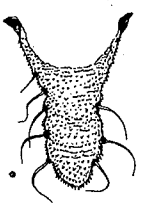

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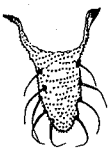


48

PLATE VI

Aphis ceanothi Clarke

Apterous viviparous female

Figs. 49. Antenna

52. Hind leg

54. Dorsum

55. Cornicle

58. Rostral segment IV + V

59. Cauda

Apterous male

50. Antenna

56. Cornicle

60. Cauda

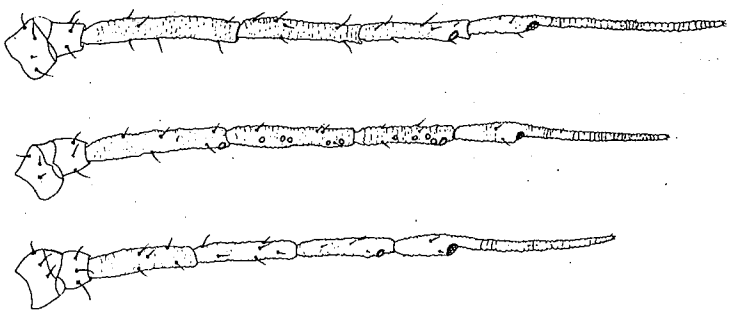
Ovipara

51. Antenna

53. Hind leg

57. Cornicle

61. Cauda



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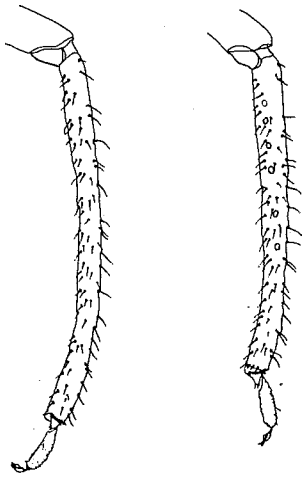

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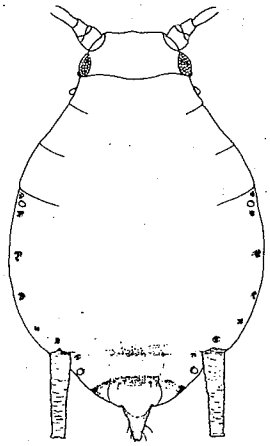

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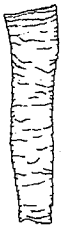

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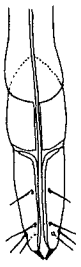

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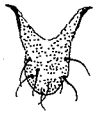


61

PLATE VII

Aphis corniella (Hille Ris Lambers)

Fundatrix

Figs. 62. Antenna
71. Cornicle
77. Cauda

Apterous viviparous female

63. Antenna
67. Hind leg
69. Dorsum
72. Cornicle
76. Rostral segment IV + V
78. Cauda

Alate viviparous female

64. Antenna
70. Dorsum
73. Cornicle
79. Cauda

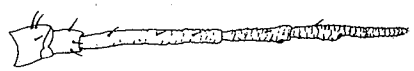
Alate male

65. Antenna
74. Cornicle
80. Cauda

Ovipara

66. Antenna
68. Hind leg
75. Cornicle
81. Cauda

62



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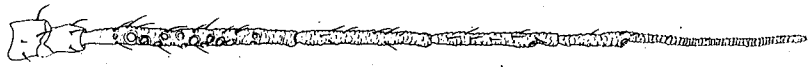

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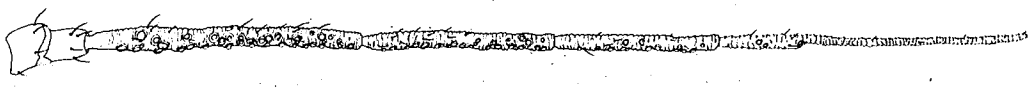

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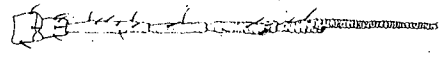

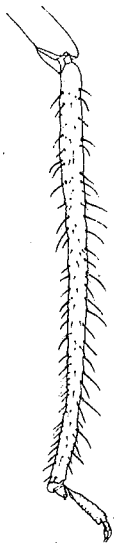

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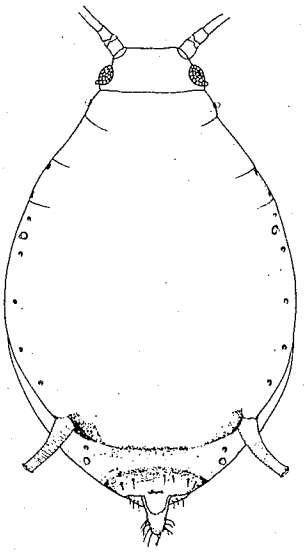

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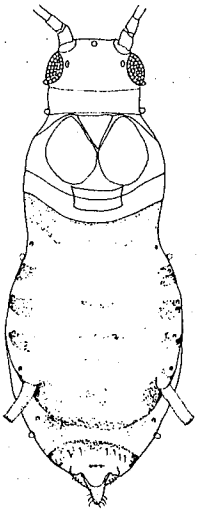

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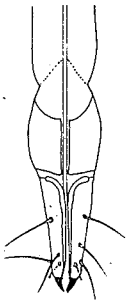

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71

72

73

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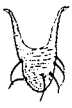

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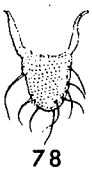

78

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80

81

PLATE VIII

Aphis craccae Linnaeus

Apterous viviparous female

Figs. 82. Antenna

84. Hind leg

85. Dorsum

87. Cornicle

89. Rostral segment IV + V

90. Cauda

Alate viviparous female

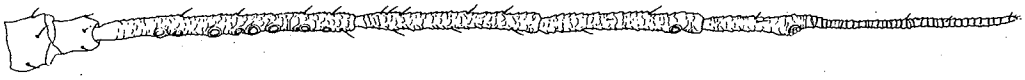
83. Antenna

86. Dorsum

88. Cornicle

91. Cauda

82



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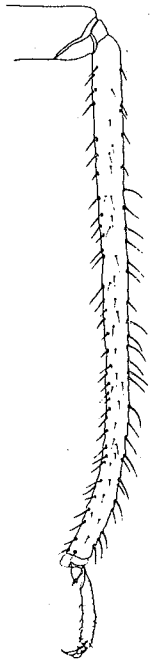

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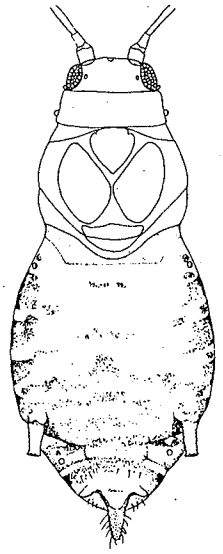

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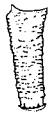

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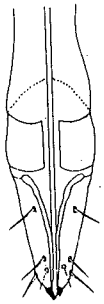

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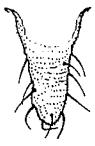


90

91

PLATE IX

Aphis decepta Hottes and Frison

Apterous viviparous female

Figs. 92. Antenna

94. Hind leg

95. Dorsum

97. Cornicle

99. Rostral segment IV + V

100. Cauda

Alate viviparous female

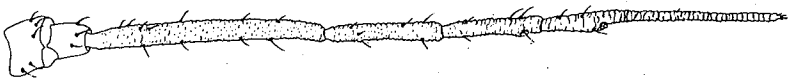
93. Antenna

96. Dorsum

98. Cornicle

101. Cauda

92



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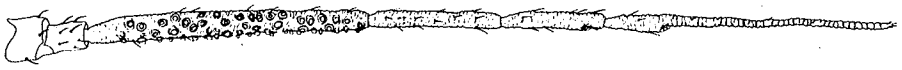

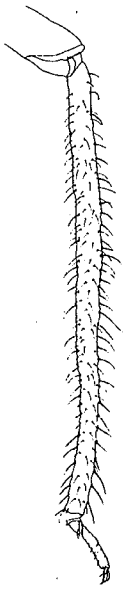

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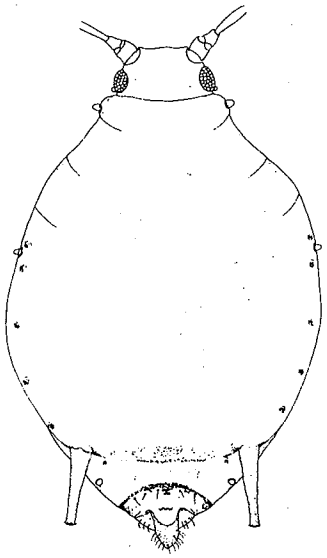

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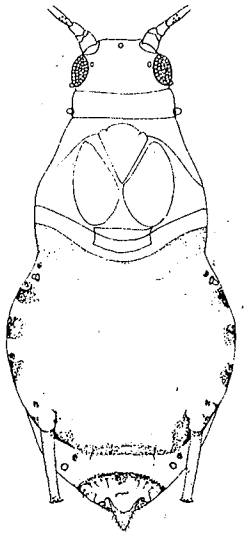

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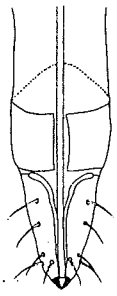

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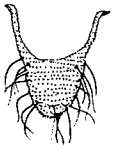


100

101

PLATE X

Aphis duckmountainensis Rojanavongse and Robinson new species

Apterous viviparous female

Figs. 102. Antenna

104. Hind leg

105. Dorsum

107. Cornicle

109. Rostral segment IV + V

110. Cauda

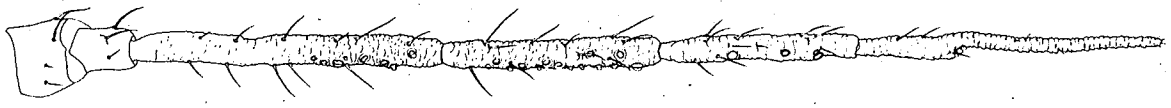
Alate viviparous female

Figs. 103. Antenna

106. Dorsum

108. Cornicle

111. Cauda



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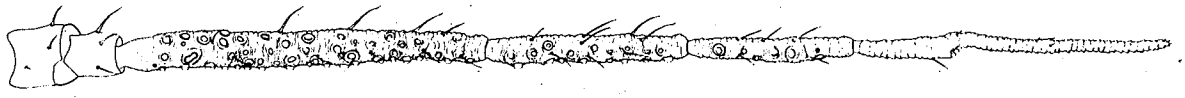

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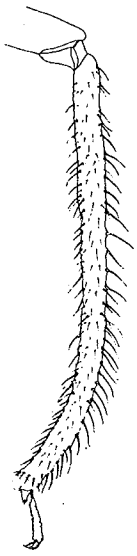

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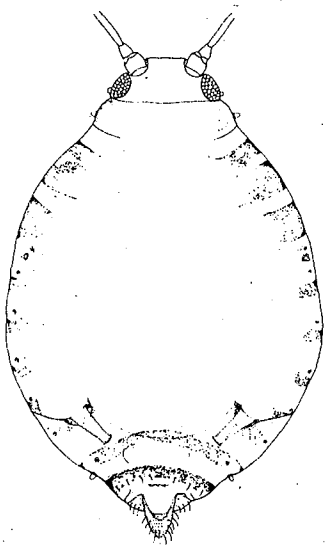

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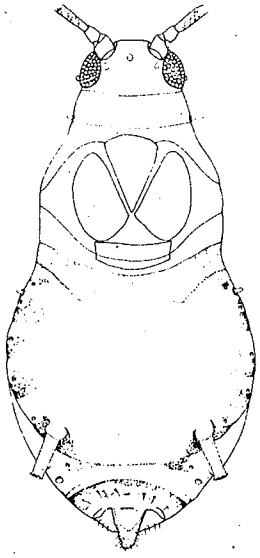

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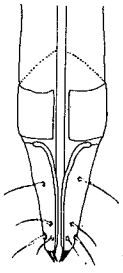

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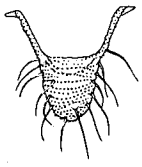
107

108



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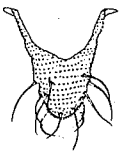


111

PLATE XI

Aphis fabae Scopoli

Fundatrix

Figs. 112. Antenna
121. Cornicle
127. Cauda

Apterous viviparous female

113. Antenna
117. Hind leg
119. Dorsum
122. Cornicle
126. Rostral segment IV + V
128. Cauda

Alate viviparous female

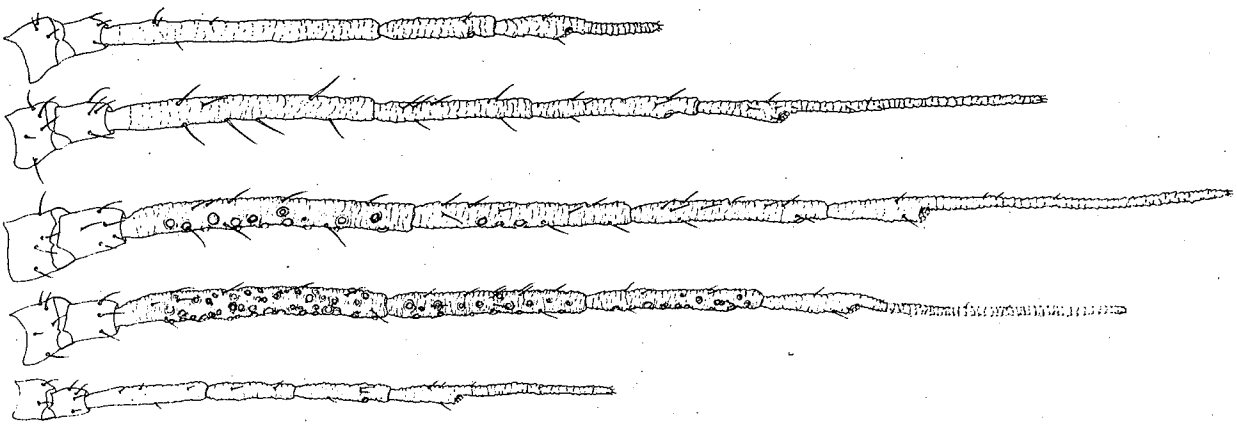
114. Antenna
120. Dorsum
123. Cornicle
129. Cauda

Alate male

115. Antenna
124. Cornicle
130. Cauda

Ovipara

116. Antenna
118. Hind leg
125. Cornicle
131. Cauda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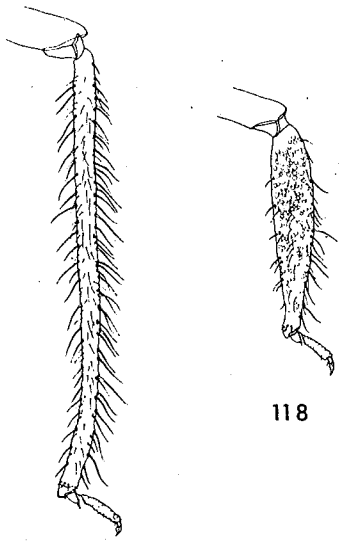
113
114
115
116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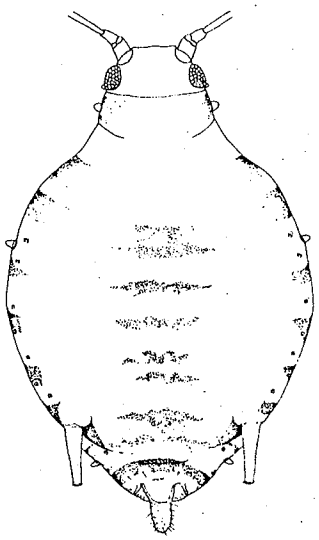
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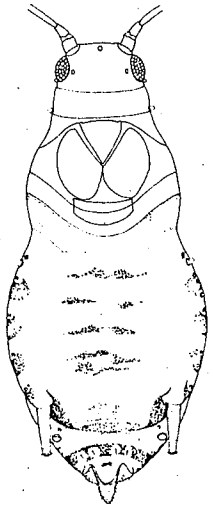
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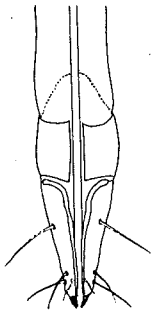
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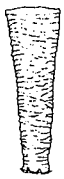
121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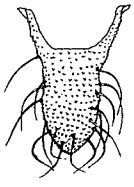
123


124


125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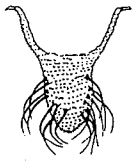
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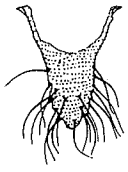
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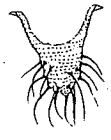
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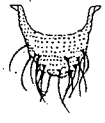

131

PLATE XII

Aphis farinosa Gmelin

Apterous viviparous female

Figs. 132. Antenna
136. Hind leg
138. Dorsum
140. Cornicle
144. Rostral segment IV + V
145. Cauda

Alate viviparous female

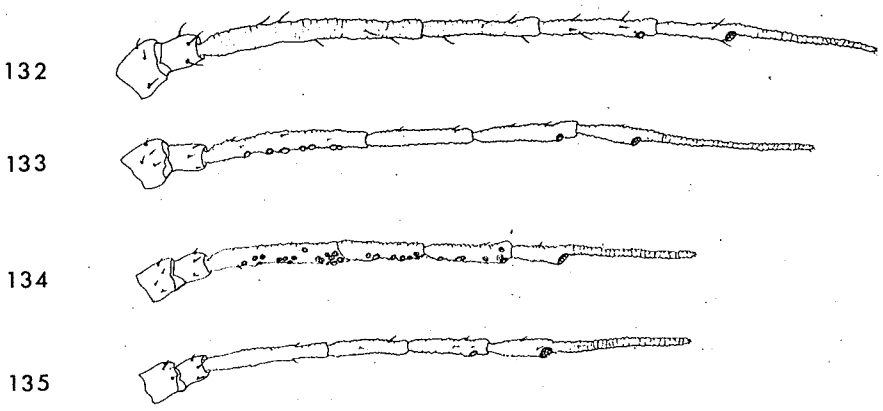
133. Antenna
139. Dorsum
141. Cornicle
146. Cauda

Apterous male

134. Antenna
142. Cornicle
147. Cauda

Ovipara

135. Antenna
137. Hind leg
143. Cornicle
148. Cauda



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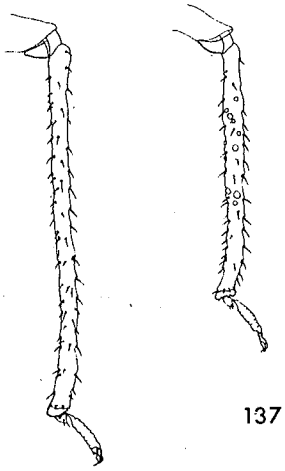
133

134

135



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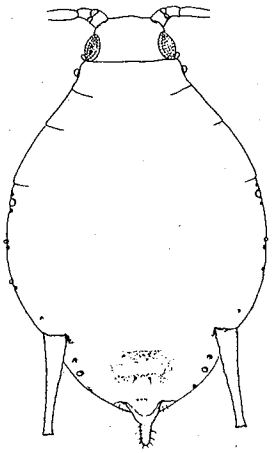

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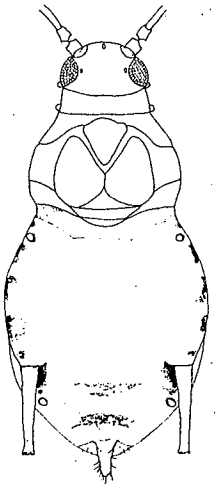

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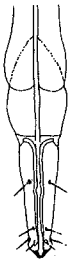

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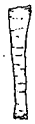

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142

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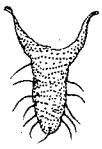

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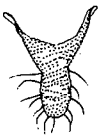

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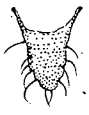


148

PLATE XIII

Aphis forbesi Weed

Apterous viviparous female

Figs. 149. Antenna

152. Hind leg

154. Dorsum

156. Cornicle

159. Rostral segment IV + V

160. Cauda

Alate viviparous female

150. Antenna

155. Dorsum

157. Cornicle

161. Cauda

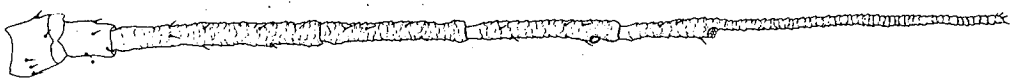
Ovipara

151. Antenna

153. Hind leg

158. Cornicle

162. Cauda



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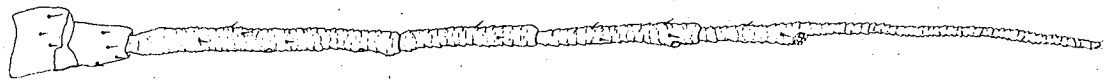

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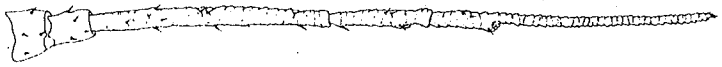

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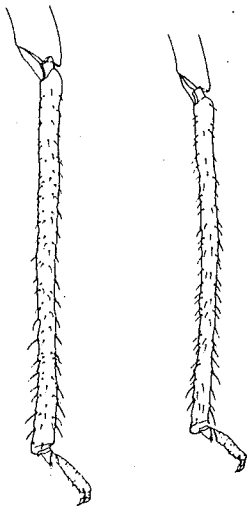

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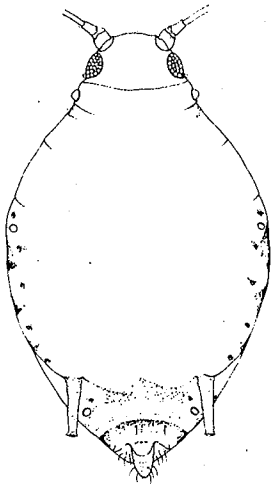

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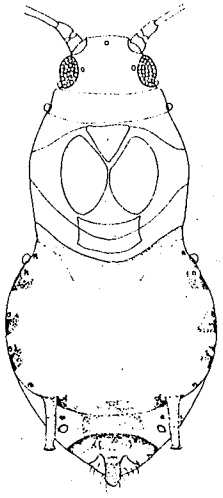

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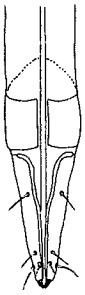

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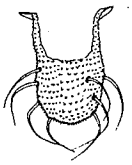
156

157

158



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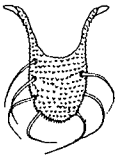

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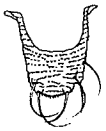


162

PLATE XIV

Aphis gossypii Glover

Apterous viviparous female

Figs. 163. Antenna

165. Hind leg

166. Dorsum

168. Cornicle

170. Rostral segment IV + V

171. Cauda

Alate viviparous female

Figs. 164. Antenna

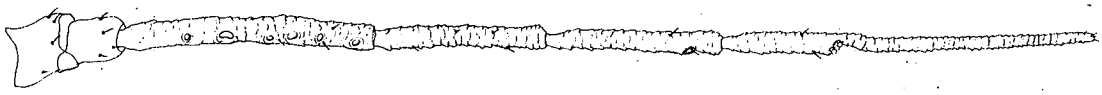
167. Dorsum

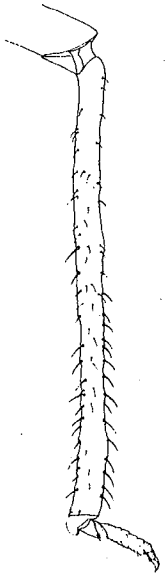
169. Cornicle

172. Cauda

163

164





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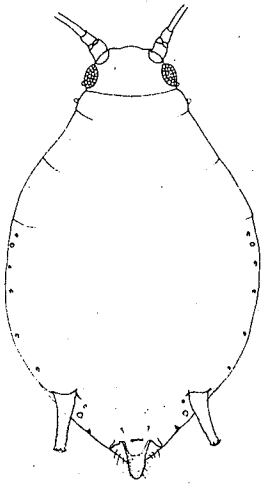

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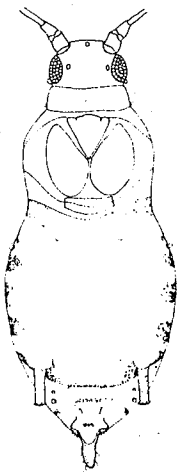

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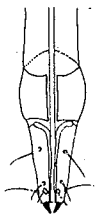

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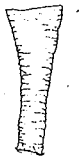

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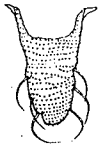

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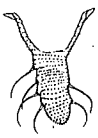


172

PLATE XV

Aphis helianthi Monell

Fundatrix

Figs. 173. Antenna
182. Cornicle
188. Cauda

Apterous viviparous female

174. Antenna
178. Hind leg
180. Dorsum
183. Cornicle
187. Rostral segment IV + V
189. Cauda

Alate viviparous female

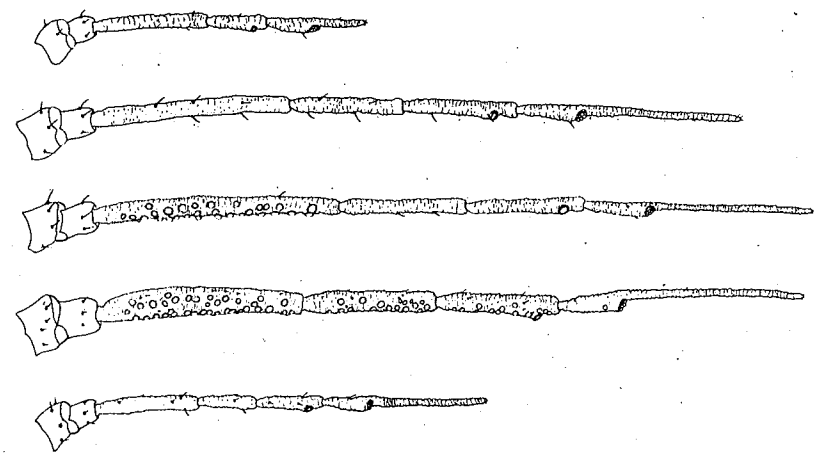
175. Antenna
181. Dorsum
184. Cornicle
190. Cauda

Alate male

176. Antenna
185. Cornicle
191. Cauda

Ovipara

177. Antenna
179. Hind leg
186. Cornicle
192. Cauda



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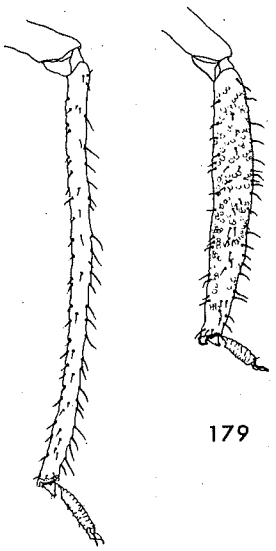
174

175

176

177



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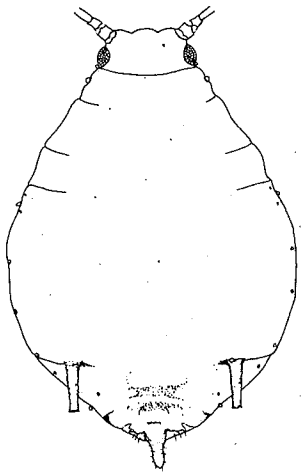
179



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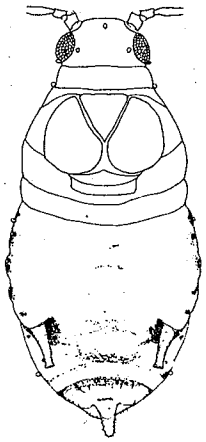

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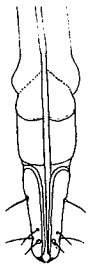

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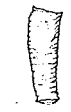

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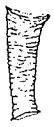

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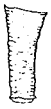

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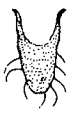

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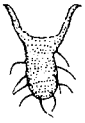


190

191

192

PLATE XVI

Aphis heraclella Davis

Apterous viviparous female

Figs. 193. Antenna

195. Hind leg

196. Dorsum

198. Cornicle

200. Rostral segment IV + V

201. Cauda

Alate viviparous female

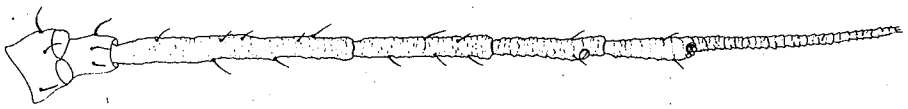
194. Antenna

197. Dorsum

199. Cornicle

202. Cauda

193



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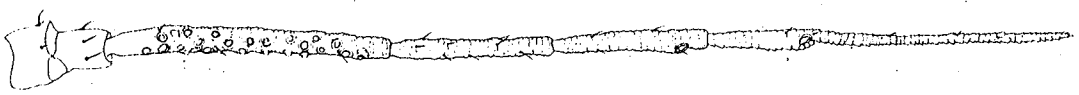

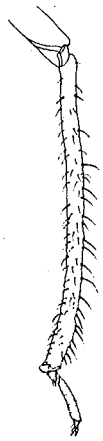

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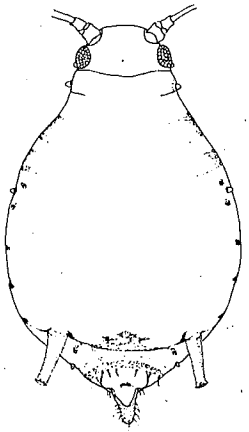

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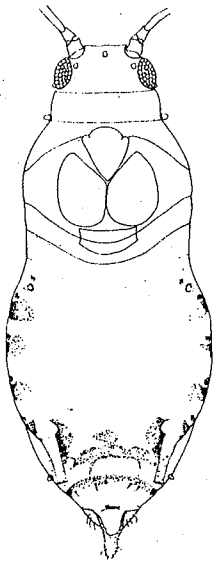

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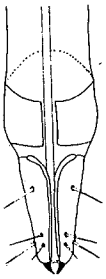

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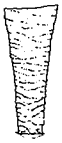

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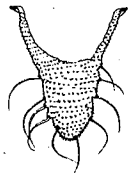

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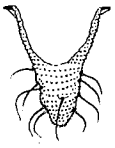


202

PLATE XVII

Aphis knowltoni Hottes and Frison

Apterous viviparous female

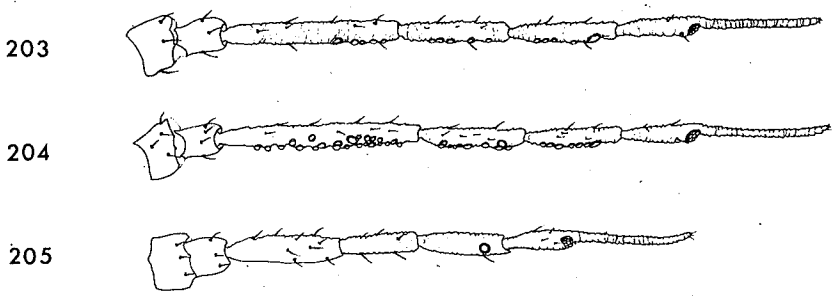
Figs. 203. Antenna
206. Hind leg
208. Dorsum
210. Cornicle
213. Rostral segment IV + V
214. Cauda

Alate viviparous female

204. Antenna
209. Dorsum
211. Cornicle
215. Cauda

Ovipara

205. Antenna
207. Hind leg
212. Cornicle
216. Cauda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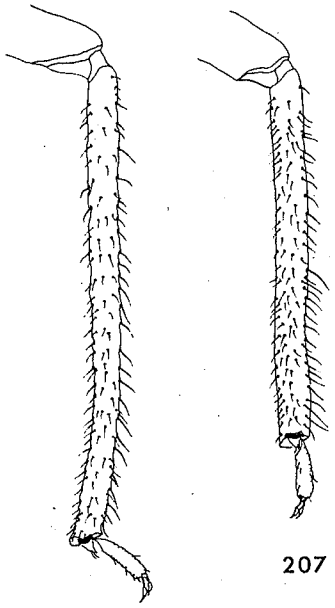
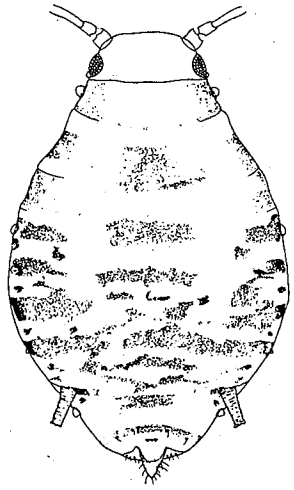
204
205


206
207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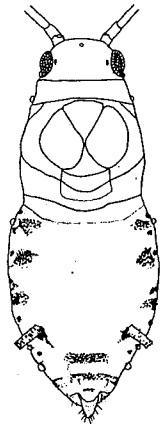
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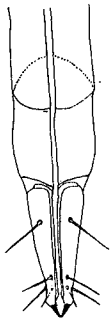
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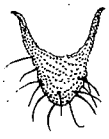
210


211


212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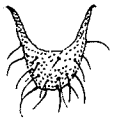

216

PLATE XVIII

Aphis maculatae Oestlund

Fundatrix

Figs. 217. Antenna
226. Cornicle
232. Cauda

Apterous viviparous female

218. Antenna
222. Hind leg
224. Dorsum
227. Cornicle
231. Rostral segment IV + V
233. Cauda

Alate viviparous female

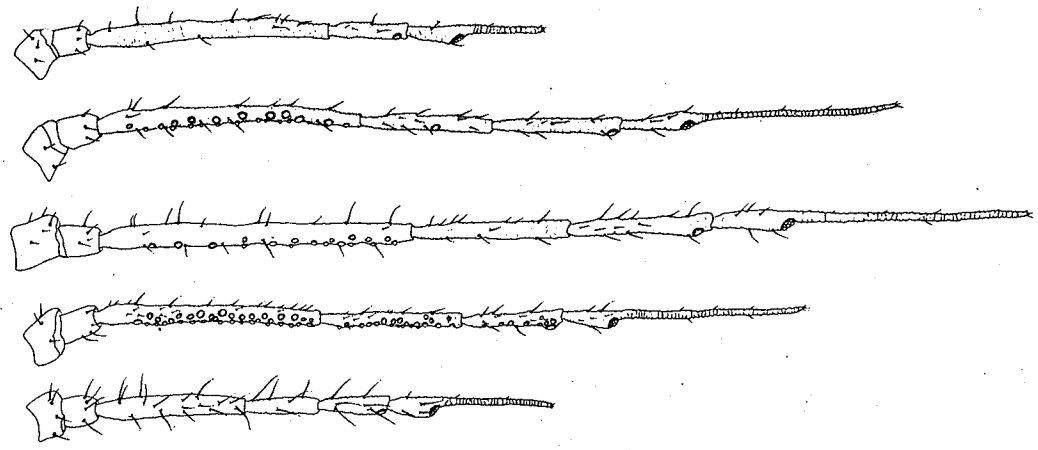
219. Antenna
225. Dorsum
228. Cornicle
234. Cauda

Apterous male

220. Antenna
229. Cornicle
235. Cauda

Ovipara

221. Antenna
223. Hind leg
230. Cornicle
236. Cauda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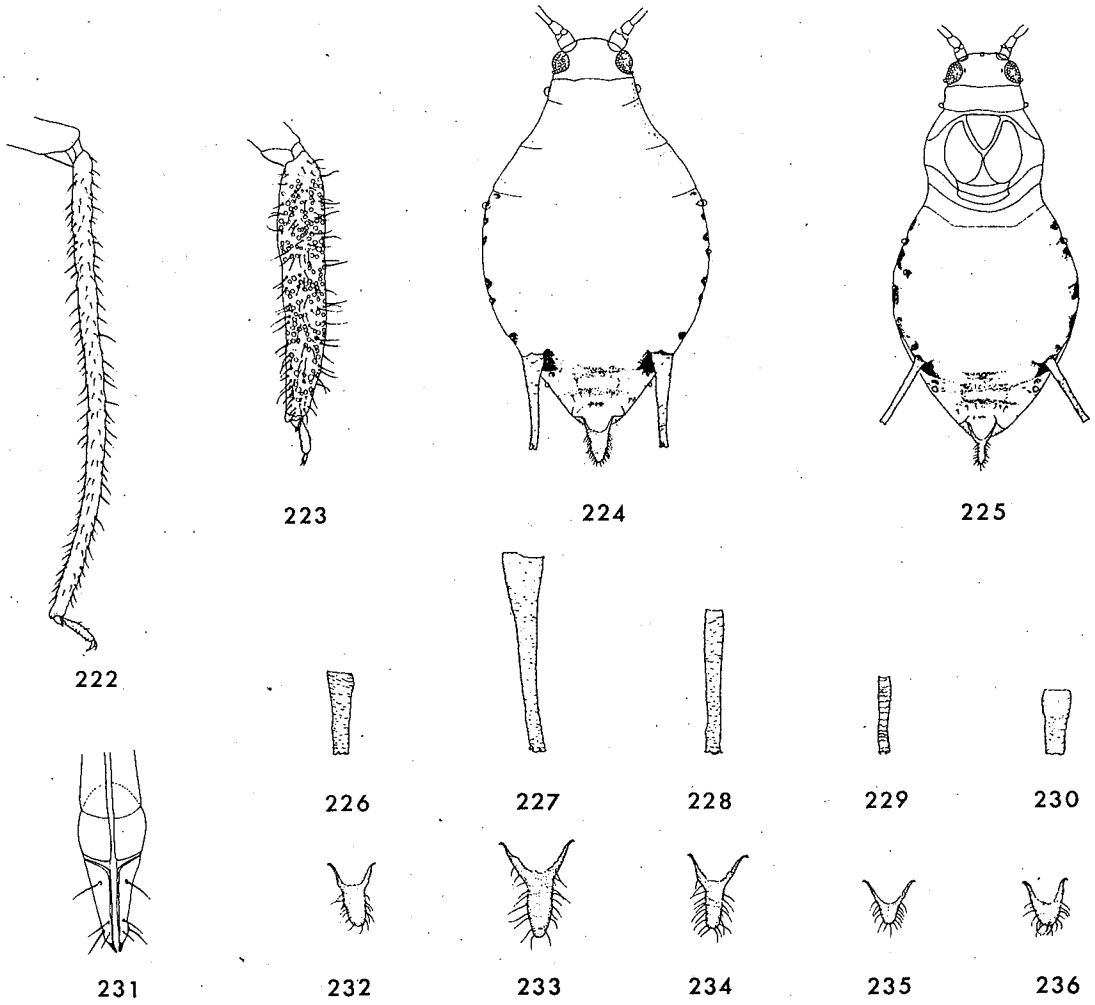
222
223
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225
226
227
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230
231
232
233
234
235
236

PLATE XIX

Aphis manitobensis Robinson and Rojanavongse new species

Apterous viviparous female

Figs. 237. Antenna
240. Hind leg
242. Dorsum
244. Cornicle
247. Rostral segment IV + V
248. Cauda

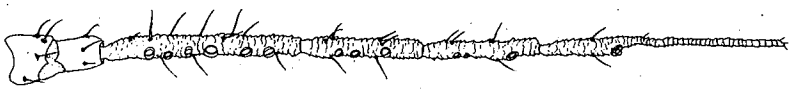
Alate viviparous female

238. Antenna
243. Dorsum
245. Cornicle
249. Cauda

Ovipara

239. Antenna
241. Hind leg
246. Cornicle
250. Cauda

237



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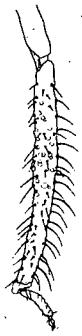

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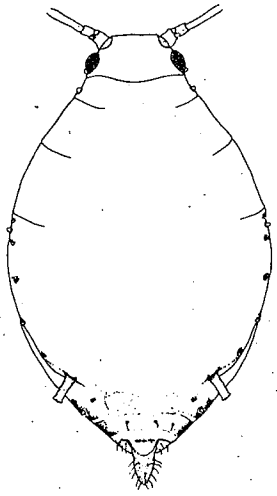

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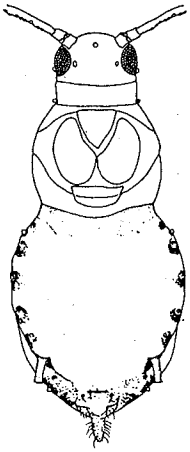

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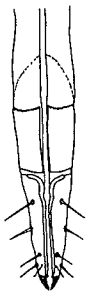

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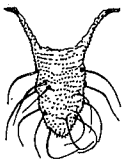
244

245

246



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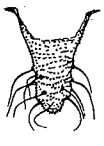

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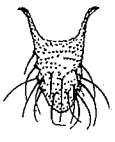


250

PLATE XX

Aphis masoni Richards

Apterous viviparous female

Figs. 251. Antenna

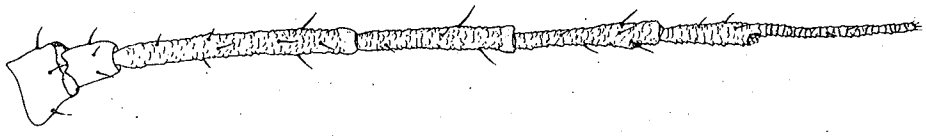
252. Hind leg

253. Dorsum

254. Rostral segment IV + V

255. Cornicle

256. Cauda



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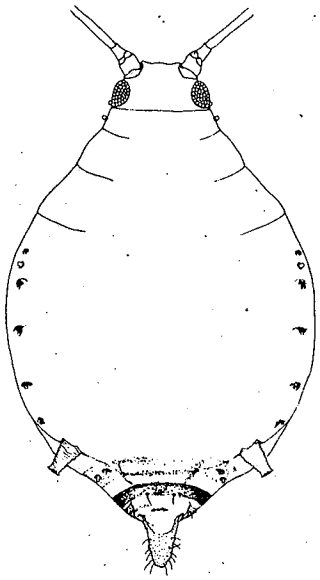
252



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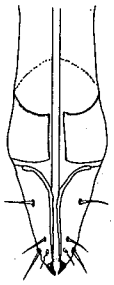

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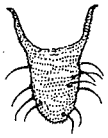
255



256

PLATE XXI

Aphis nasturtii Kaltenbach

Apterous viviparous female

Figs. 257. Antenna

260. Hind leg

261. Dorsum

263. Cornicle

266. Rostral segment IV + V

267. Cauda

Alate viviparous female

258. Antenna

262. Dorsum

264. Cornicle

268. Cauda

Alate male

259. Antenna

265. Cornicle

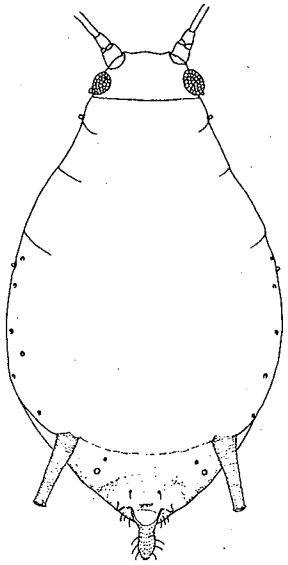
269. Cauda

257

258

259

260



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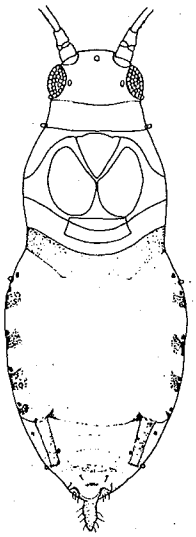

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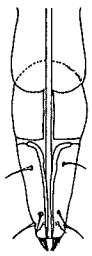

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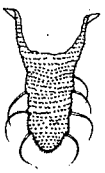

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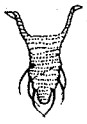

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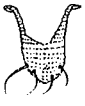


269

PLATE XXII

Aphis neogillettei Palmer

Fundatrix

Figs. 270. Antenna
279. Cornicle
285. Cauda

Apterous viviparous female

271. Antenna
275. Hind leg
277. Dorsum
280. Cornicle
284. Rostral segment IV + V
286. Cauda

Alate viviparous female

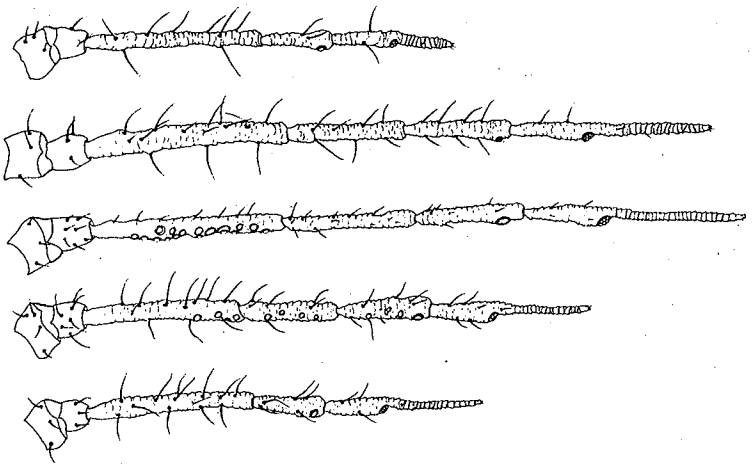
272. Antenna
278. Dorsum
281. Cornicle
287. Cauda

Apterous male

273. Antenna
282. Cornicle
288. Cauda

Ovipara

274. Antenna
276. Hind leg
283. Cornicle
289. Cauda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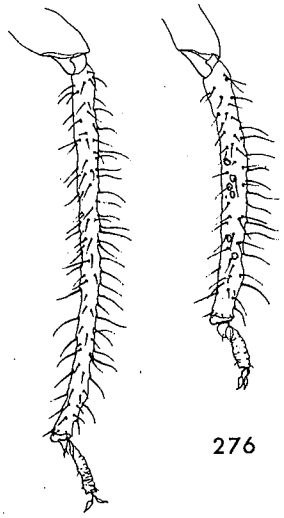
273
274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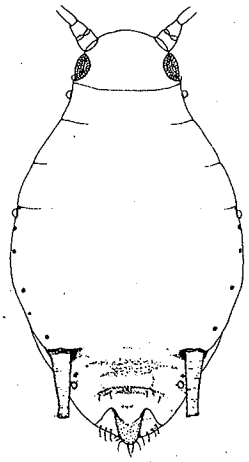
276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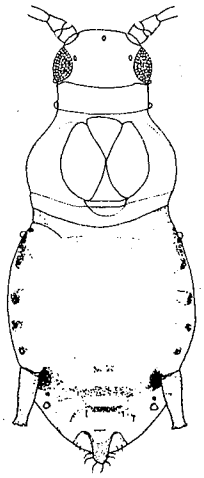
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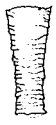
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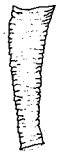
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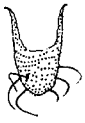
282


283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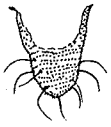
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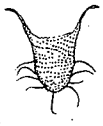
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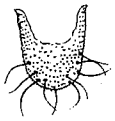

289

PLATE XXIII

Aphis neomexicana (Cockerell)

Apterous viviparous female

Figs. 290. Antenna

292. Hind leg

293. Dorsum

295. Cornicle

297. Rostral segment IV + V

298. Cauda

Alate viviparous female

291. Antenna

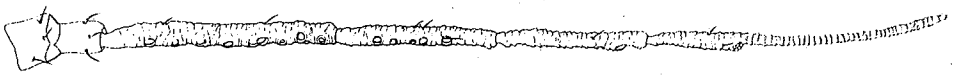
294. Dorsum

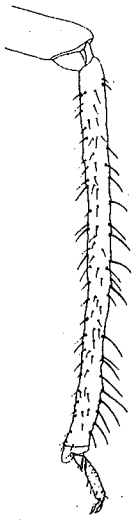
296. Cornicle

299. Cauda

290

291





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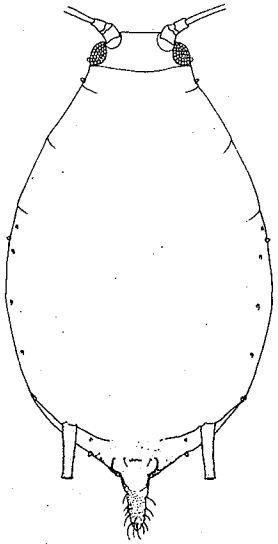

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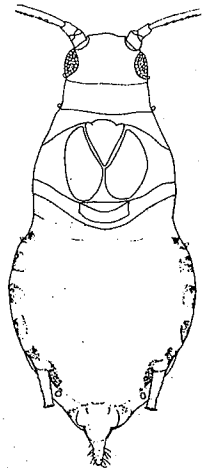

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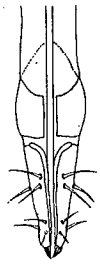
295

296



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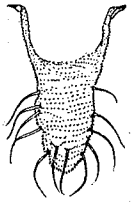

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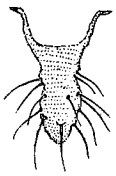


299

PLATE XXIV

Aphis neomonardae Rojanavongse and Robinson new species

Apterous viviparous female

Figs. 300. Antenna

302. Hind leg

303. Dorsum

305. Cornicle

307. Rostral segment IV + V

308. Cauda

Alate viviparous female

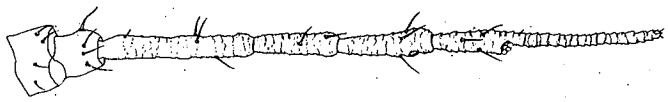
301. Antenna

304. Dorsum

306. Cornicle

309. Cauda

300



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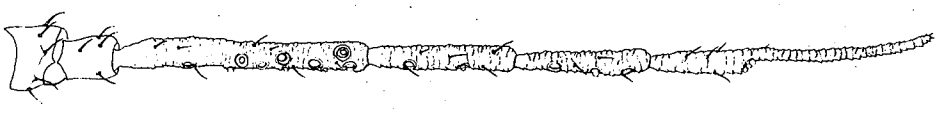

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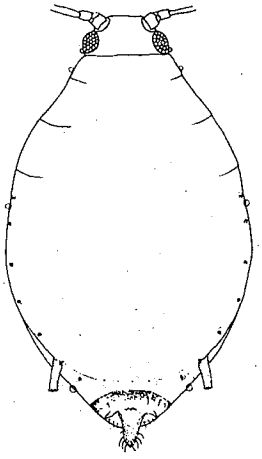

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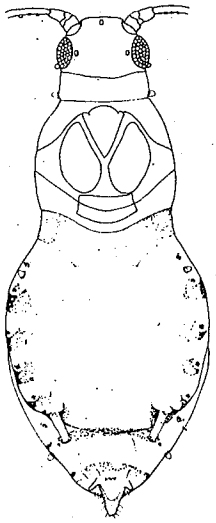

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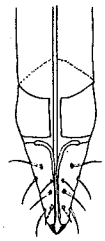

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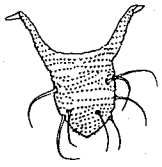
305

306



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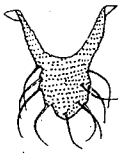


309

PLATE XXV

Aphis nivalis Hille Ris Lambers

Apterous viviparous female

Figs. 310. Antenna

311. Hind leg

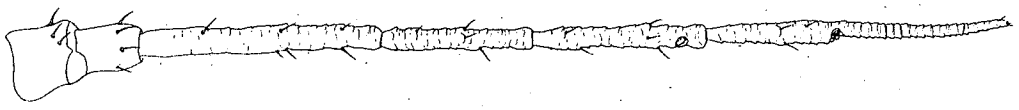
312. Dorsum

313. Rostral segment IV + V

314. Cornicle

315. Cauda

310



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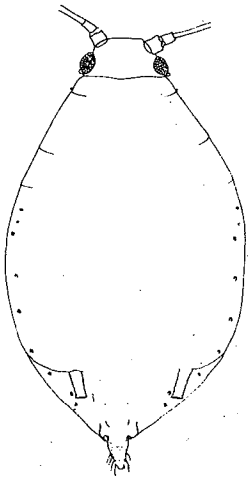

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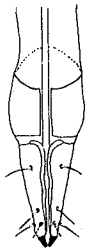

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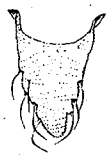


315

PLATE XXVI

Aphis oenotherae Oestlund

Apterous viviparous female

Figs. 316. Antenna

318. Hind leg

319. Dorsum

321. Cornicle

323. Rostral segment IV + V

324. Cauda

Alate viviparous female

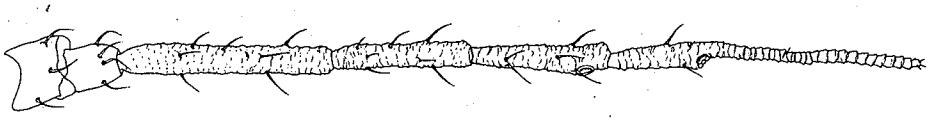
317. Antenna

320. Dorsum

322. Cornicle

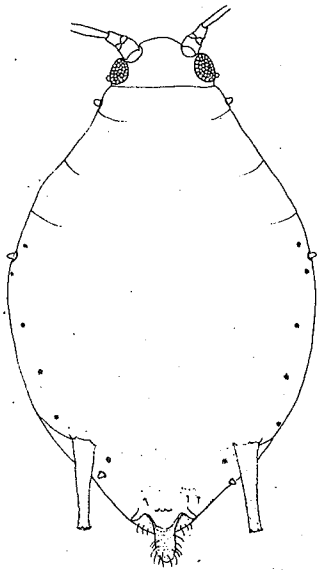
325. Cauda

316



317

318



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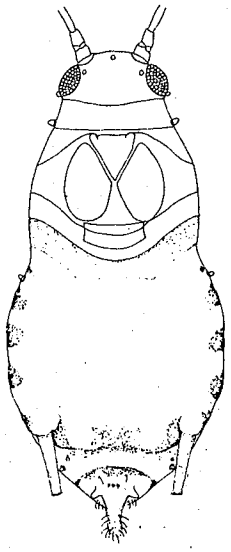

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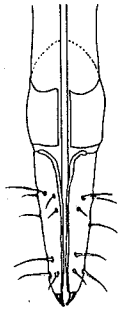

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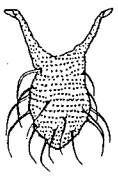

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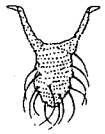


325

PLATE XXVII

Aphis oestlundi Gillette

Apterous viviparous female

Figs. 326. Antenna
330. Hind leg
332. Dorsum
334. Cornicle
338. Rostral segment IV + V
339. Cauda

Alate viviparous female

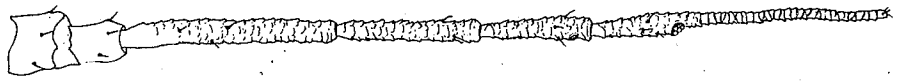
327. Antenna
333. Dorsum
335. Cornicle
340. Cauda

Apterous male

329. Antenna
336. Cornicle
341. Cauda

Ovipara

328. Antenna
337. Cornicle
342. Cauda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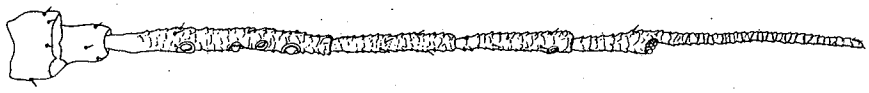
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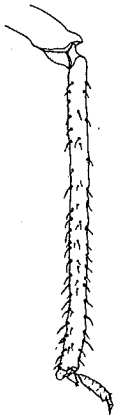
329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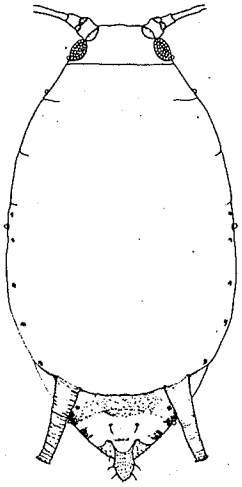
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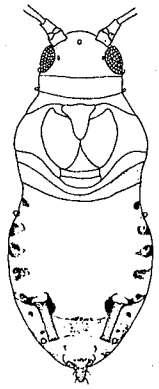
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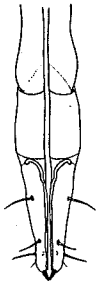
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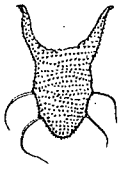
334


335


336


337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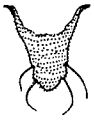
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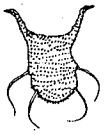
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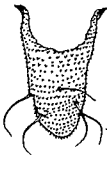

342

PLATE XVIII

Aphis pomi DeGeer

Fundatrix

Figs. 343. Antenna
351. Cornicle
356. Cauda

Apterous viviparous female

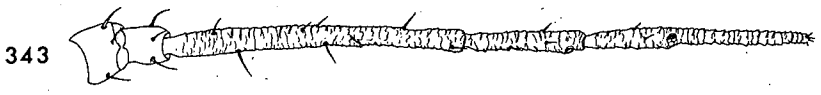
344. Antenna
347. Hind leg
349. Dorsum
352. Cornicle
355. Rostral segment IV + V
357. Cauda

Alate viviparous female

345. Antenna
350. Dorsum
353. Cornicle
358. Cauda

Ovipara

346. Antenna
348. Hind leg
354. Cornicle
359. Cauda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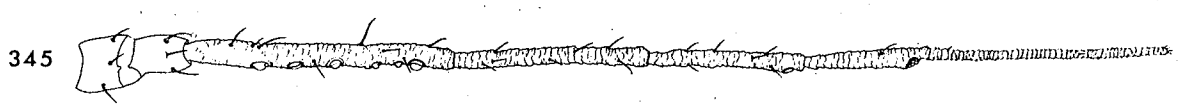
344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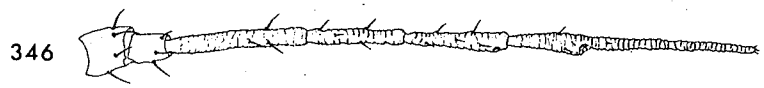
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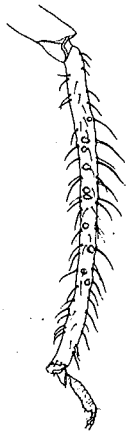
347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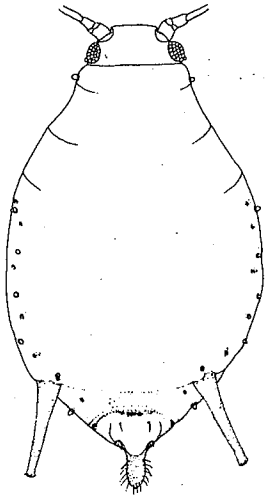
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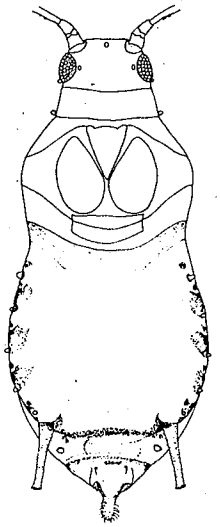
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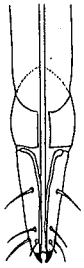
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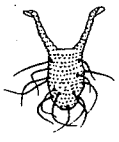
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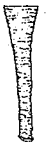
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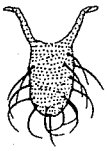
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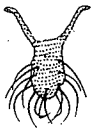
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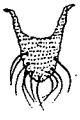

359

PLATE XXIX

Aphis ribiensis Gillette and Palmer

Apterous viviparous female

Figs. 360. Antenna

362. Hind leg

363. Dorsum

365. Cornicle

367. Rostral segment IV + V

368. Cauda

Alate viviparous female

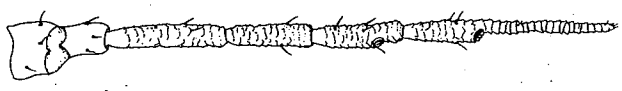
361. Antenna

364. Dorsum

366. Cornicle

369. Cauda

360



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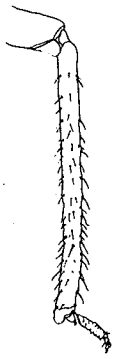

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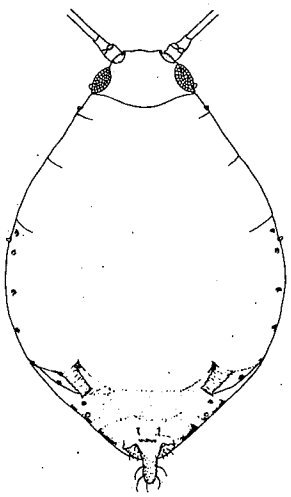

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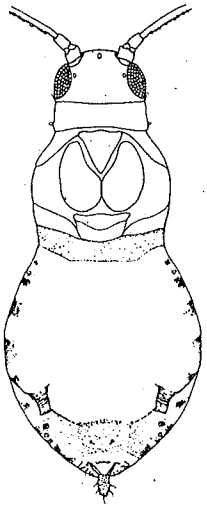

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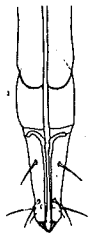

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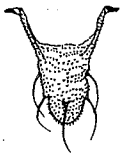
365

366



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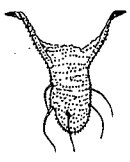


369

PLATE XXX

Aphis rubicola Oestlund

Fundatrix

Figs. 370. Antenna
379. Cornicle
385. Cauda

Apterous viviparous female

371. Antenna
375. Hind leg
377. Dorsum
380. Cornicle
384. Rostral segment IV + V
386. Cauda

Alate viviparous female

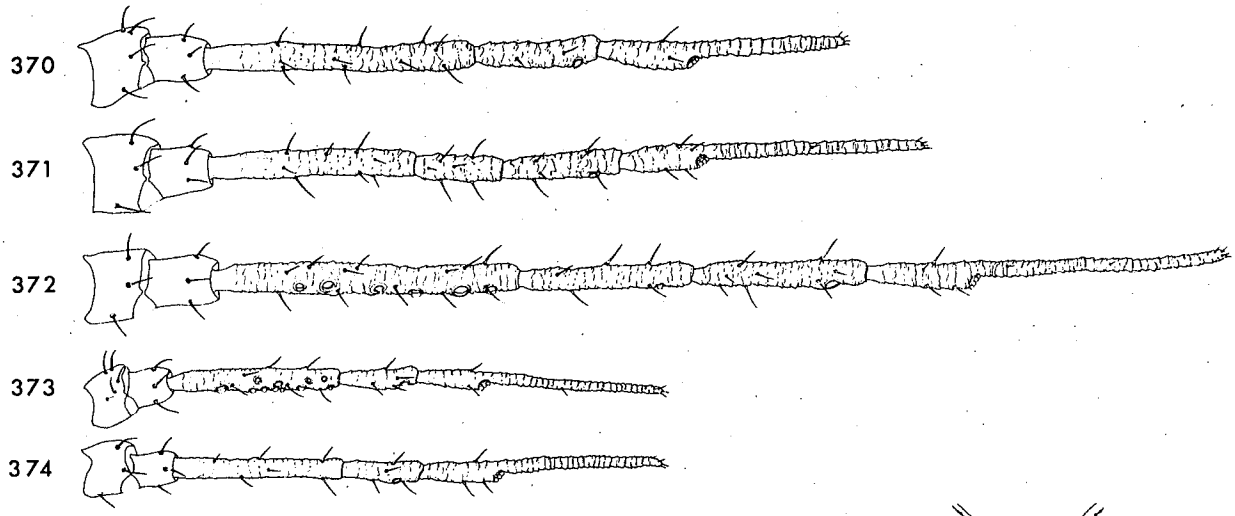
372. Antenna
378. Dorsum
381. Cornicle
387. Cauda

Apterous male

373. Antenna
382. Cornicle
388. Cauda

Ovipara

374. Antenna
376. Hind leg
383. Cornicle
389. Cauda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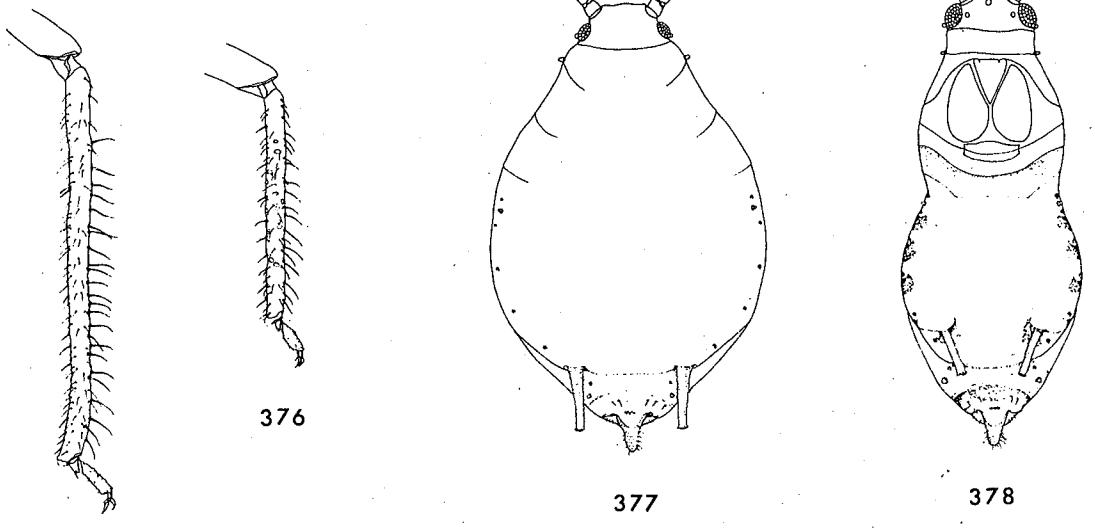
371
372
373
374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376
377
378

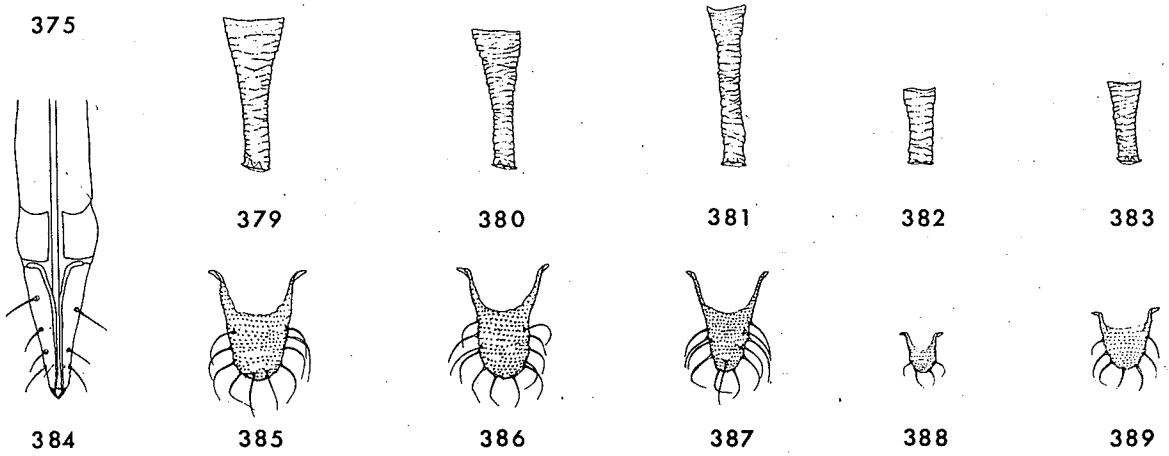

379
380
381
382
383
384
385
386
387
388
389

PLATE XXXI

Aphis rumicis Linnaeus

Apterous viviparous female

Figs. 390. Antenna

392. Hind leg

393. Dorsum

395. Cornicle

397. Rostral segment IV + V

398. Cauda

Alate viviparous female

391. Antenna

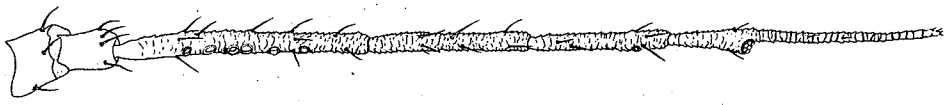
394. Dorsum

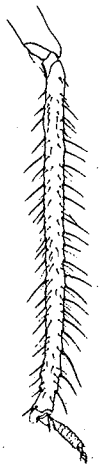
396. Cornicle

399. Cauda

390

391





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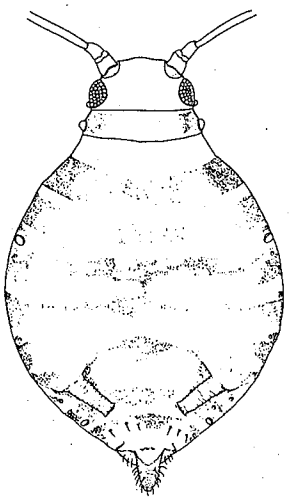

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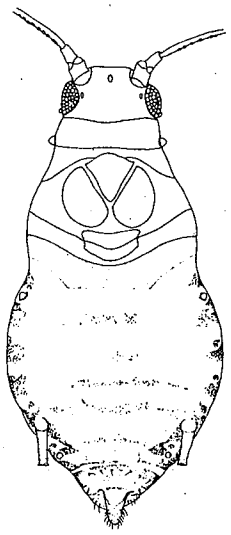

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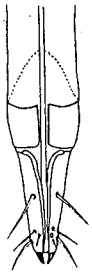
395

396



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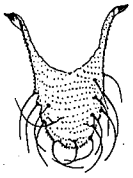

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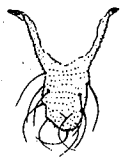


399

PLATE XXXII

Aphis saniculae Williams

Apterous viviparous female

Figs. 400. Antenna

402. Hind leg

403. Dorsum

405. Cornicle

407. Rostral segment IV + V

408. Cauda

Alate viviparous female

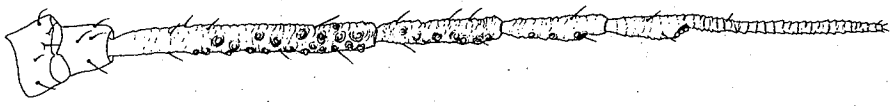
401. Antenna

404. Dorsum

406. Cornicle

409. Cauda

400



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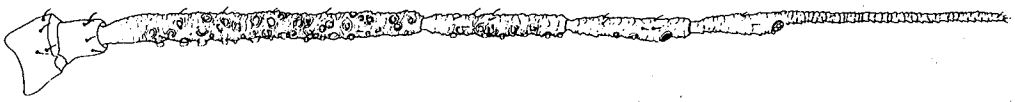

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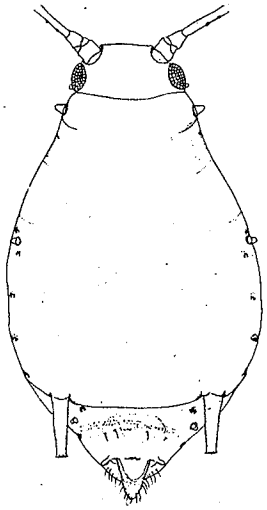

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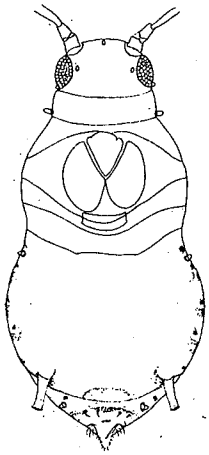

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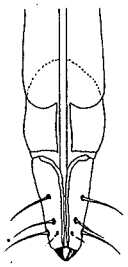
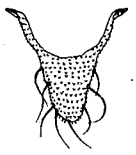


407

405

406



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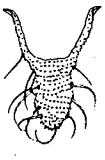


409

PLATE XXXIII

Aphis sedi Kaltenbach

Apterous viviparous female

Figs. 410. Antenna

414. Hind leg

416. Dorsum

418. Cornicle

422. Rostral segment IV + V

423. Cauda

Alate viviparous female

411. Antenna

417. Dorsum

419. Cornicle

424. Cauda

Apterous viviparous female

412. Antenna

420. Cornicle

425. Cauda

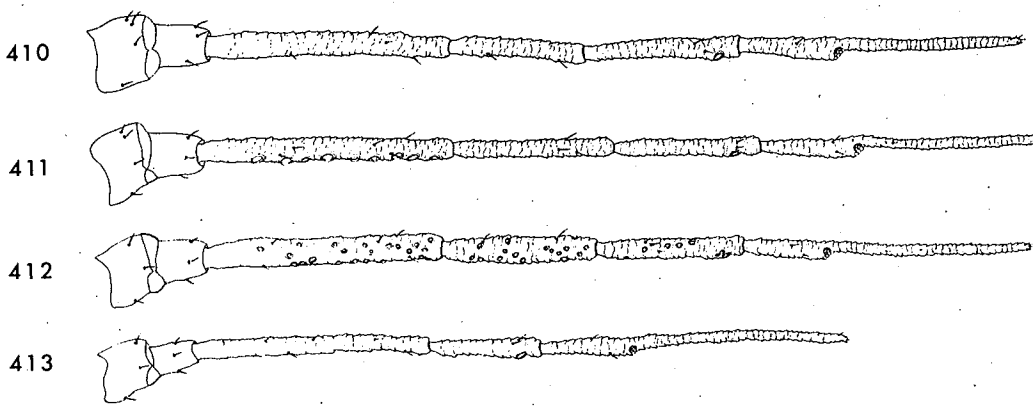
Ovipara

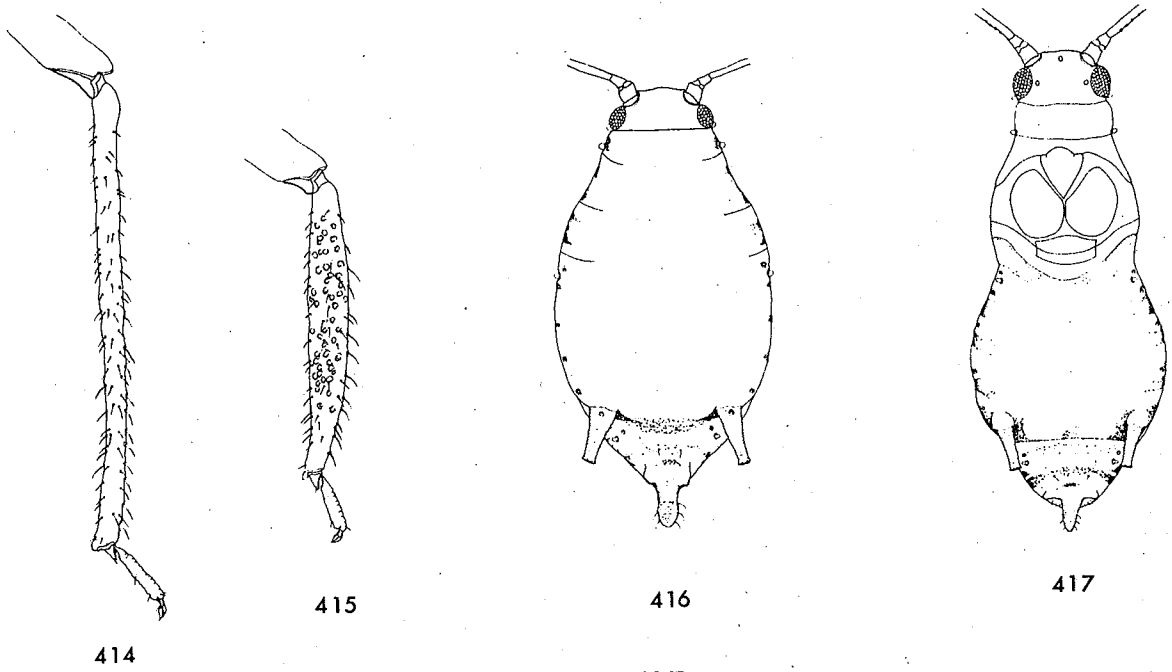
413. Antenna

415. Hind leg

421. Cornicle

426. Cauda


410
411
412
413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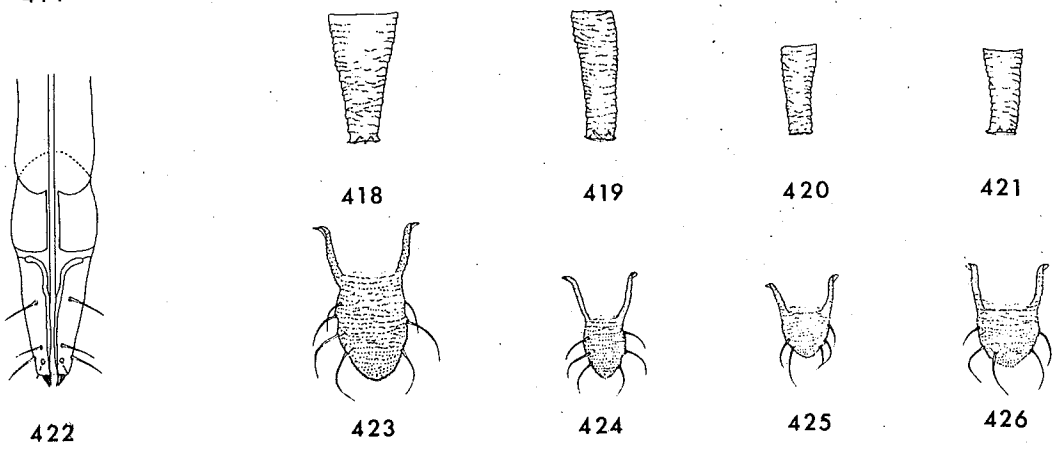
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PLATE XXXIV

Aphis spiraecola Patch

Apterous viviparous female

Figs. 427. Antenna

430. Hind leg

432. Dorsum

434. Cornicle

437. Rostral segment IV + V

438. Cauda

Alate viviparous female

428. Antenna

433. Dorsum

435. Cornicle

439. Cauda

Ovipara

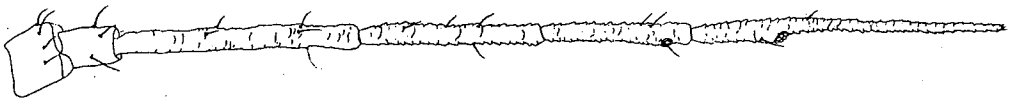
429. Antenna

431. Hind leg

436. Cornicle

440. Cauda

427



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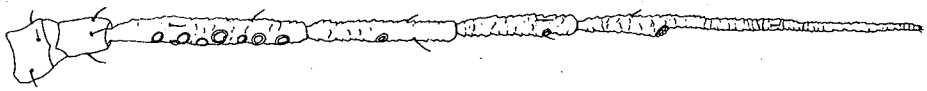

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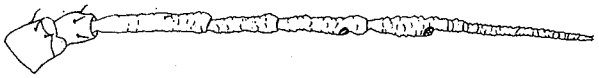

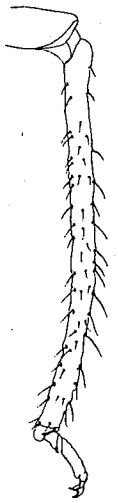

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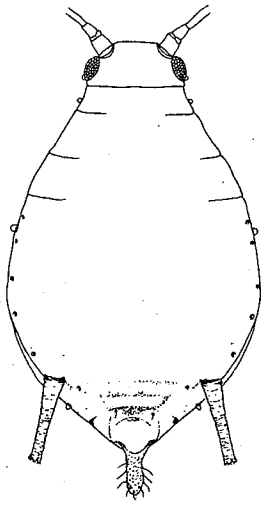

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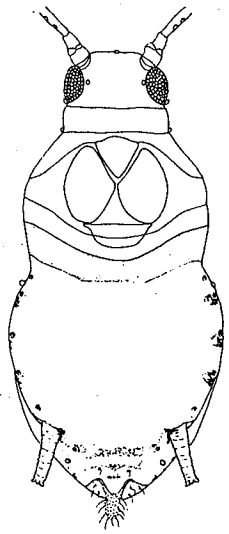

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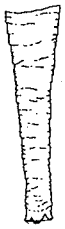

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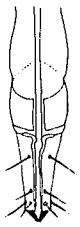

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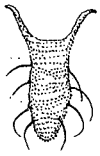

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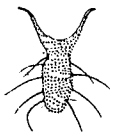

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440

PLATE XXXV

Aphis spiraephila Patch

Apterous viviparous female

Figs. 441. Antenna

444. Hind leg

446. Dorsum

448. Cornicle

451. Rostral segment IV + V

452. Cauda

Alate viviparous female

442. Antenna

447. Dorsum

449. Cornicle

453. Cauda

Ovipara

443. Antenna

445. Hind leg

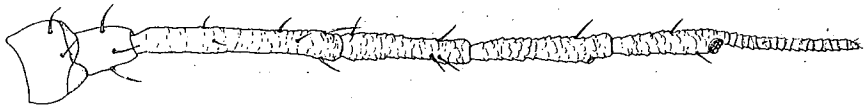
450. Cornicle

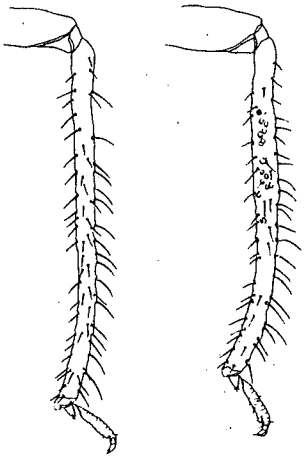
454. Cauda

441

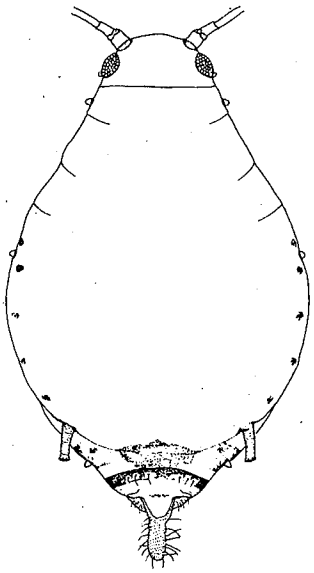
442

443





444 445



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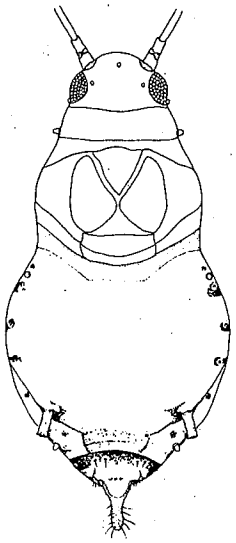

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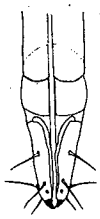

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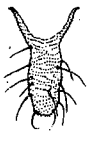

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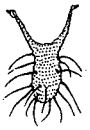

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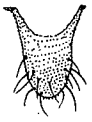


454

PLATE XXXVI

Aphis thaspii Oestlund

Apterous viviparous female

Figs. 455. Antenna

459. Hind leg

461. Dorsum

463. Cornicle

467. Rostral segment IV + V

468. Cauda

Alate viviparous female

456. Antenna

462. Dorsum

464. Cornicle

469. Cauda

Alate Male

457. Antenna

465. Cornicle

470. Cauda

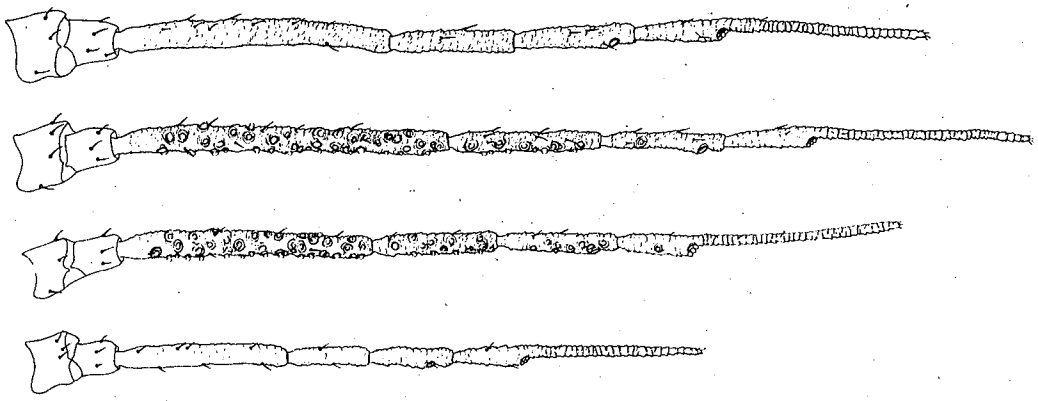
Ovipara

458. Antenna

460. Hind leg

466. Cornicle

471. Cauda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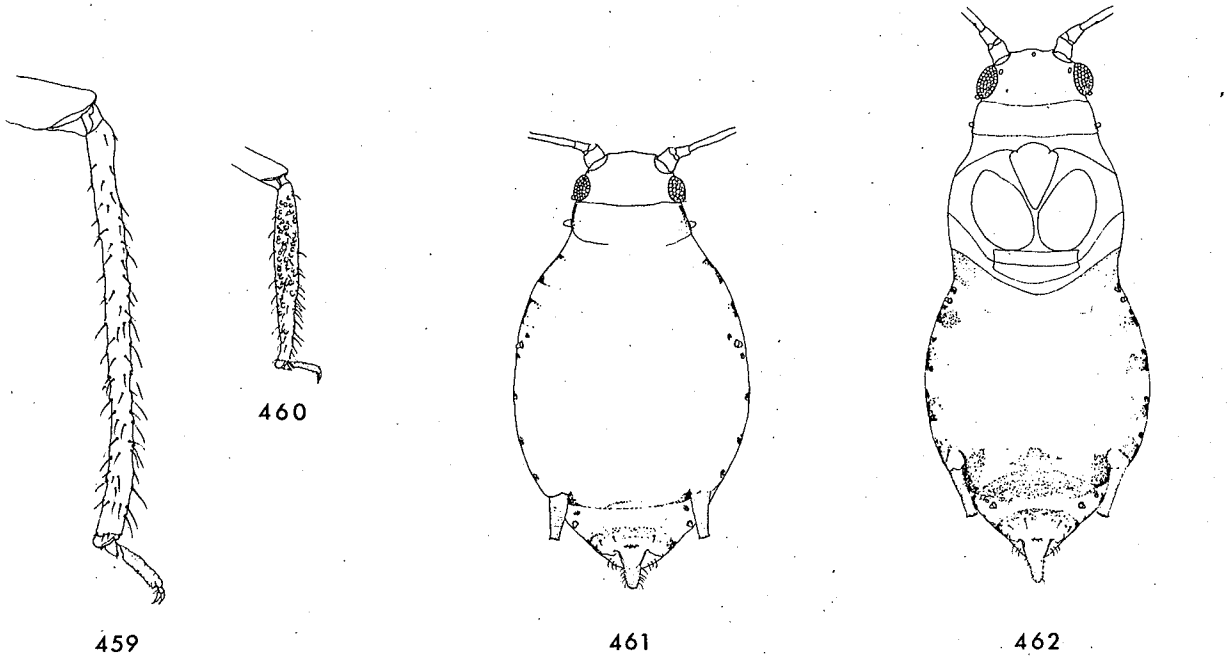
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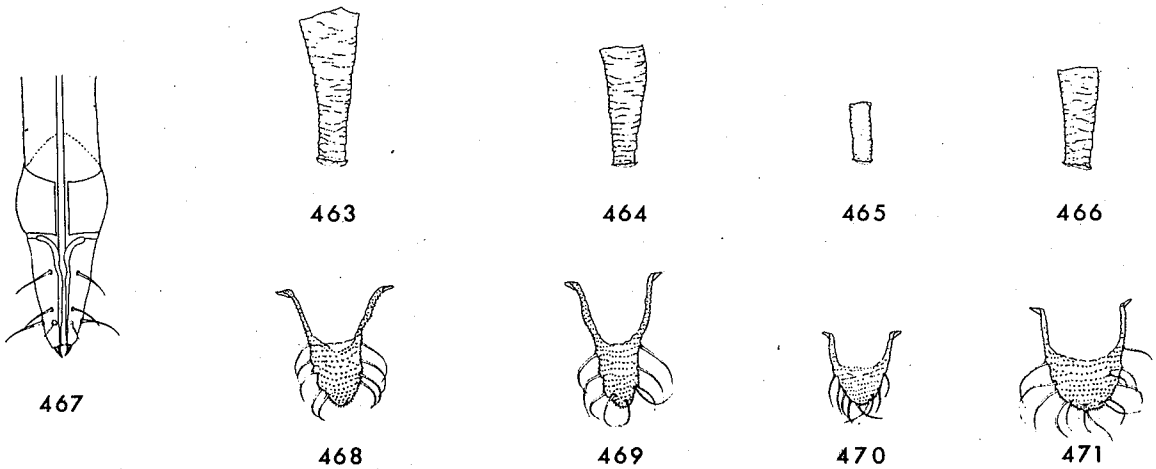
463
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PLATE XXXVII

Aphis varians Patch

Fundatrix

Figs. 472. Antenna

478. Cornicle

482. Cauda

Apterous viviparous female

473. Antenna

475. Hind leg

476. Dorsum

479. Cornicle

481. Rostral segment IV + V

483. Cauda

Alate viviparous female

474. Antenna

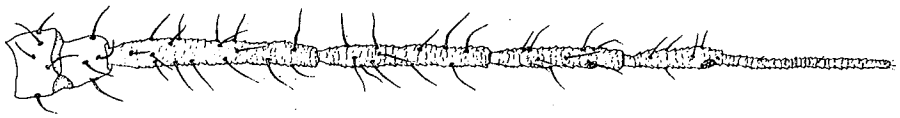
477. Dorsum

480. Cornicle

484. Cauda

472

473



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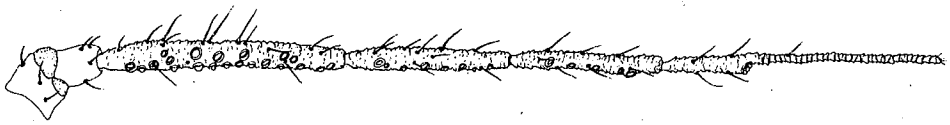

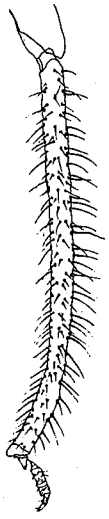

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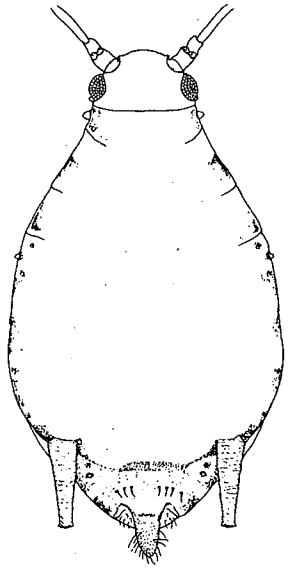

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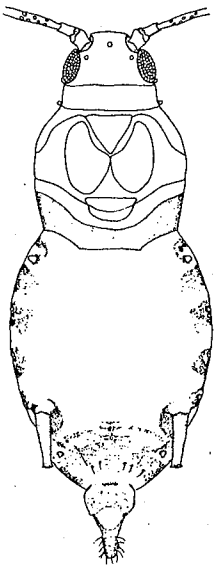

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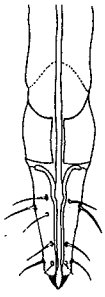

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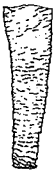

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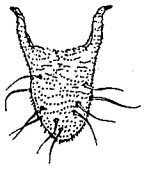

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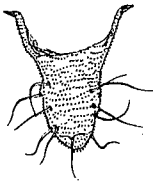

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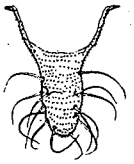


484

PLATE XXXVIII

Aphis whiteshellensis Rojanavongse and Robinson new species

Fundatrix

Figs. 485. Antenna
494. Cornicles
500. Cauda

Apterous viviparous female

486. Antenna
490. Hind leg
492. Dorsum
495. Cornicle
499. Rostral segment IV + V
501. Cauda

Alate viviparous female

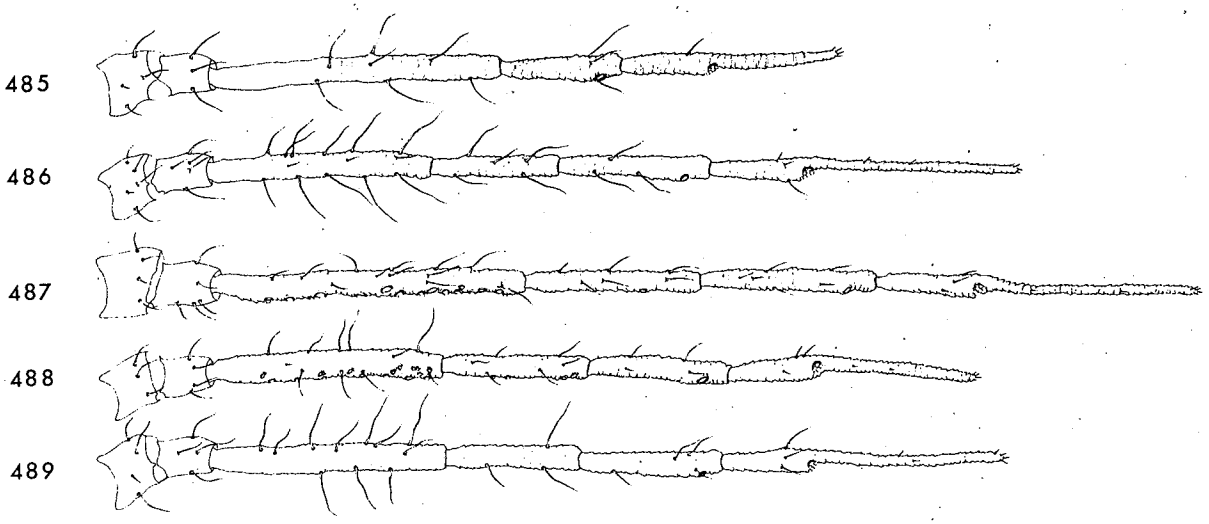
487. Antenna
493. Dorsum
496. Cornicle
502. Cauda

Apterous male

488. Antenna
497. Cornicle
503. Cauda

Ovipara

489. Antenna
491. Hind leg
498. Cornicle
504. Cauda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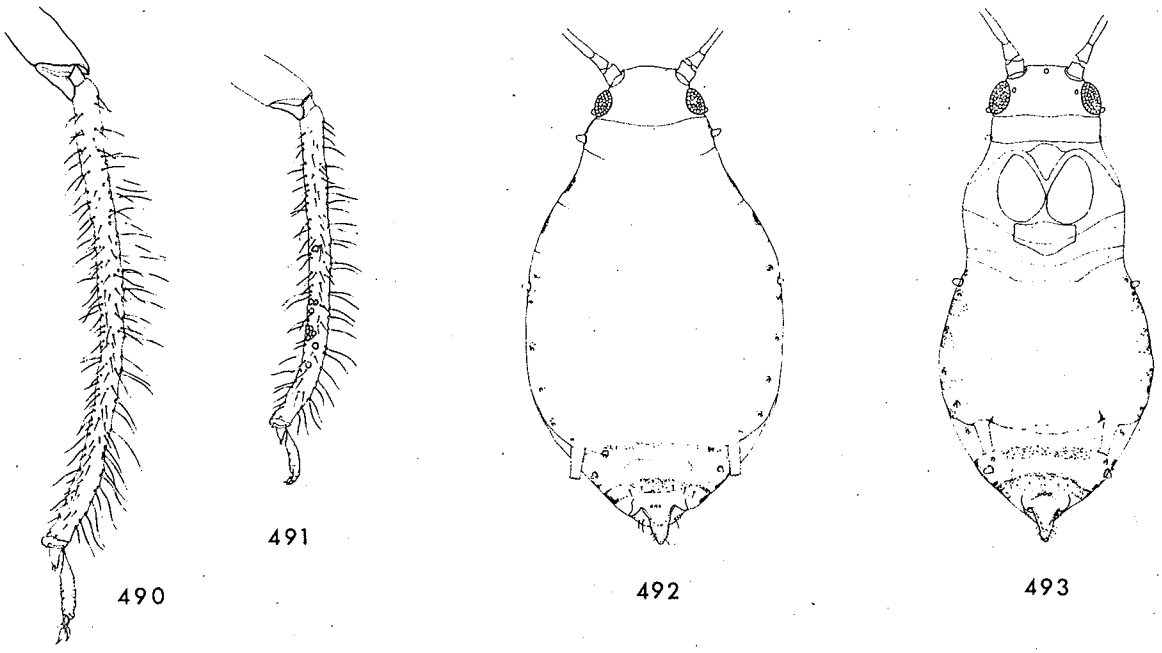
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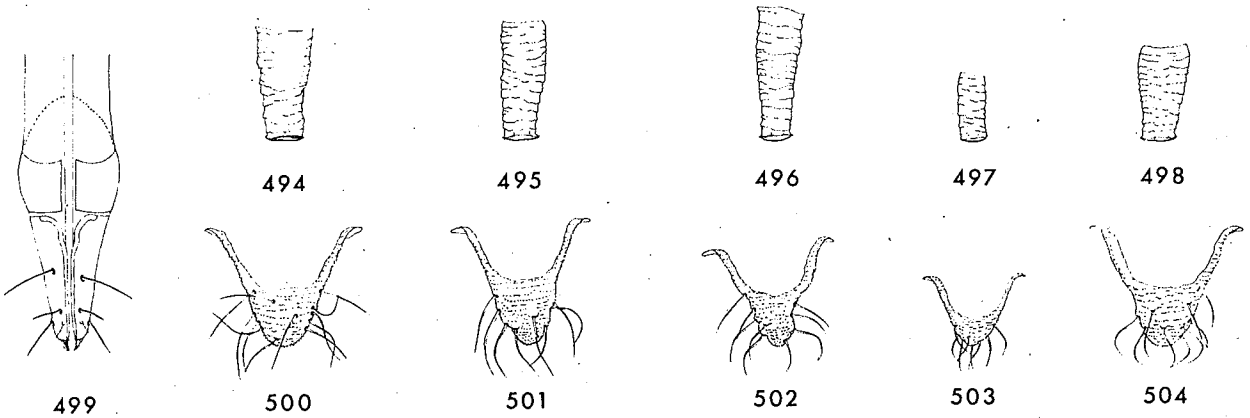
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