

The University of Maine
DigitalCommons@UMaine

Technical Bulletins

Maine Agricultural and Forest Experiment Station

8-1-1972

TB60: Survey of Internal Parasites of Potato-Infesting Aphids in Northeastern Maine, 1963 through 1969

W.A. Shands

Geddes W. Simpson

Corinne C. Gordon

Follow this and additional works at: https://digitalcommons.library.umaine.edu/aes_techbulletin

 Part of the [Entomology Commons](#)

Recommended Citation

Shands, W.A., G.W. Simpson, and C.C. Gordon. 1972. Survey of internal parasites of potato-infesting aphids in northeastern Maine, 1963 through 1969. Life Sciences and Agriculture Experiment Station Technical Bulletin 60.

This Article is brought to you for free and open access by DigitalCommons@UMaine. It has been accepted for inclusion in Technical Bulletins by an authorized administrator of DigitalCommons@UMaine. For more information, please contact um.library.technical.services@maine.edu.

SURVEY OF INTERNAL PARASITES OF POTATO-INFESTING APHIDS IN NORTHEASTERN MAINE, 1963 THROUGH 1969

**W. A. Shands, Geddes W. Simpson,
and Corinne C. Gordon**

**A Cooperative Publication of the Life Sciences and Agriculture Experiment
Station, University of Maine at Orono, and the Entomology Research Service,
United States Department of Agriculture**

University of Maine at Orono

CONTENTS

Acknowledgment	2
Introduction	3
Procedure	4
Role of parasites in control of aphids on potato plants not treated with insecticides	5
Abundance of parasitized aphids on field-growing potatoes	5
Seasonal variation in abundance of the parasitized aphids	6
Average seasonal abundance of mummified potato-infesting aphids of three species	8
The parasites	8
Parasites reared from the potato aphid	10
Parasites reared from the green peach aphid	11
Parasites reared from the buckthorn aphid	12
Parasites reared from the foxglove aphid	13
Summary and conclusions	14
References cited	15

ACKNOWLEDGMENT

We are grateful to several entomologists of the Insect Identification and Parasite Introduction Branch, of the former Entomology Research Division, Agricultural Research Service, U. S. Department of Agriculture, for assistance during the present study. These include P. M. Marsh, who identified the adult primary parasites in the family Braconidae, and adult hyperparasites in the family Ceraphronidae; B. D. Burks and W. A. Crawford, who identified the adult hyperparasites in the families Pteromalidae and Cynipidae; and R. I. Sailer, Chief of the Branch, who lent his support and encouragement.

Research reported herein was supported in part by Hatch funds.

Survey of Internal Parasites of Potato-Infesting Aphids in Northeastern Maine, 1963 through 1969

W. A. Shands², Geddes W. Simpson³, and Corinne C. Gordon⁴

INTRODUCTION

Beginning in 1941, a continuing study was made of the biology of the potato-infesting species of aphids in northeastern Maine and of the biological agents influencing their populations. Internal arthropod parasites received attention throughout the study as an important element among these biological agents. The study included counts of the four species of aphids on sample units of potato foliage throughout each summer and, in many years, on their primary hosts in spring before the spring migrants matured and moved to secondary hosts, and in autumn after the fall migrants returned to the primary hosts. During all aphid counts, collections were made, from aphid-count leaves, of all parasitized aphids from which the parasites had not yet emerged. This procedure may well introduce some bias since parasitized aphids may wander from the plants or fall off in wind and rain and thus not be counted. The immature parasites in the affected aphids were reared to adulthood, preserved and after rechecking aphid identifications with the aid of a microscope the parasites were submitted for identification to the Insect Identification and Parasite Introduction Branch of the former Entomology Research Division, Agr. Res. Serv., USDA, Washington, D. C.

From 1941 through 1962, approximately 40 species of internal insect parasites were identified from the four aphid species on potatoes viz. the potato aphid, *Macrosiphum euphorbiae* (Thomas), the green peach aphid, *Myzus persicae* (Sulzer), the buckthorn aphid, *Aphis nasturtii* Kaltentbach, and the foxglove aphid, *Acyrtosiphon solani* (Kaltentbach) (7, 6)⁵. Altogether, 22 of these 40 species were primary parasites of the aphids and 18 were hyperparasites. Most of the primary parasites belonged to five species as did most of the hyperparasites. The most common species of primary parasites were the braconids, *Aphidius*

¹ Hemiptera: Aphididae.

² Visiting Professor of Entomology, University of Maine, Orono, Maine 04473; formerly, Research Entomologist, in the former Entomology Research Division, Agr. Research Serv., U. S. Department of Agriculture.

³ Professor of Entomology, University of Maine, Orono.

⁴ Biological Technician, in the former Entomology Research Division, Agr. Res. Serv., USDA.

⁵ See references cited, page 15.

nigripes Ashmead, and *Praon* spp.; the most common hyperparasites were the pteromalids, *Asaphes lucens* (Provancher) and *Coruna clavata* Walker, and the ceraphronids, *Lygocerus* spp.

MacGillivray and Spicer (1) reported on parasites of aphids taken in New Brunswick. The forms collected fell into 12 genera in five families of the Hymenoptera. Some of these species are hyperparasites. Of six species of parasites reported from the buckthorn aphid, five were primary parasites; of 19 species from the potato aphid, only eight were primary parasites. Of 15 species reported from the green peach aphid, eight were primary parasites. The one species reported from the fox-glove aphid was a hyperparasite.

In a more recent study by Sullivan and van den Bosch (9), restricted to the potato aphid on the west coast of North America, only four primary parasites were found, one of which was found in only small numbers. Seven species of hyperparasites were found, one of which was extremely rare. However, hyperparasites were reared from some 66.5% of the aphid mummies collected.

We concluded that internal parasites were of value as an agent of biological control of the potato aphid on potatoes in northeastern Maine, although not of impressive importance. That conclusion was based principally on two considerations, viz., (A) on no occasion was the level of parasitism high enough or maintained long enough to effect a downward departure from the expected rate of potato aphid increase, as in the instance of entomogenous fungi (3) or of arthropod predators (8), and (B) hyperparasitism was so high in most years that primary parasites were unable to reach and maintain for a long enough period the level of abundance required to provide significant, effective aphid control. Hyperparasites comprised from 15 to 45% of the parasites reared annually from parasitized specimens of the potato aphid from 1952 through 1962; the average for the 11 years was 22%.

From 1963 through 1969 we continued the annual survey of parasitized aphids on potatoes in northeastern Maine, chiefly on Aroostook Farm, near Presque Isle. The results of the survey during these years are contained in this bulletin.

Procedure

Weekly counts of aphids by species were made each summer from 1964 through 1969 on potato plants growing in replicated small plots on Aroostook Farm. Each year the aphid counts were made for 12 or 13 consecutive weeks from mid-June until early in September. During these counts records and collections were made of all mummified aphids from which the parasites had not emerged, on all units or subunits of

the potato foliage used in making the aphid counts. The specific identification of each mummified aphid was subsequently checked in the laboratory with the aid of a binocular microscope.

Until the potato plants were about eight inches tall, the unit of aphid count, including mummified specimens, was all of the foliage of each sample plant. Thereafter, the subunits of each sample plant consisted of three compound leaves or parts of these leaves, randomly located within the top, middle, or bottom thirds of stem length (2, 4). The sample plants were located in a screen grid on the two middle rows of the four-row plots which were separated by strip plantings of oats in both columns and rows (5). Each parasitized aphid was put into a separate glass vial (40 x 10mm) by gently dislodging the aphid from the leaf with the vial or by placing in the vial a small leaf disc bearing the attached aphid mummy. The vial was then closed with a cork, labelled, and stored in an unheated room. Each vial was examined at least weekly throughout the field season or until the parasite had emerged from the aphid. After emergence, the adult parasite was preserved with the aphid from which it emerged in 60% alcohol-water solution. The vials containing the preserved parasites and the identified aphids were submitted to the Insect Identification and Parasite Introduction Branch of the former Entomology Research Division, ARS, USDA, for identification of the parasite.

ROLE OF PARASITES IN CONTROL OF APHIDS ON POTATO PLANTS NOT TREATED WITH INSECTICIDES.

The field counts of living aphids and collections of parasitized aphids on untreated potatoes from 1963 through 1969 were made each year in three to six locations on Aroostook Farm; in most years there were five or six locations. The numbers of aphids and percentages of parasitized aphids were those found in the weekly examination of a total of 567 to 1,620 plant-sample units, 1,700 to 4,900 potato leaves when the unit was three leaves per plant; the average number of plant-sample units examined weekly during the seven years was 860, or 2,580 compound potato leaves.

Abundance of parasitized aphids on field-growing potatoes.

The yearly differences in total-season numbers of aphids counted (Table 1) have no particular meaning because of the variation among years in number of plant-sample units examined. However, the data show the correct relationship of abundance of each species of aphid to that of the other three species for the entire season and, as well, the

Table 1

All-season prevalence of parasitized aphids on foliage of field-growing potatoes not treated with insecticides, 1964 through 1969, inclusive.

Year	Potato aphid		Green peach aphid		Buckthorn aphid	
	No. in hundreds ^a	Percent parasitized ^b	No. in hundreds ^a	Percent parasitized ^b	No. in hundreds ^a	Percent parasitized ^b
1964	269	1.2	211	0.1	40	0.1
1965	142	1.4	35	0.4	14	0.3
1966	140	0.7	9	0	24	0
1967	285	1.7	86	T ^c	1,784	T ^c
1968	77	1.7	4	0	14	0.1
1969	55	2.1	9	0.5	6	0

^a Total number of living, parasitized, and dead, diseased specimens in the counts.

^b Recently killed, mummified aphids from which parasites had not emerged. Such aphids were thus infested by parasites in the pupal or larval stages.

^c 0.01 or less.

prevalence of parasitism in each species.

During the six years 1964 through 1969, the all-season⁶ field abundance of parasitized specimens of the potato aphid on untreated potatoes varied from as low as 0.7% of the potato aphid population in 1966 to a high of 2.1% in 1969 (Table 1). The comparable range of parasitism for the green peach aphid was from 0% in 1966 and in 1968 to a high of 0.5% in 1969, and that for the buckthorn aphid was from 0% in 1966 and 1969 to a high 0.3% in 1965. Foxglove aphids were scarce on potatoes in the plots during all six years; few were found parasitized on the aphid-count leaves.

The general level of aphid parasitization on untreated potatoes during this six-year period was much below that of the 11-year period 1952 through 1963 (6). Comparable ranges in percentages of parasitized specimens during the earlier period were 0.8% to 4.3% for the potato aphid, 0% to 0.6% for the green peach aphid, 0% to 0.2% for the buckthorn aphid, and 0% to 1.5% for the foxglove aphid.

Seasonal variation in abundance of the parasitized aphids.

The seasonal range in abundance of mummified potato aphids each year varied from 0% early in the summer to a seasonal peak as low as 2.7% of the population of that species in 1965 to a high of 7.7% in 1969 (Table 2). The time of first finding mummies of this species varied from about July 1 to July 14. The seasonal peak came between July 2 and July 18. In 1967, 1968, and 1969 there were one or two secondary,

⁶ All mummified aphids in all counts found during a field season on untreated potatoes divided by the total number of aphids (living plus mummified) found in all counts.

smaller peaks. Once they were found, parasitized specimens of the aphids were present on the plants throughout the remainder of the season in 1964 and 1967 but none was found in the final one or two weeks of aphid counts in the remaining years.

During years when mummified green peach aphids were found, their seasonal abundance varied from 0% of the population to a seasonal peak as low as 0.1% in 1967 to a high of 4.8% in 1965. No mummified specimens were found in 1966 or in 1968 (Table 2). The time of first finding green peach aphid mummies varied from July 12 to August 6; the seasonal peak of their abundance varied from about mid-July to August 29.

In years when found, mummified buckthorn aphids varied from 0% to a seasonal peak as low as 0.1% in 1967 to one as high as 1.6% of the population in 1965 (Table 2). The time of first finding parasite mummies of this aphid was from July 7 to August 9, while the final date varied from July 20 to August 26.

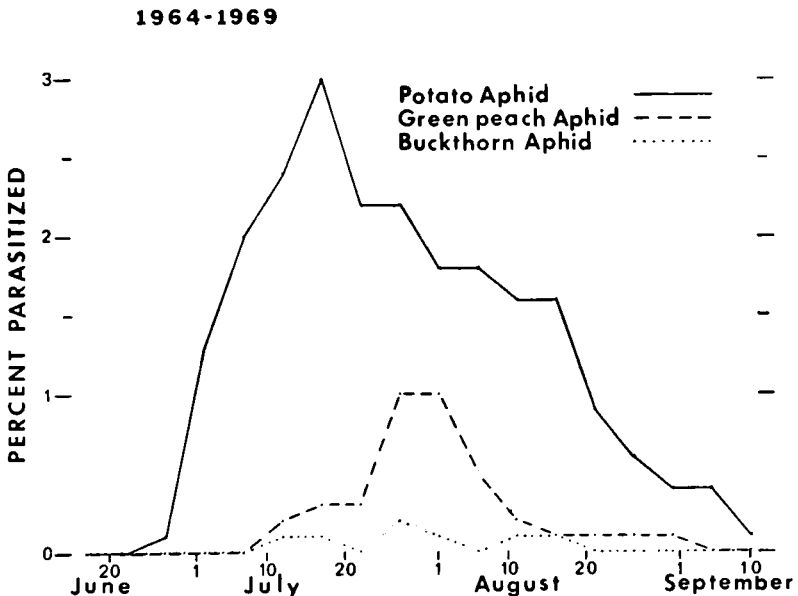


FIGURE 1. Average seasonal variation in proportions of aphid populations comprised of mummified aphids, from which parasites had not emerged at the times of weekly aphid counts, on potato plants not treated with insecticides, 1964 through 1969.

Average seasonal abundance of mummified potato-infesting aphids of three species.

On field-growing potatoes the general level of abundance of parasitism in the potato aphid was substantially above that in the green peach or buckthorn aphids during the period 1964 through 1969 (Figure 1). Percentage-wise, on average, the seasonal peaks of abundance of mummified potato aphids, from which parasites had not emerged, occurred in mid-July. The comparable peak for the green peach aphid was observed in late July and early August. Mummified buckthorn aphids were not abundant enough to establish a seasonal peak for the species. However, the largest numbers of mummified aphids of all species were found on potatoes in August because this was when the aphids were most abundant (Table 2).

THE PARASITES

The tabulation below lists the primary parasites and hyperparasites reared from potato-infesting species of aphids collected from potatoes in northeastern Maine during the period 1963 through 1967. Altogether, at least 15 species of primary parasites and nine species of hyperparasites were reared from the aphids during this five-year period. This is five fewer than the number of species of primary and half the number of hyperparasites reared from the aphids during the period 1942 through 1962 (6).

Primary Parasites	Hyperparasites
BRACONIDAE	PTEROMALIDAE
Aphidiinae	Sphegigasterinae
<i>Ephedrus incompletus</i> (Provancher)	<i>Asaphes lucens</i> (Provancher)
<i>Praon</i> spp.	<i>Asaphes rufipes</i> Brues
<i>Praon aguti</i> Smith	<i>Pachyneuron siphonophorae</i> (Ashmead)
<i>Praon pequodorum</i> Viereck	<i>Coruna clavata</i> Walker
<i>Aphidius</i> spp.	<i>Cyrtogaster</i> sp.
<i>Aphidius avenaphis</i> (Fitch)	
<i>Aphidius matricariae</i> Haliday	CYNIPIDAE
<i>Aphidius nigripes</i> Ashmead	Charipinae
<i>Aphidius obscuripes</i> Ashmead	<i>Charips</i> sp.
<i>Trioxys</i> sp.	
<i>Trioxys carolinensis</i> Smith	CERAPHRONIDAE
<i>Diaeretiella</i> sp.	<i>Lygocerus</i> sp.
<i>Diaeretiella rapae</i> (M'Intosh)	<i>Lygocerus attentus</i> Muesebeck
EULOPHIDAE	<i>Lygocerus incompletus</i> Muesebeck
<i>Aphelinus semiflavus</i> Howard	<i>Lygocerus niger</i> (Howard)
<i>Aphelinus mali</i> (Haldeman)	

Table 2

Seasonal prevalence of living and parasitized aphids on foliage of field-growing potatoes not treated with insecticides 1964-1969, inclusive.

Date	Potato aphid		Green peach aphid		Buckthorn aphid		Foxglove aphid	
	Avg No. ^a	Percent parasitized ^b	Avg No. ^a	Percent parasitized ^b	Avg No. ^a	Percent parasitized ^b	Avg No. ^a	Percent parasitized ^b
<u>1964</u>								
June 14-20	T ^c	0	0		0		0	
June 21-27	0.8	0	T		0.2	0	0	
June 28-								
July 4	0.9	0	0.1	0	0.3	0	T	0
July 5-11	0.5	0	0.1	0	0.2	0	0	
July 12-18	2.2	4.5	0.4	2.3	0.5	0	T	0
July 19-25	8.2	1.7	2.2	0	2.0	0	T	0
July 26-								
Aug. 1	19.3	2.0	9.6	0	5.1	0	0.1	0
Aug. 2- 8	24.2	2.5	10.4	0.1	4.8	0	0.4	0
Aug. 9-15	62.3	0.9	29.5	0.1	9.6	0.1	0.2	0
Aug. 16-22	65.6	1.1	39.4	0.1	8.9	0.2	0.4	0
Aug. 23-29	56.7	1.0	43.2	0.1	5.1	0	0.1	0
Aug. 30-								
Sept. 5	25.0	0.3	40.1	0	1.4	0	0.4	0
Sept. 6-12	3.1	0.3	35.7	0	2.2	0	0	
<u>1965</u>								
June 20-26	0.2	0	1.0	0	0.1	0	0	
June 27								
July 3	1.8	0	0.2	0	0.1	0	T	0
July 4-10	2.1	0.5	0.1	0	0.2	0	0	
July 11-17	2.6	2.7	0.1	0	0	0	0	
July 18-24	2.8	0.7	0.1	0	0.1	0	0	
July 25-31	9.4	2.0	0.6	4.8	0.6	1.6	T	0
Aug. 1- 7	24.6	2.2	2.4	2.1	0.9	0	T	0
Aug. 8-14	68.4	1.4	14.5	0.6	2.6	0.8	0.1	0
Aug. 15-21	26.1	0.9	13.1	0.2	8.6	0.1	T	0
Aug. 22-28	3.6	0.3	3.3	0.6	0.4	0	0	
Aug. 29-								
Sept. 1	0.2	0	0.1	0	T	0	0	
<u>1966</u>								
June 19-25	0.5	0	0		0.1	0	0	
June 26-								
July 2	0.3	0	0		0.1	0	0	
July 3- 9	0.5	4.3	0		T	0	0	
July 10-16	0.5	0	0		T	0	0	
July 17-23	1.2	0.8	0		0.3	0	0	
July 24-30	11.2	1.8	0.1	0	1.4	0	0	
July 31-								
Aug. 6	56.3	0.9	1.6	0	5.5	0	0	
Aug. 7-13	33.7	0.2	3.6	0	6.9	0	0	
Aug. 14-20	27.1	0.6	2.3	0	3.8	0	0	
Aug. 21-27	5.9	0	0.8	0	4.2	0	0	
Aug. 28-								
Sept. 3	3.1	0	0.3	0	1.7	0	0	

Table 2 (continued)

Date	Potato aphid		Green peach aphid		Buckthorn aphid		Foxglove aphid	
	Avg No. ^a	Percent parasitized ^b	Avg No. ^a	Percent parasitized ^b	Avg No. ^a	Percent parasitized ^b	Avg No. ^a	Percent parasitized ^b
<u>1967</u>								
June 25-								
July 1	T	0	T	0	4.0	0	0	
July 2- 8	0.7	4.2	0	0	4.1	0	0	
July 9-15	2.8	2.1	T	0	8.6	0	T	0
July 16-22	14.7	2.2	0.1	0	19.2	0	T	0
July 23-29	62.3	2.1	0.9	0	94.6	0.1	T	0
July 30-								
Aug. 5	48.4	3.0	2.6	0	162.0	T	0	
Aug. 6-12	131.3	1.0	7.7	0.1	375.0	T	T	0
Aug. 13-19	20.0	1.9	6.9	0	656.7	T	0	
Aug. 20-26	2.5	2.4	6.5	0	342.6	T	0	
Aug. 27-								
Sept. 2	0.8	1.2	43.3	0	60.7	0	T	0
Sept. 3- 9	0.5	2.2	17.9	0	55.6	0	T	0
<u>1968</u>								
June 26	7.0	0	T	0	0.1	0	0	
July 1- 6	1.4	0.7	0	0	1.1	0	T	0
July 7-13	3.2	5.7	T	0	2.5	0.4	0	
July 14-20	5.6	1.8	0.2	0	1.3	0.8	0	
July 21-27	2.6	6.2	T	0	0.4	0	0	
July 28-								
Aug. 3	7.2	0.4	0.1	0	0.8	0	0	
Aug. 4-10	22.4	1.4	0.6	0	3.3	0	0.1	0
Aug. 11-17	8.4	3.7	0.2	0	0.4	0	0	
Aug. 18-24	17.7	1.1	2.1	0	1.1	0	T	0
Aug. 25-31	9.0	0.2	0.6	0	0.6	0	0.2	0
<u>1969</u>								
June 27	0.3	0	0		T	0	T	0
July 3	0.5	1.9	0		T	0	0	
July 10	0.2	0	0		0		0	
July 17	0.3	7.7	0		T	0	0	
July 24	8.9	0.8	0.6	1.6	0.3	0	0	
July 31	20.1	1.9	0.3	3.2	0.9	0	0	
Aug. 7	21.5	2.4	6.4	0.5	1.7	0	0	
Aug. 15	3.1	2.3	1.5	0	1.8	0	0	
Aug. 21	0.3	0	0.3	0	0.9	0	0	
Aug. 28	0.2	0	0.1	0	0.7	0	0	

^a Numbers in hundreds (living plus parasitized) on three leaves per plant—top, middle, bottom

^b Mummified aphids from which the parasites had not emerged.

^c Less than 0.05.

Parasites reared from the potato aphid.

At least nine species of primary parasites and 10 species of hyperparasites were reared from the potato aphid during the period 1963 through 1967 (Table 3). By far the most abundant among the primaries were *Aphidius nigripes*, *Praon* spp., and *Aphidius* spp. *Asaphes*

lucens comprised 55.5% of the hyperparasites. By years, hyperparasites were reared from 22% to 70% of parasitized potato aphids.

Table 3

Number of parasites reared yearly from the potato aphid collected on potatoes in northeastern Maine, 1963 through 1967.

Species of parasite	1963	1964	1965	1966	1967
Primary parasites					
BRACONIDAE					
Aphidiinae					
<i>Ephedrus incompletus</i>		1			
<i>Praon</i> sp.	14	22	1	7	94
<i>Praon aguti</i>		1			
<i>Praon pequodorum</i>		1	1	1	
<i>Aphidius</i> spp.	3	25	4	9	45
<i>matricariae</i>		1			
<i>nigripes</i>	227	147	133	238	378
<i>obscuripes</i>		3	7	1	
<i>Diaeretiella rapae</i>		1			
Hyperparasites					
PTEROMALIDAE					
Sphegigasterinae					
<i>Asaphes lucens</i>	27	68	83	83	339
<i>rufipes</i>		3			
<i>Pachyneuron siphonophorae</i>				1	115
<i>Coruna clavata</i>	13	12	4	6	17
<i>Cyrtogaster</i> sp.			1		
CYNIPIDAE					
Charipinae					
<i>Charips</i> sp.	6	7		1	16
CERAPHRONIDAE					
<i>Lygocerus</i> spp.					
<i>attentus</i>	7	5	3	18	84
<i>incompletus</i>	13	18		1	40
<i>niger</i>	4	21	15		40
Percent of parasitized aphids from which hyperparasites were reared	22.3	39.9	42.1	69.6	56.0

Parasites of the green peach aphid.

At least seven species of primary parasites and six species of hyperparasites were reared from green peach aphids collected from potatoes during the period 1963 through 1967 (Table 4). The most abundant of the primaries were *Aphidius* spp., *Aphidius nigripes*, and *A. matricariae*, while *Asaphes lucens* and *Coruna clavata* were the most common hyper-

parasites. By years, hyperparasites were reared from 0% to 37% of the parasitized green peach aphids.

Table 4

Number of parasites reared yearly from the green peach aphid collected on potatoes in northeastern Maine, 1963 through 1967.

Species of parasite	1963	1964	1965	1966	1967
Primary parasites					
BRACONIDAE					
Aphidiinae					
<i>Praon</i> sp.	12	4			
<i>Aphidius</i> spp.		3	14	4	9
<i>avenaphis</i>			1		
<i>matricariae</i>		1	1	12	1
<i>nigripes</i>	5	5	3	1	7
<i>Diaeretiella rapae</i>		1	2	6	
EULOPHIDAE					
Aphelinae					
<i>Aphelinus semiflavus</i>	16				
Hyperparasites					
PTEROMALIDAE					
Sphegigasterinae					
<i>Asaphes lucens</i>	1	4	9		8
<i>rufipes</i>			1		
<i>Pachyneuron siphonophorae</i>			1		
<i>Coruna clavata</i>	1	1	1		
CERAPHRONIDAE					
<i>Lygocerus</i> sp.					2
<i>attentus</i>			1		
Percent of parasitized aphids from which hyperparasites were reared	5.7	26.3	38.2	0	37.0

Parasites of the buckthorn aphid.

At least 10 species of primary parasites and three species of hyperparasites were reared from mummified buckthorn aphids collected on potatoes from 1963 through 1967 (Table 5). The most common of the primaries were *Praon* sp., *Aphidius* sp., *Trioxys carolinensis*, and *Diaeretiella rapae*; of the eight specimens of hyperparasites, four were *L. incompletus*, three were *Asaphes lucens*, and one was *L. attentus*. By years, with but few collected, hyperparasites emerged from 0% to 50% of the mummified buckthorn aphids found on the plant-sample units used in making the aphid counts.

Table 5

Number of parasites reared yearly from the buckthorn aphid collected on potatoes in northeastern Maine, 1963 through 1967.

Species of parasite	1963	1964	1965	1966	1967
Primary parasites					
BRACONIDAE					
Aphidiinae					
<i>Ephedrus incompletus</i>	1				
<i>Praon</i> sp.	15			1	3
<i>Aphidius</i> spp.	3				6
<i>nigripes</i>	1				
<i>obscuripes</i>			1		1
<i>Trioxys</i> sp.	1				2
<i>carolinensis</i>	4				
<i>Diaeretiella</i> sp.					1
<i>rapae</i>		2			2
EULOPHIDAE					
Aphelinae					
<i>Aphelinus mali</i>	1				
Hyperparasites					
PTEROMALIDAE					
Sphegigasterinae					
<i>Asaphes lucens</i>	1			1	1
CERAPHRONIDAE					
<i>Lygocerus attentus</i>	1				
<i>incompletus</i>	1				3
Percent of parasitized aphids from which hyperparasites were reared	10.3	0	0	50.0	15.8

Parasites of the foxglove aphid.

Only five specimens of primary parasites and one hyperparasite were reared from the mummified foxglove aphids found on the plant-sample units of potatoes used in aphid counts during the period 1963 through 1967. Of the primary parasites, two specimens were *Aphidius nigripes*, and the others were one each of *Aphidius* sp., *Praon* sp., and *Aphelinus semiflavus*. The single specimen of a hyperparasite reared from the foxglove aphid during this period was *Asaphes lucens*. One out of three foxglove aphid mummies yielding parasites in 1963 produced a hyperparasite.

SUMMARY AND CONCLUSIONS

The survey of parasites of potato-infesting aphids on field-growing potatoes made annually in northeastern Maine from 1942 through 1962 was continued from 1963 through 1969. Collections were made of mummified aphids from which the parasites had not emerged as found on all plant-sample units examined in the weekly counts of aphids. Parasites emerged from 50 to 75% of these mummified aphids. The aphids and aphid mummies were identified to species during the field counts; later the identification of each mummy was checked microscopically.

On untreated potatoes, mummified aphids from which parasites had not emerged at the times of the weekly aphid counts, comprised 0.7% to 2.1% of the total-season population of the potato aphid, from 0% to 0.5% of the green peach aphid, and from 0% to 0.3% of the buckthorn aphid. Very few parasite mummies of the foxglove aphids were found on untreated potatoes during the period 1963 through 1967.

Within years, the seasonal abundance of mummified specimens of the potato aphid comprised from 0% to a maximum of 2.7% of the population in one year to one of 7.7% of the population in another year; for the green peach aphid it varied from 0% to a maximum of 0.1% in one year to one of 4.8% in another year; for the buckthorn aphid the seasonal range was from 0% to a maximum of 0.1% in one year, to a peak of 3.2% in another year. Percentage-wise, the seasonal peak of aphid mummy abundance was usually in the first half of July for the potato aphid and in mid-August for the green peach aphid. Mummies of the buckthorn aphid were so few in number that a comparable seasonal peak was not indicated.

Except for the one weekly count in which 7.7% of the potato aphid population was comprised of mummified specimens, the suppression of aphid population growth from parasites was considered as being relatively unimportant in determining the size of the population at the peak of any one of the four species of potato-infesting aphids. It was relatively unimportant even for the one exception because of the short duration of that level of parasitization.

Of the 15 species of primary parasites reared from the potato-infesting species of aphids during the period 1963 through 1967, nine were reared from the potato aphid, seven from the green peach aphid, 10 from the buckthorn aphid, and five from the foxglove aphid. Of the 10 species of hyperparasites reared from the mummified aphids, 10 came from the potato aphid, six from the green peach aphid, three from the buckthorn aphid, and one from the foxglove aphid.

Parasitized (mummified) aphids, parasitized aphid mummies, and the number of species of primary and hyperparasites reared from aphids

on untreated potatoes were fewer during the period 1963 through 1969 than from 1942 through 1962. The reasons for this are unclear but may be associated with increasing use and effectiveness of aphidicides used by the commercial potato growers, especially in the instance of systemic aphidicides.

References Cited

1. MacGillivray, M. E., and P. G. Spicer. 1953. Aphid parasites collected in New Brunswick in 1950. *Canad. Entomol.* 85: 423-431.
2. Shands, W. A., and G. W. Simpson. 1953. Survey Methods: Aphid populations on potatoes in the northeast. *USDA Coop. Econ. Insect Rept.* 3: 181-182.
3. _____, _____, and I. M. Hall. 1963. Importance of entomogenous fungi in controlling aphids on potatoes in northeastern Maine. *Maine Agr. Exp. Sta. Bull.* T-6, 42 p.
4. _____, _____, and L. B. Reed. 1954. Subunits of sample for estimating aphid abundance on potatoes. *J. Econ. Entomol.* 47: 1024-27.
5. _____, _____, P. M. Lombard, R. M. Cobb, and P. H. Lung, 1950. Control of Aphids on potatoes with DDT when used with fungicides. *Maine Agr. Exp. Sta. Bull.* 480, 41 p.
6. _____, _____, C. F. W. Muesebeck, and H. E. Wave. 1965. Parasites of potato-infesting aphids in northern Maine. *Maine Agr. Exp. Sta. Bull.* T-19, 77 p.
7. _____, _____, F. S. Roberts, and C. F. W. Muesebeck. 1955. Parasites of potato-infesting aphids and of some other aphids in Maine. *Proc. Wash. Entomol. Soc.* 57: 131-36.
8. _____, _____, H. E. Wave, and C. C. Gordon. 1972. Importance of arthropod predators in controlling aphids on potatoes in northeastern Maine. *Maine Life Sciences and Agr. Exp. Sta. Tech. Bull.* 54, 49 p.
9. Sullivan, D. J. and R. van den Bosch. 1971. Field ecology of the primary parasites and hyperparasites of the potato aphid, *Macrosiphum euphorbiae*, in the east San Francisco Bay area. *Ann. Entomol. Soc. Amer.* 69: 389-394.