

Seasonal fluctuation of the population density of the maple aphid (*Periphyllus californiensis* SHINJI ; Hom., Aphididae)

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1. Introduction

Aphids have several forms, and develop and reproduce rapidly. Therefore, there are many important pest species in agriculture and forestry among aphids, and population dynamics of them attracted much interests in economical view points. Many of the studies on population dynamics of aphids were, however, done in crop or grass fields, and few studies were done in forest except on those of some species which make galls or infest saplings in plantations.

Trees are perennial and large in size, and seem to be more stable hosts for insects than herbs not only in quality but also in quantity. However, most insects including aphids are usually kept at low density levels in forests. MACARTHUR and WILSON (1967) proposed the concept of r- and k-strategy in natural selection, and aphids seem to be typical r-strategists because they have large innate capacities to increase and short longevities. This means that aphids adapt themselves to unstable environment like crop or grass fields, and forests whose ecosystems are much more complicated and stable than those of fields are seemingly unsuitable for them. Therefore, how aphid populations live in forests and how their densities are determined are interesting problems from both ecological and economical view points. The mechanisms which determine density of aphid populations in forest must have something in common with those of other insect populations, and information on aphid population serves to develop some silvicultural control strategy of forest pests.

Periphyllus californiensis infests maple trees the whole year round and does not alternate hosts. The populations are usually kept at innocuous density levels in forests. However, the aphid often reaches to very high density levels in spring especially on trees in parks and gardens, and prevents leaves and shoots from normal growing. Therefore, this aphid

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is considered to be an important pest on maple trees. However, population dynamics and even biology of the aphid is still insufficiently known and why its population density is kept at low levels in forest is not yet known.

In Tanashi wood, Tokyo, the aphid is mostly kept at low density levels, but reaches to high levels occasionally on some trees. Therefore, by counting the aphid number regularly from spring to winter in 1982 in the wood, we observed the life cycle of this insect and the seasonal fluctuation of the population density, and analyzed the role of biotic factors on determining the density.

P. californiensis infests various species of maple trees. In this paper, however, the populations on two maple species, *Acer palmatum* and *A. amoenum* were described. The remarkable differences between the two maple species are seen in size of leaves, inflorescences and key fruits; *A. amoenum* has larger leaves and key fruits than *A. palmatum*.

2. Methods

Studies were undertaken in Tanashi wood, University Forest Experiment station at Tanashi, west suburb of Tokyo. The wood has an area of about 9 ha, and is composed of various kinds of trees of about 5-25 m in height. In the forest section I, there are more than 50 maple trees. Many of them were planted about 50 years ago, and were 5-12 m high. Three study areas, 0.2 ha each, were chosen and four study plots were established there (Fig. 1). Both the plots 11 and 12 were established in the same area, but the species of the maple trees differed. Plot 11 consisted of four trees of *A. amoenum* of about 5-8 m high, and plot 12 consisted of four *A. palmatum* of about 3-6 m high. There are ten more maple trees, four *Pinus densiflora*, one *Prunus jamasakura* and one *Camellia sasanqua*, with no undergrowth in the area.

Two study areas were chosen in *P. densiflora* stand, and plots 2 and 3 were established there. Plot 2 was composed of six *A. palmatum* of about 8-12 m high. In the area, where plot 2 was established, 22 trees of *P. densiflora* occupied the upper layer, nine maple trees occupied the middle layer, and *Aucuba Japonica* and *Hydrangea macrophylla* occupied the lower layer. Plot 3 was composed of five *A. amoenum* and one *A. palmatum*, both of them were 4-6 m high. In the area, where plot 3 was established, four *P. densiflora*, three *Chamaecyparis obtusa* and 14 *Quercus serrata* occupied the upper layer, ten maple trees occupied the middle layer and *A. japonica* occupied the lower layer.

Thus, each plot was composed of 4-6 sample trees out of 9-18 maples in the study area, and five sample branches at about 2 m high above the ground were chosen from each tree of the plots and numbered beforehand. The number of the aphid was counted with its natural enemies, which were seen on the part of 40 cm long from the top of the sample branch. Count was done once a week except summer with counting once a month when the aphid was aestivating dimorph. The number of aphids on branches of 40 cm long taken from the upper and middle layers of the sample trees at plots 11 and 12 did not differ from those on other sample branches (Table 1).

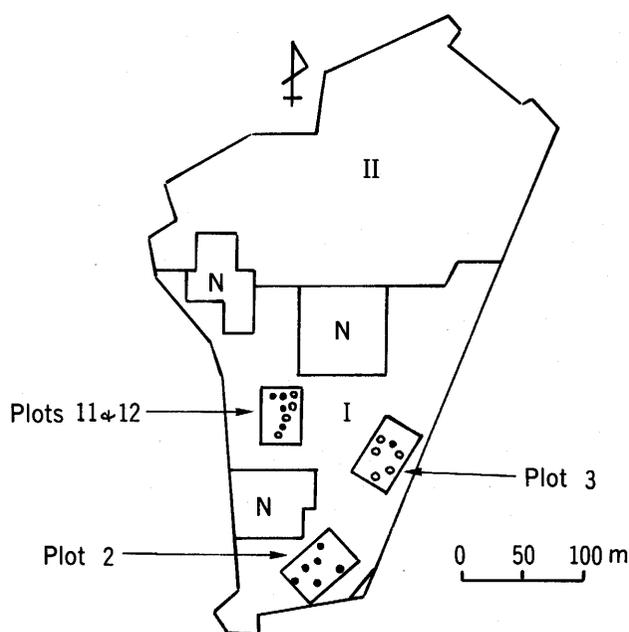


Fig. 1 Study area. Three study areas were chosen and four study plots were established in Tanashi wood. N : area for nursery or buildings. I and II : forest section number. White : *Acer palmatum*, Black : *A. amoenum*.

Table 1 Mean number of *Periphyllus californiensis* on samples and on other branches of the same size taken from the upper or middle layers of the trees ($\bar{x} \pm s$).

Plot	Date	Sample branches		Other branches	
		No. samples observed	No. aphids	No. branches observed	No. aphids
11	Apr. 20	10	4.25 ± 3.59	10	6.10 ± 3.12
	Jul. 13	20	3.77 ± 2.09	20	2.87 ± 2.39
12	Jul. 13	20	1.58 ± 1.29	20	0.98 ± 1.86

3. Results

3-1. Life-cycle and seasonal fluctuation

An outline of the life-cycle of *P. californiensis* observed in Tanashi wood in 1982 is shown in Fig. 2.

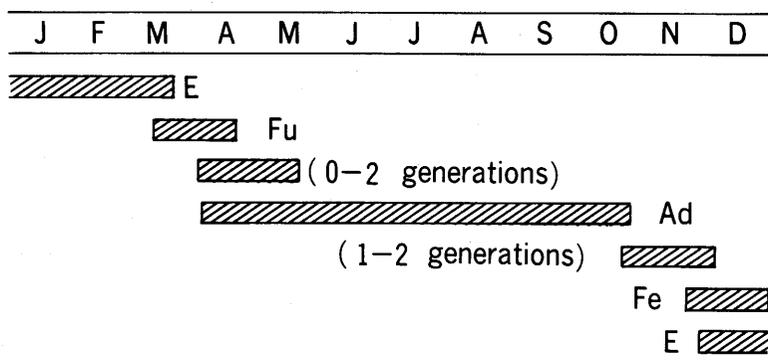


Fig. 2 Life-cycle of *Periphyllus californiensis* in Tanashi wood, Tokyo. E : egg, Fu : fundatrix, Ad : aestivating dimorph, Fe : Ovipositing female.

The aphid overwintered in egg. Fundatrices hatched from the eggs in early and mid-March, when maples scarcely budded. Winged forms appeared mostly in the second generation in mid-April and dispersed. Winged or wingless females reproduced aestivating dimorphs after mid-April. The aestivating dimorphs stayed on leaves or key fruits until mid-October, and then moulted. They grew to wingless females and produced winged females which dispersed in mid-November and reproduced wingless females. This wingless female deposited 1-15 eggs on each bud or small space between twigs from late November to early January. Winged males were seen in late November and December.

The number of maple aphids on samples is shown in Fig. 3. The aphid numbers increased to peaks in spring and autumn: i. e. in 8-9 weeks and in 37-40 weeks after March 1. Though a rapid increase to high peak occurred at plot 11 in spring, the peak numbers in other plots were rather small and the densities were kept at low levels throughout the year. The aphid spent most of the duration between the two peaks as aestivating dimorph, and the number of aestivating dimorphs decreased steadily at all the plots. Thus, though the patterns of the seasonal fluctuations were coincident with each other, the peak densities differed greatly among the plots.

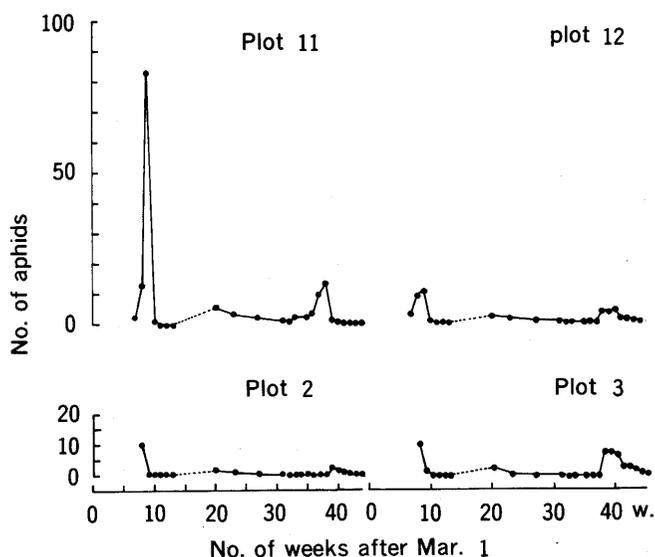


Fig. 3 Mean number of *Periphyllus californiensis* per one sample.

3 - 2. Spring population

The periodical observations started on April 20 at plots 11 and 12, and on April 24 at plots 2 and 3, but we counted the number of aphids at plots 11 and 12 preliminarily on April 16 on 15 branches from three sample trees, and both the increasing and the decreasing phases of the population fluctuations were observed at the two plots.

The number of *P. californiensis*, and its mummies formed by a parasitic wasp *Aphidius aroelatus* and the number of syrphid larvae which fed on aphids are shown in Fig. 4. This figure shows that the population of the aphid increased until the end of April and then decreased drastically, and the largest difference between the two plots was seen in their peak numbers. There were 1.7 and 2.8 aphids per one sample at plots 11 and 12, respectively, on April 16, and the populations increased 7.4 times and 3.2 times at plots 11 and 12, respectively, in four days. And then, the aphid population increased 6.6 times (3-32 times in each sample tree) at plot 11 and 1.2 times (0.6-3 times in each sample tree) at plot 12 in a week from April 20 to 27.

Few mummies were formed by parasites during the time from April 16 to 27, and 0.05 and 0.2 syrphid larvae, mostly of *Epistrophe balteata*, were seen per sample on April 20 at plots 11 and 12, respectively. The number of syrphid larvae increased to 0.35 by April 27 at plot 11, and the syrphid larvae might play a role in determining the rate of increase of the aphid population during April, but it was not ascertained.

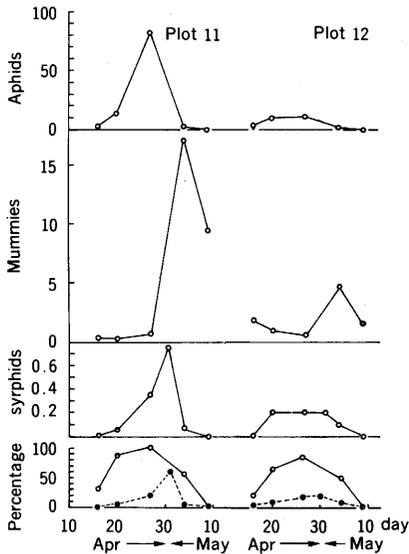


Fig. 4 Mean numbers of *Periphyllus californiensis*, its parasitized mummies, and syrphid larvae per sample in spring. White circles in the bottom figure mean the percentage of trees infested by the aphid and black circles mean the percentage of trees where the presence of syrphid larvae was recorded.

Table 2 Mean number of leaves and inflorescences per sample and the number of *Periphyllus californiensis*.

Plot	No. leaves	No. inflorescences	Date	Total No. aphids		No. winged females	% winged females on inflorescences
				On leaves	On inflorescences		
11	33.2	11.6	Apr. 20	10.8	6.4	2.8	78.6
			27	6.8	89.4	5.4	72.4
12	48.0	0.8	Apr. 20	2.6	0	0.8	0
			27	9.0	0.6	2.4	0

Increasing rates of the population in April differed between plots 11 and 12. Observations showed that the aphids at plot 11 and 12 lived on different parts of the maple trees (Table 2). More than 70 percent of the winged aphids stayed on inflorescences at plot 11, but all of them stayed on shoots or leaves at plot 12. At plot 11, where 11.6 inflorescences were seen per sample, the number of aphids on leaves decreased but that on inflorescences increased greatly in a week from April 20. The inflorescence seems to be a suitable place for the aphid to reproduce in this time of a year. Thus, the percentage of aphids stayed on inflorescences increased from 37.2 % to 92.9 % during the period. On the other hand, at plot 12, where 0.8 inflorescences were seen per sample, the population increased only a little both on shoots or leaves, and inflorescences. The presence of many large inflorescences seemed to have played an important role in determining the aphid density at high levels at plot 11.

The number of the aphids decreased greatly at both plots from April 27 to May 4, and only 0.5-2.0 aphids remained per sample after the drastic decreases. With the more aphids on each sample tree on April 27, the larger was the difference between the numbers counted on April 27 and May 4 (Fig. 5). And the ratio of the difference was also large on

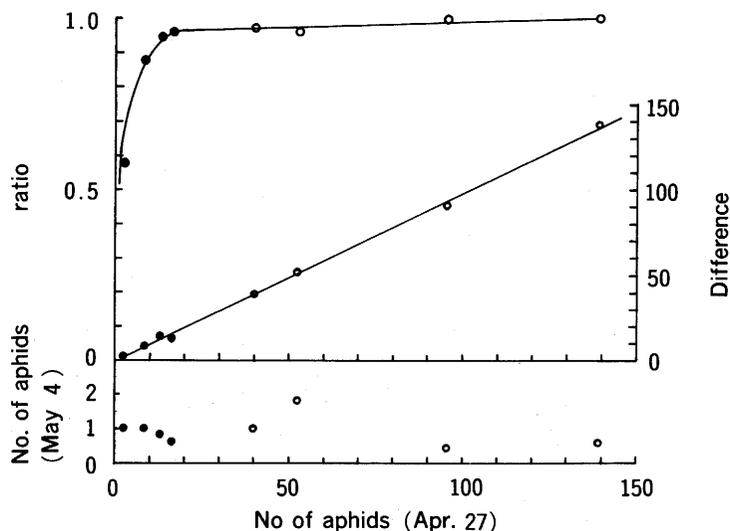


Fig. 5 Relationship between the mean numbers of *Periphyllus californiensis* per sample on April 27 and that on May 4, the difference between the two mean numbers, and the ratio of the difference to the mean number of April 27. White : Plot 11, Black : Plot 12.

the trees on which more aphids were seen, and the population was considered to have changed density-dependently during this period. Many of the aphids collected from ten colonies at plot 11 on April 20, May 1 and 10 were larvae, though the percentages of young larvae decreased in the latter samples (Fig. 6). Therefore, the decrease in aphid number at plot 11 must not be caused by physiological death due to old age, but be caused by some external factors.

A large number of mummies appeared in early May and all of them were formed by *A. areolatus*. Adults of *A. areolatus* emerged in early and middle March from the mummies formed in the field in November of the previous year, and then emerged again at the end of April from the mummies which were formed in early April. The ratio of the number of mummies seen on May 4 to the number of aphid seen on April 27 was 0.2 at plot 11, and 0.4 at plot 12. There was no clear correlation between the number of aphids seen on April 27 and that of the mummies seen on May 4, and the ratio showed a decrease with

increasing number of aphids seen on April 27 (Fig. 7). This parasitic wasp must be an important mortality factor of the aphid population in early May, but is not the factor to decrease the aphid population density-dependently.

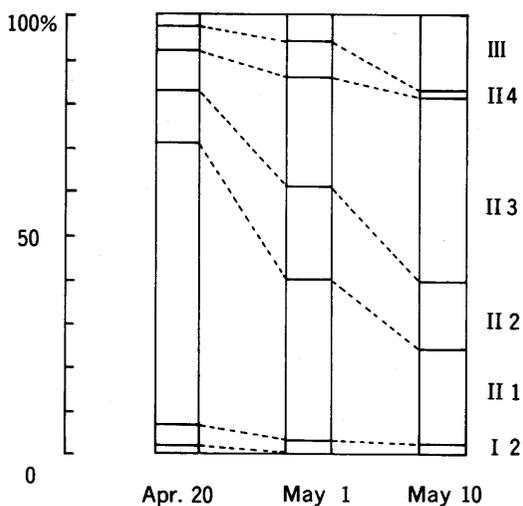


Fig. 6 Age structures of *Periphyllus californiensis* during mid-April and early May. I 1 : Winged full grown larvae, I 2 : Winged females, II 1 : small sized larvae, II 2 : middle sized larvae, II 3 : large sized larvae, II 4 : Wingless females, III: aestivating dimorphs.

The number of syrphid larvae increased to a peak in early May and all the larvae pupated by May 9. There were 19 syrphid larvae, 18 of them were *E. balteata* at the two plots 11 and 12 on May 1. There was correlation between the number of aphids seen on each sample tree on April 27 and the number of syrphids on the same sample tree on May 1 ($r=0.813$). This means that the more syrphids were seen on trees on which the more aphids infested (Fig. 7).

Some syrphid larvae prey upon 60 aphids per one day and others consume 134-162 aphids in their last instar period (SCHNEIDER 1969). When three larvae of *E. balteata* were reared individually in petri dishes for two days in their last instar, each consumed at least 50 *P. californiensis* in a day. Therefore, the syrphids must be able to prey upon at least more than 100 aphids in two days, and almost all aphids on a sample will be preyed upon when syrphid larvae search the aphids intensely. Syrphids were seen on sample branches of all the sample trees at plot 11 and on the sample branches of 75% of the sample trees at plot 12 on May 1. Syrphids were one of the most important mortality factors of the aphid population at the two plots in spring, and the drastic decrease of the aphid density at plot

11 was considered to have been caused by the syrphids.

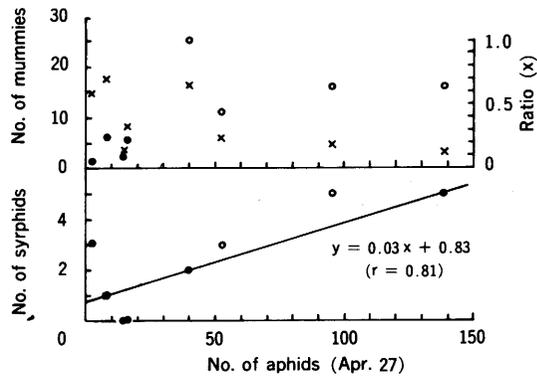


Fig. 7 Relationship between the mean number of *Periphyllus californiensis* per sample on April 27 and the number of mummies formed between April 27 and May 4, the ratio of the mummies to the aphid number on April 27, and the number of syrphid larvae on May 1. White circles : plot 11, Black circles : plot 12.

3 - 3. Summer population

Aestivating dimorph stayed mostly on leaves on *A. palmatum*, but more than 30% of them stayed on key fruits on *A. amoenum* (Table 3). We counted the number of aestivating dimorphs once a month from July to September. Fig. 8 indicates that the aestivating dimorph population suffered high and inversely density-dependent mortalities during the

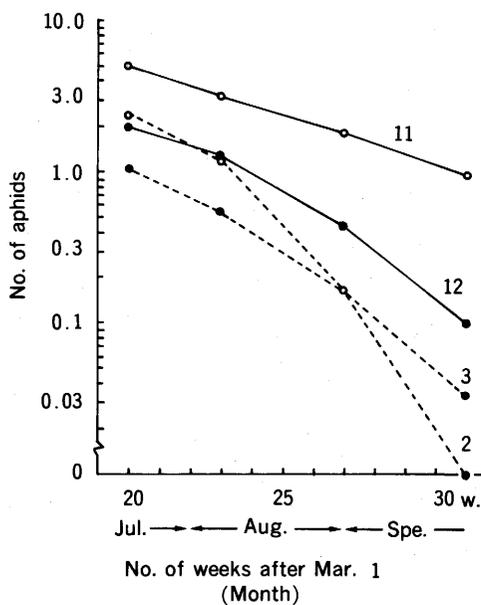


Fig. 8 Number of aestivating dimorphs of *Periphyllus californiensis* per sample at four plots 11, 12, 2 and 3.

period and the aphids at plots 12, 2 and 3 disappeared by mid-October. The mortalities of the aphids on different parts of a tree were not the same; aphids on key fruits suffered smaller mortalities than those on leaves (Table 4).

Table 3 Number of aestivating dimorphs of *Periphyllus californiensis* on all samples on July 14.

Plot	No. key fruits	No. of aphids					
		On key fruits		On upper side of leaves		On under side of leaves	
		No.	%	No.	%	No.	%
11	428	33	32.4	52	51.0	17	16.7
12	7	0	0	37	92.5	3	7.5
2	21	0	0	26	65.0	13	35.0
3	495	24	33.8	33	46.5	14	19.7

Table 4 Number of aestivating dimorphs of *Periphyllus californiensis* on all samples and percentages of decrease from July to September.

Plot	On upper side of leaves			On under side of leaves			On key fruits		
	Jul. 13	Sep. 27	%	Jul. 13	Sep. 27	%	Jul. 13	Sep. 27	%
11	51	7	86.3	18	2	88.9	33	9	72.7
12	37	2	94.6	3	0	100	0	0	—
2	26	0	100	14	0	100	0	0	—
3	34	0	100	14	0	100	24	1	93.8

Table 5 Mean number of leaves and key fruits per sample injured by a typhoon or defoliators. (Observed on September 6)

Plot	Leaves					Key fruits			
	Total	Healthy	Defoliated more than 2/3	Defoliated partly	Injured by typhoon	Total	Healthy	Injured completely	Injured partly
11	32.5	23.2	1.8	7.5	0	16.5	14.7	0	1.8
12	60.8	49.5	0	11.3	0	0	0	0	0
2	97.5	62.5	5.7	28.8	0.5	0.5	0.3	0.2	0
3	76.5	26.7	1.5	16.0	32.3	12.8	0.2	2.2	10.4

A typhoon attacked the area on August 1 and injured leaves, especially at plot 3. And about 20-30% of the leaves and 10% of the key fruits were injured or lost by insect defoliators before early September (Table 5). When leaves were defoliated, many of the aestivating dimorphs on the leaves should be eaten with the leaves. Thus, some of the mortalities of aestivating dimorphs seemed to have been caused by the typhoon and defoliators.

3 - 4. Autumn and winter population

Aestivating dimorphs moulted during the period from early to middle October, and developed to wingless females and reproduced winged females. The number of aphids increased greatly in late October by the reproduction of these females (Fig. 9). The winged females dispersed and then produced wingless females which deposited eggs at all the plots, but before the dispersal of the winged females in mid-November the aphids were seen only at plot 11.

Table 6 Number of larvae of *Periphyllus californiensis* after moulting from aestivating dimorph. (Observed on October 26)

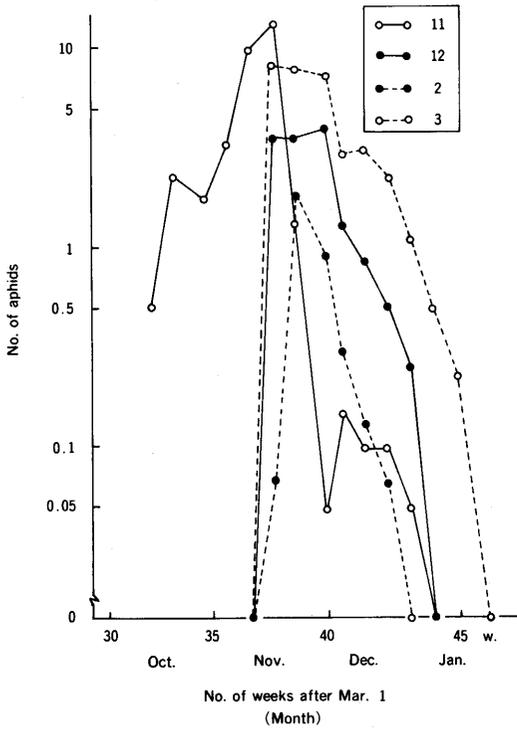
Plot	On key fruits		On upper side of leaves		On under side of leaves		On leafstalks	
	No.	%	No.	%	No.	%	No.	%
11	31	88.5	0	0	1	2.9	3	8.6

Table 7 Number of *Periphyllus californiensis* on different parts of maple trees after the dispersal of winged females in autumn. Observation was done on November 16.

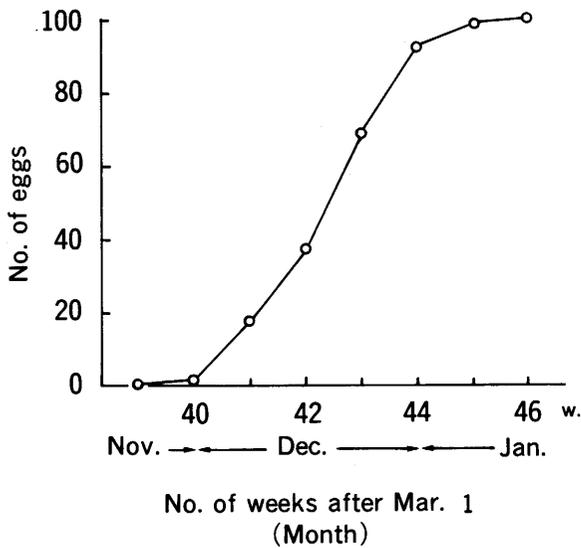
Plot	On upper side of leaves		On under side of leaves		On leafstalks		On twigs	
	No.	%	No.	%	No.	%	No.	%
11	7	2.7	249	96.9	0	0	1	0.4
12	0	0	42	60.0	28	40.0	0	0
2	0	0	2	100.0	0	0	0	0
3	0	0	227	95.4	11	4.6	0	0

Few natural enemies were seen on the samples during the period from October 26 to November 11, and the number of aphids increased 1.8-2.2 times in a week. When the aphids were aestivating dimorphs, 30% and 40% of them stayed on key fruits on July 14 and September 27, respectively, but after they moulted 90% of the aphids stayed and developed on key fruits (Table 6). Key fruits seem to be a favourable developing site for them.

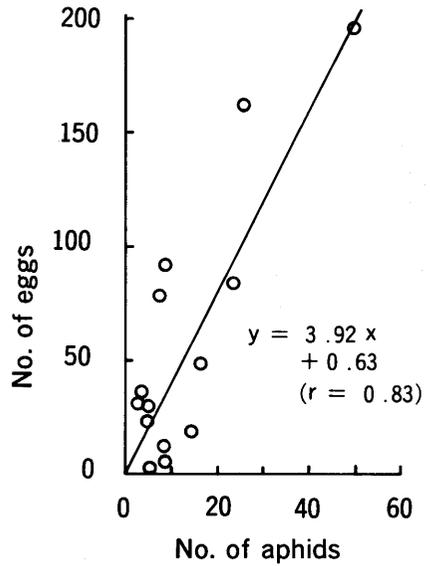
As the winged aphids left, the number of aphids decreased at Plot 11. But at other plots, winged aphids came and stayed underside of leaves and reproduced quickly (Table 7). Each winged female formed a colony with 10.6-17.3 nymphs in a week, but the numbers started to decrease after November 23. The decrease was caused density-independently at all the study plots except plot 11 (Fig. 9). Natural enemies on sample branches were parasitic wasps (*A. areolatus* and *Dyscritutus* sp.), lacewings, syrphids and lady beetles. However, the role of these natural enemies in determining the aphid density in autumn was



⇐ Fig. 9 Mean number of *Periphyllus californiensis* per sample at the four plots 11, 12, 2 and 3 in autumn.



↗ Fig. 10 Accumulated percentage of the number of eggs deposited by *Periphyllus californiensis* in 1982.



↗ Fig. 11 The relationship between the total number of *Periphyllus californiensis* counted four times in December and the number of eggs deposited on the sample.

not ascertained.

Females deposited eggs from early December to early January (Fig. 10), but most of the eggs were deposited in December. The number of the females and that of eggs deposited were counted every once a week on 15 samples from three sample trees at plot 3. The relationship between the total number of aphids counted four times during December (\times) and the total number of eggs deposited on the same sample branch (y) was expressed by a linear regression (Fig. 11). This means that the females deposited eggs density-independently, and the number deposited per sample was estimated as 2.2, 12.0, 2.5 and 34.5 at plots 11, 12, 2 and 3, respectively.

4. Discussion

The fluctuation type of *P. californiensis* population was the same among the study plots, but the peak densities differed greatly. The peak density at Plot 12 was low and the population was kept at low levels throughout the year, but the peak density at plot 11 increased to a very high level in spring especially on inflorescences. Existence of a large number of inflorescences on the host tree contributed to realize the high peak density.

After the population increased in spring, the density decreased greatly at all the plots. The great decreases were caused density-dependently, and the most important mortality factor was the syrphid, *E. balteata*. Eggs of the syrphid are usually seen near colonies of aphids. ITO and IWAO (1977) observed oviposition behaviour of syrphid on *Myzus persicae* which infested cabbage, and showed that syrphid searched plant and laid eggs where many aphids were swarmed. Syrphids have an ability to consume a large number of aphids in a short time, and almost all the aphids on one branch often disappeared quickly when a syrphid larva searched them on the branch. Therefore, the mortality due to syrphids was caused density-dependently. Density-dependent mortality of aphids due to syrphid larvae was also observed on *Cinara todocola* population in mixed forest in Hokkaido (FURUTA, 1976). Syrphids must play an important role in determining the density of aphid population in forests.

The syrphid *E. balteata* preyed upon more than 100 aphids in two days in the laboratory and it was estimated that all aphids on a branch or on a tree would be consumed by syrphid larvae. MOGI (1969) discussed on the relationship between extermination and regulation of prey population due to predation by a lady beetle, *Harmonia axyridis*. Of course, local

extermination due to natural enemies such as polyphagous predators may often be caused in the field. However, insect population in the field is usually composed of several local populations. When large local populations are exterminated but small local populations escaped from extermination, the extermination contributes to cause density-dependent mortality among the local populations, and this may often serve to regulate the whole population in the area. Therefore, though syrphids often exterminate some local populations of their preys, they are able to regulate the prey population to low density levels in the field.

P. californiensis lives only on maple trees. As maple trees are perennial, the aphid seems to be able to live on one tree for many years. If it were the case, the aphid might not need to produce a large number of winged aphids every year. However, a large number of winged aphids were produced twice a year, once in spring and once in autumn, and they dispersed among trees. KENNEDY and BOOTH (1954) mentioned that the dispersal of winged aphids served to escape the population from its natural enemies. The population of *P. californiensis* suffered high mortality due to syrphids and parasitic wasps in spring, and the aphid might sometimes be eliminated by natural enemies before they laid aestivating dimorphs unless they dispersed in spring. Dispersal of the aphid seemed to contribute the population to escape from natural enemies to some extent. Though syrphids, as the most important mortality factor, caused the mortality density-dependently upon the aphid population, extermination of the whole population was improbable in the field. Dispersal of the aphid seems to have some other meaning to the population.

The life history of the aphid is composed of various life stages and a great increase of the population was realized just after the dispersal of winged aphids; the population increased more than ten times in a week. A maple tree is divided into six groups of microhabitats from the view point of the life history of the aphid.

1. Fundatrices Buds and shoots
2. Spring population after dispersal
of winged aphids Shoots and inflorescences
3. Aestivating dimorphs Leaves and key fruits
4. Autumn population before dispersal Key fruits
5. Autumn population after dispersal Leaves
6. Ovipositing females Twigs

Thus, though the aphid lives on maple tree the whole year round, it does not always stay

on the same part of a tree but changes its micro-habitat according to its life-cycle. This suggests that the whole tree is not a uniform habitat for the aphid throughout a year, and a favourable place for the aphid is restricted to a part of the whole tree. Time of budding is influenced by environmental conditions and differs among trees, and the shapes of leaves and key fruits and number of inflorescences also differs among tree species. Inter-tree dispersal of the aphid may contribute to find the most suitable micro-habitat for its reproduction.

Aestivating dimorph is the most interesting form of the aphid. DIXON (1971) showed that nutritional conditions of bird-cherry leaves changed with season, and CARTER (1975) considered that the appearance of the aestivating dimorph of *P. californiensis* was governed by the nutritional conditions of maple leaves. Observations of the aphid in Tanashi wood showed that aphid on growing terminal shoots reproduced winged or wingless individuals, but those on open leaves reproduced aestivating dimorphs at the same time in mid-April. Therefore, it seems to be reasonable that the aestivating dimorph could be induced through nutritional conditions of the host tree.

Summary

The maple aphid, *Periphyllus californiensis*, lives on maple trees the whole year round. We observed populations of this aphid in Tanashi wood, a suburb of Tokyo, and tried to analyze the factors in determining the density.

Four study plots were established in the wood, and five branches were chosen as sample branches from each of the 4-6 sample trees in each plot. Numbers of the aphid and its natural enemies were counted on the part of 40cm long from the top of the sample branch.

1. Larvae hatched from overwintered eggs in early March. Winged aphids dispersed in mid-April, and aestivating dimorphs were reproduced from April to May. The aestivating dimorphs molted in mid-October. Winged aphids appeared again in mid-November, and produced wingless females that deposited eggs mostly in December.
2. The population had two peaks in a year; once in spring and once in autumn. The peak in spring was realized after the dispersal of winged aphids, but the populations suffered high mortality due to syrphids, mostly *Epistrophe balteata*, soon after the population reached to high levels. Syrphid larvae consumed a large number of aphids in a short time, and almost all the aphids on a sample tree disappeared soon after the syrphids appeared on the tree. The mortality due to syrphid larvae was caused density-dependently, and syrphids were considered to have played an important role in decreasing the aphid population to lower density levels.
3. The mortality of aestivating dimorphs in summer, reproduction after the dispersal of

winged aphids, and the decrease in population density after the reproduction in autumn were all caused density-independently. The mortality of aestivating dimorphs in summer was especially high and the aphid populations in three out of the four study plots decreased to zero. However, after the dispersal of winged aphids in autumn, populations were restored again in all the plots.

4. The aphid lived mostly on inflorescences or key fruits during the period from dispersal of winged aphid in spring to just before the dispersal of winged aphid in autumn, and the aphid lived on leaves in autumn and lived on buds or young shoots in spring before dispersal. Thus, though the aphid infests maple trees the whole year round, it utilized different parts of the host tree at different stages in its life-cycle. This suggests that the best reproduction and development of the aphid is realized on some certain part of the tree which changes seasonally. The dispersal of winged aphids seems to contribute to find the most suitable place for reproduction and development.

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モミジニタイケアブラムシ

(*Periphyllus californiensis* SHINJI ; Hom., Aphididae)

個体群密度の季節的变化

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要 旨

モミジニタイケアブラムシ (*Periphyllus californiensis*) はカエデ類に寄生するアブラムシで、寄主交代はしない。本種の個体群を野外で観察し、その生活史を追跡するとともに、密度が決定される過程を解析した。

調査は東京都下、東京大学演習林田無試験地内に設定した4調査区で行なった。このうち2調査区はオオモミジに、他の2調査区はイロハモミジに設定したものである。アブラムシと天敵類の個体数は、調査区を構成する4～6本のカエデについて、各5本の枝の枝先40cmの部分にいるものを直接観察で数えた。その結果である。

1. 本種は3月上旬にふ化し、4月中旬に有翅虫による分散が見られ、4～5月に越夏型1齢幼虫が産みつけられた。越夏型1齢幼虫は10月中旬に脱皮し、発育を再開したが、11月中旬に有翅虫が分散し、有性虫による産卵は主として12月に見られた。
2. 本種は4月と11月にピークをもつ2山型の発生経過をとり、4月のピークは有翅虫の分散後に見られた。しかし、主としてホソヒラタアブ (*Epistroph balteata*) による捕食によって、個体数は急激に減少した。ホソヒラタアブなどのヒラタアブ類幼虫はアブラムシ密度の高い木に多く見られ、1頭あたりの捕食量が大きく、かつ短い期間に発育を完了することもあり、ほとんどすべてのアブラムシを食いつくした。この死亡は密度依存的に引き起こされており、ヒラタアブ類はモミジニタイケアブラムシの密度を制御するうえで重要なものであると判断された。
3. 越夏型1齢幼虫の死亡、秋の有翅虫の分散後の増殖とその後の個体数の減少はアブラムシの密度に依存しない経過をとっていた。越夏型1齢幼虫の死亡率は高く、3調査区では絶滅するほどに密度が低下したが、秋の分散を経て再び個体群が形成された。
4. 春の分散後、秋の分散が始まるまでの間は本種は主として花序や翅果上に、秋の分散後、春の分散までの間は芽や葉に多く寄生しているのが観察された。このように本種は1年間を通してカエデ樹上に生活するとはいえ、発育に応じて主たる寄生部位を変更しており、したがってその増殖と発育に適した部位は樹体内の限られた部分であり、しかもその部位はアブラムシの生活史に応じて季節的に変化することが示唆された。有翅虫の飛行分散はこのような好適な寄生の場を求めて行なわれていると考えられる。