Kobe University Repository : Kernel

PDF issue: 2026-06-04

Studies on Symphyta (II) : On the Life-History of a Japanese Pamphilid-Sawfly, Pamphilius lucidus RHOWER

Okutani, Teiichi

Fujita, Etsuhisa

(Citation)
兵庫農科大學研究報告. 農学編,2(1):80-88

(Issue Date)
1955-12

(Resource Type)
departmental bulletin paper

(Version)
Version of Record

(JaLCDOI)
https://doi.org/10.24546/81006499

(URL)
https://hdl.handle.net/20.500.14094/81006499

KOBE UNIVERSITY

STUDIES ON SYMPHYTA(II)

On the Life-History of a Japanese *Pamphilid*-Sawfly, *Pamphilius lucidus* RHOWER.

Teiichi OKUTANI and Etsuhisa FUJITA

Introduction

Sawflies cause a serious damage to agricultural, horticultural and forestry plants by boring into stems or eating leaves, though exceedingly varied in the mode of attack in different species. Inspite of the urgent importance from an economic standpoint, very little has hitherto been published concerning the biology and the identification of the early stages of these serious pests.

The present paper deals with the biology of *Pamphilius lucidus* ROHWER (1910) observed at Sasayama in Hyogo Prefecture mainly in 1955. This species is one of the serious pests of *Rubus*, though in Japan *Rubus* is not so important bush fruit as in Europe or America.

The Adlt

APPEARANCE--The sawfly has a generation a year. The adults appear early to late in April at Sasayama. The most abundant period of the adult was 10 th to 15 th of April in 1955. Sex ratio of 30 adults collected on 11th to 26 th in April was 1 : 1, i. e. 15 females and 15 males.

LONGEVITY--The adults collected from the field were reared in a glass-cylinder(18 cm in diameter and 25 cm high), in which a cut branch of *Rubus crataegifolius* BUNGE was preserved keeping its cut end in water. They were fed on honey solution, though their food in the field still remains unknown. The longevity of the adults is shown in Table 1. From this table it is considered that the longevity of the female is longer than of the male, i. e. the male is able to live about a week and the female about 2 weeks.

Table 1. Longevity of the adults.

Sex	Date of Collection	Longevity (days)
Female	April 11	11
	11	5
	11	16
	12	13
	12	10
	12	10
	12	8
	12	12
	12	10
	12	19
	12	20
	13	10
	21	11
	26	3
	Mean	11.3
Male	April 11	6
	12	5
	13	7
	13	5
	Mean	5.7

HABITS…

General Habits : The adults are always found flying near the shrub of their host-plants. The males fly around the host-plants always more actively than the females. The females usually try to lay their eggs on the under sides of the leaves, as soon as they cease their flights and alight on the leaves. In bright sunshine, they are extremely active and readily try to fly about, but not so active in dull and windy wheathers. The most active hours are from 10 a. m. to 3 p. m. In worse wheathers, they do not fly and remain still hiding themselves under the foliages. Although both sexes are set free in the cage, the copulation has never been observed.

Oviposition : The following five species of plants on which the females laid their eggs were observed in the field in 1955 : *Rubus microphyllus* LINNÉ, *R. crataegifolius* BUNGE, *R. palmatus* THUNB., *R. hirsutus* THUNB. and *R. crochorifolius* LINNÉ.

Usually oviposition takes place at 12 a. m. to 2 p. m. Even at the first time of oviposition the female visits only the extension shoots on the current season's growth. As soon as she alights on a young leaf, she goes round to the under side of the leaf, with her antennae vibrating continually, and begins to seek for the most suitable portion for oviportion for the distance from the base to the apex of the leaf, moving toward the tip along mid-rib, bending the posterior part of the abdomen ventrad and swinging it to right and left on the vein. Usually the females select the young leaves only of newly shooted branches on the over-wintered stems for oviposition, and it has never been observed that they oviposited on the leaves of the young shoots from the roots, which are usually rather thicker and stronger. When the female has finished the first egg-laying, she goes on to the next leaf and repeats the above mentioned action. But if she cannot find a suitable portion, she does not lay

Table 2. Numbers of eggs on the various widths of the veins.

Species of *Rubus* / Width of Vein	*crochorifolius* (Field)	*microphyllus* (Field)	*crataegifolius* (Field)	*crataegifolius* (Laboratory)	*hirsutus* (Field)	Total
0.125 mm	1	3	1	1		6
0.156		8	4		4	16
0.187	4	22	13	6	6	51
0.218	4	25	16	16	1	62
0.249		22	23	6	1	52
0.280	1	9	23	10	1	44
0.311		6	8	2		16
0.342		5	5	2	1	13
0.373		4	6	1		11
0.404		2	2			4
0.435		1	2	2		5
0.466		2				2
Total	10	109	103	46	14	282

Table 3. Egg carrying leaves of various heights.

a) *Rubus crataegifolius* (4 stubs convined, which are 263 cm, 175 cm, 200 cm, and 80 cm in height).

Heights of Laeves (cm)	Number of Eggs per Leaf 1	2	3	4	5	6	7	No. of Leaves	Total No. of Eggs
50	1							1	1
60								0	0
70	4	4						8	12
80	5	1						6	7
90	2	1						3	4
100								0	0
110	5	1	1					7	10
120	2							2	2
130	19	8	1		2			30	48
140	16	5						21	26
150	11	10	5					26	46
160	35	15	11	9	2			72	149
170	25	3	5			2	1	36	65
180	12	13	8	3	3			39	89
190	10	6	1	3		1		21	43
200	4	1						5	6
210	3							3	3
220		1						1	2
230	3							3	3
240	5							5	5
250	3							3	3
Total of Leavae	165	69	32	15	7	3	1	292	
Total of Eggs	165	138	96	60	35	18	7		519

b) *R. crochorifolius* (1 stub, 190 cm high; only 1 egg per leaf)

Heights of Leaves	No. of Leaves
130 cm	1
140	6
150	5
160	2
Total	14

c) *R. hirsutus* (1 stub, 40 cm high; only one egg per leaf-let)

Heights of Leaves	No. of Leaves
10 cm	1
20	6
30	5
Total	12

d) *R. microphyllus* (1 stub, 140 cm in height)

Heighs of Leaves / No. Eggs per Leaf	1	2	No. of Leaves	Total No. of Eggs
70 cm	6	1	7	8
80	1		1	1
90	7		7	7
100	9	1	10	11
110	5		5	5
120	4		4	4
Total of Leaves	30	2	32	
Total of Eggs	30	4		36

Table 4. Egg-location on leaf, in captivity.

Location	Normal	Abnormal						Total
	Under-side of Leaf	Upper-side of Leaf	Petiole	Stem	Bud	Glass	Fall down on Bottom	
No. of Eggs	131	11	5	1	1	1	4	154
Total	131	23						154

her eggs and goes to the other leaves. Generally the entire course of egg-laying lasts only about 10 minutes, but often the selection of leaves wastes time and the full course goes on about 30 minutes.

Usually the eggs are laid on the vein of the under side of the leaf as shown in Photo. 1. It is observed that the egg-location on the leaves seems to be related to the widths of the veins, which are about 0.2~0.3mm in each case of 4 species of *Rubus* as shown in Table 2. Therefore the eggs can scarcely be found on the edge or the base of the leaf. Sometimes the eggs are abnormally laid on the upper side of the leaves, the buds or the stems. In captivity, as the number of the leaves are few, the abnormal oviposition is observed more often than in the field (Table 4).

The heights of egg-carrying leaves, though varying with the heights of the shrubs, are usually about 160 cm above the ground in the case of *R. crataegifolius*, about 100 cm in *R. microphyllus*, about 150 cm in *R. crochorifolius* and about 30 cm in *R. hirsutus*. Table 3 shows these observation data and one of these examples is diagramatically shown in Fig. 1. From this fact it may be considered that the females are refrained from ovipsition on the leaves, which are in danger of being splashed with mud in rain or being shaked by incessant wind.

The females, collected on *R. crataegifolius*, were made to lay their eggs on the same plants in the cage, for the purpose of observation of egg laying capacity. The results are recorded in Table 5. From this table it will be seen that total number of eggs in ovary is about 30 and about 80% of the latter are deposited. The oviposition period is about 5~6 days as shown Table 5, and in some cases the females died without the act of egg-laying.

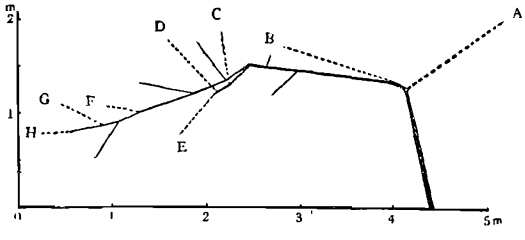


Fig. 1. Diagram of a *R. crataegifolius* with 8 shoots (dotted lines) carrying *Pamphilius lucidus* eggs (A with 150 eggs, B 87, C 45, D 39, E 8, F 17, G 11, H 10).

Host Selection : As the females could not be collected on various species of *Rubus*, the host-selecting habit of the adults remains uncertained except ones collected on the shrubs of *R. crataegifolius* whose larval stages may be passed on the latter.

The females, collected on *R. crataegifolius*, were put at our experiments of the host-plant selection. Six species of *Rubus*, namely *R. crataegifolius*, *R. crochorifolius*, *R. microphyllus*, *R. palmatus*, *R. parvi-*

Table 5. Egg-laying period and the number of deposited eggs.

Date		Temp. at 5 p.m. (°C)	Rearing Examples 1	2	3	4	5	6	7	8	Mean
	IV 11	22	c								
	12	22	0	c	c	c	c		c	c	
	13	22	8	8	8	7	12	c	0	0	
	14	22	1	7	3	2	5	6	0	0	
	15	19	2	0	0	4	3	1	0	0	
	16	21	0	2	2	2	4	3	0	0	
	17	19	1	3	1	0	1	1	0	0	
	18	14	1	4	3	3	0	1	0	0	
	19	12	0	0	0	0	0	0	0	0	
No. of	20	12	0	0	0	0	0	0	0	0	
deposited	21	15	0	0	0	0	0	0	0	0	
Eggs	22	16	d	d	0	d	0	0	0	d	
per day	23	17			0		0	d	0		
	24	18			d		0		0		
	25	17					0		d		
	26	17					0				
	27	18					0				
	28	19					0				
	29	15					0				
	30	17					0				
	V 1	18					0				
	2	18					d				
Oviposition Period (days)			6	6	6	6	5	5	—	—	5.7
Number of deposited Eggs			13	24	17	18	25	12	—	—	18.2
No. of Eggs in Ovary	Mature		10	0	2	0	4	2	28	10	
	Immature		2	5	3	6	0	0	2	0	
Total Number of Eggs			25	29	22	24	29	14	30	10	22.9

c : date of collection, d : date of death.

Table 6. Measurements of 21 eggs. (mm)

		Min.	Max.	Mean	Standard Deviation	Correlation Coefficient between Length and Width
Just after Oviposition	Length	1.28	1.66	1.49	0.096	0.48
	Width	0.51	0.63	0.57	0.036	
One day before Hatching	Length	1.56	2.03	1.84	0.127	0.66
	Width	0.66	0.82	0.73	0.026	

folius LINNÉ and *R. buergeri* DUCHESEN are used for this purpose. When *R. crataegifolius* and others were set together, they oviposited only on the former species. In the other combinations, with the exception of *R. crataegifolius*, they selected only *R. microphyllus*. If there are neither *R. crataegifolius* nor *R. microphyllus* in the cage, they did not lay their eggs on any other species of *Rubus* till they died, but, if the plants were changed with *R. crataegifolius*, they could immediately lay their eggs on it. From this fact it will be seen the females collected on *R. crataegifolius* prefer this plant at first and secondarily *R. microphyllus* for their host-plants and does not lay their eggs on the other species of *Rubus*.

Table 7. Incubation period of the egg.

Incubation Period (days)	9	10	11	12	Total	Mean
Number of Eggs	8	8	3	2	21	9.95 days

Table 8. Increase ratio of the egg.

No. measured Eggs.	21									13	5	2
Days after Oviposition	Just after	1	2	3	4	5	6	7	8	9	10	11
Increase Ratio Length	1.00	1.01	1.04	1.08	1.16	1.19	1.21	1.22	1.23	1.23	1.20	1.15
Increase Ratio Width	1.00	1.00	1.02	1.07	1.14	1.18	1.21	1.23	1.29	1.31	1.30	1.26
Length/Width	2.66	2.66	2.58	2.74	2.65	2.59	2.59	2.57	2.57	2.53	2.57	2.51

The Egg.

COLOR and SIZE--The egg is light reddish yellow with glass-lustre just after oviposition, but becomes slightly paler one day after, changes into pale yellow three or four days after and comes to the extreme point of fading about 3 days before hatching. The shape of the egg is cylindroid and sometimes slightly constricted or expanded at the middle. The sizes of the eggs are shown in Table 6.

DEVELOPMENT··· In laboratory the eggs on the leaf were kept in Petri dish (7.5 cm in diameter and 2.5 cm in depth) moistened with wet cotton. Twenty-four eggs were kept in this condition and only 3 out of them did not hatch. If the cotton is dry, the eggs decrease in size and soon die. Also in the field the abnormal oviposition makes always the eggs to die.

The incubation period is 9.95 days on an average, the details are recorded in Table 7.

The average increase ratio of the egg per about 24 hours is shown in Table 8, though the difference of the incubation period causes a little disagreement in the ratio as shown in Fig. 2. The width of the egg is measured at three different points, i. e. the cephalic, the middle and the caudal portions, where the measurements vary a little. In this table the ratio of the width is averaged due to the mean value of the widths of these three portions. One day before hatching the difference between the widths of the cephalic and caudal portion was measured as about 0.05 mm. From this table it will be seen that about 4 days after oviposition the eggs increase rapidly in size.

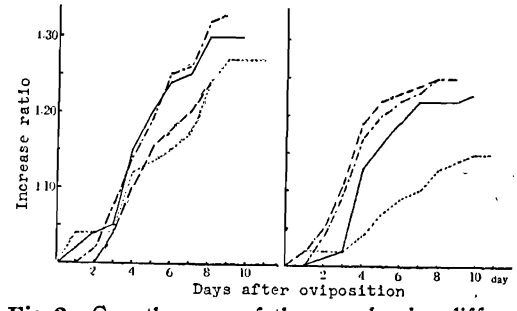


Fig 2. Growth curves of the eggs, showing differences between different incubation period, Left : width, Right : length. (--- shows 9 days of incubation period, —·— 10 days,——11 days,····· 12 days)

The correlation between the increase ratio and the day after oviposition indicates the following formula, in which Y signifies the increase ratio and X signifies the days after oviposition.

Length·····$Y = 0.2865\ \log X + 0.9581$

Width·····$Y = 0.4496\ \log X + 0.8701$

Although the egg is laid out of the leaf-tissue, it

increases in size as many cases of the other species of sawflies which lay their eggs into the plant-tissues, as *Arge similis* VOLLENHOVEN observed by M. TOZAWA (1940). The swelling of the egg of the present species during incubation seems to be due to absorption of moisture from the transpiration of the leaf, because the eggs laid on the upper surface of the leaf always fail to develop and hatch.

HATCHING -- Though in the cases of the eggs laid in the tissues of the host plants the course of their embryonic developments is usually easily observed through the egg membrane, in the case of this sawfly the body of the larva becomes to be observed only before hatching. Just before hatching the larva begins to move in the egg and soon after the black head hidden by its caudal end becomes visible toward the leaf base through the egg-shell and it begins to change its direction. About 30 minutes after, the larva finishes the change of its direction and keeps its head toward the apex of the leaf. About 30 minutes after, the larva breaks the cephalic part of the egg-shell. About 40 minutes after, as soon as the head gets out entirely from the egg-shell, the larva begins to lay a bridge of silk spreading from the egg-shell to the leaf by swinging its head to and fro with its back pressed to the leaf and about 20 minutes after the larva completely get off the egg-shell. The total amount of the time for hatching is about 2 hours as mentioned above. The movement of the hatching larva is shown in Fig. 3. Sometimes it was observed the larva died in the way of hatching. As the larva cannot creep on the leaf on its ventral surface but of its dorsal, it sometimes trys to get out in the state of Fig. 3 b, but it can not be out unless it returns toward the apex of the leaf as Fig. 3 c.

The Larva

MORPHOLOGY -- The details of each instar will be described the other day. The brief description of the 5 th instar larva is as follows (Fig. 4):

About 20 mm long, male larva shorter than female.

Head dark brown or black; body whitish green with following parts brownish black or black : dorsal part and a pair of patterns of prothorax, cervical sclerites, outer parts of each leg, each thoracic surpedal lobe, 3 patches on epiproct and 10 th abdominal sternite.

Head almost polished, setigerous only on gena. Antennae 7-segmented; relative lengths of the segments about 9 : 10 : 10 : 7 : 8 : 6 : 9. Frons pentagonal in outline and without seta, about 25/27 nearly as high as broad. Clypeus with 3 setae on each side. Labrum with 8 setae on each side and slightly depressed longitudinally. Frons : clypeus : labrum about 25 : 10 : 8. Prothorax with 2, mesothorax~8th abdominal segment each with 4, 9 th abdominal segment with 3 annulets on dorsal and ventral aspects. Body without seta except the patterns of prothorax. Legs 5-segmented and each segment setigerous except tarsus fused with claw. Dorsal part of 10 th abdominal segment scarcely haired, but sternite and suranal and subanal lobes with rather long setae. Subanal appendages 3-segmented; relative lengths of the segments about 2 : 1 : 1 and basal sement with about 6 setae and others without seta.

When the larva seases seating, the color of the body changes into yellowish green.

First instar larva without colored patches on 10th abdominal segment, and the color pale yellow just after hatching and changes into greenish from the time when it begins to feed on the leaf.

Second~4 th instar larva are nearly similar to 5 th instar larva in structure and color.

DEVELOPMENT -- The development of the larva was observed mainly for a month from 22 nd of April in 1955, in laboratory where the average temperature at 5 p. m. is 19.7°C while 19.0°C in the field.

The larvae have usually 4 moults, but only in one example 5 moults was observed. In this paper "5 th instar" is determined by the interval from the 4 th moulting up to the time when the larva seases eating.

The first and the 5 th instars subequal and longest, the 2 nd and the 3 rd instars subequal and shortest as shown in Table 9. The total larval period is 16.4 days on an average as recorded in Table 10. The short duration means that of the male, which shortens especially in the 2 nd, 3 rd and 4 th instars, although the duration of the larval stage may be changed by the environmental condition. The head widths of the alcoholic specimens of each instar larvae were measured with ocular micrometer as shown in Table 11 and Fig. 5. From this table it will be seen that the standard deviations of the older stages are larger than those of the younger. The growth ratio may fit to Przibram's factor in the 2 nd, the 3 rd and the 5 th instars, but in the 4 th instar it may be fited in Dyar's constant. From Fig. 4 the differences between both sexes may be seen only at the 5 th instar.

HABITS -- With its back pressed to the leaf the

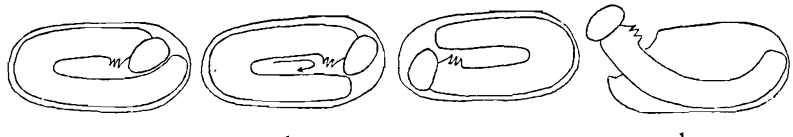


Fig. 3. The movement of the larva in the egg-shell when hatching. (Left : toward the base of the leaf, Right: toward the tip of the leaf.)

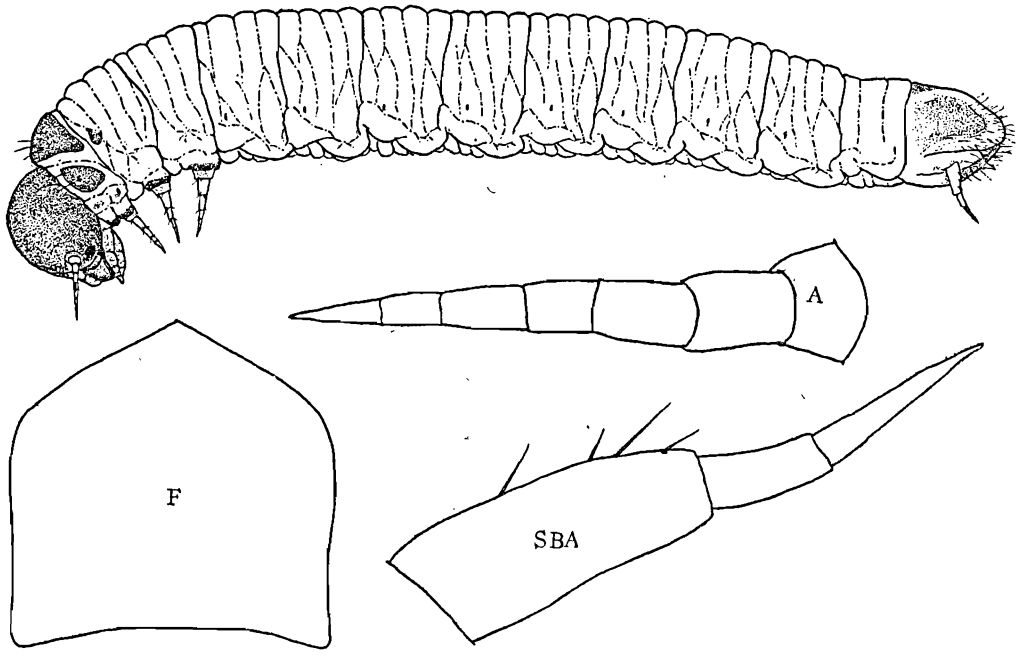


Fig. 4. 5 th instar larva, F : frons, A : antenna, SBA : subanal appendage. (drawn by Y. YAMAMOTO).

hatching larva lays a bridge of silk in a close zig-zag pattern under which it moves toward the tip of the leaf swinging the head to and fro. Sometimes the larva moves on the upper surface of the leaf or along the petiole, but it moves to the under surface sooner or later and it can reach to the leaf-edge without fail. On the way to the leaf-edge, the larva stops occasionally curving the body ventrad. In attaching to the leaf-edge, the larva seeks for a suitable part for nesting, and when it succeeds to find it begins to pull the tip of the serration by means of a large number of cross-threads and to prepare a nest keeping the head toward the base of the leaf. The time from hatching to beginning of the nest-preparation lasts about an hour. By this way the larva continues the preparation for about 40 minutes and serration is folded as a half-roll into which it conceals itself, and it spends about 5 minutes rest. After the rest, the larva turns toward the tip of the leaf bending its body ventrad for a half-minute, and begins to lay closely threads again at the edge of

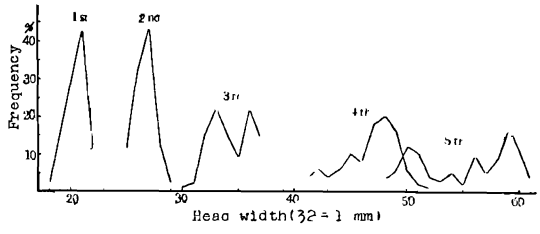


Fig. 5. Frequency distribution of the head-widths of each instar (Numbers of each instar larvae similar to Table 11.)

Table 9. Durations of larval stadia.

Duration (days)	Stage				
	1 st	2 nd	3 rd	4 th	5 th
6	4				1
5	23	1			16
4	18	7	3	7	11
3		16	13	15	2
2		19	22	7	
1		1	2		
No. of examined Specimens	45	44	40	29	30
Average of Duration	4.7	2.7	2.4	3.0	4.5

Table 10. Lengths of larval period.

Larval Period (days)	19	18	17	16	15	14	Total	Average
No. of examined Specimens	4	5	2	6	4	5	26	16.4 days

Table 11. Head-widths of the larvae (mm).

Stage	Min.	Max.	Average	Standard Deviation	Growth Ratio	No. measured Specimens
1 st	0.56	0.69	0.64	0.029		61
2 nd	0.78	0.92	0.83	0.025	1.296	65
3 rd	0.94	1.16	1.07	0.049	1.287	87
4 th	1.28	1.63	1.46	0.084	1.364	96
5 th	1.50	1.91	1.72	0.127	1.178	94

the serration. After the larva turns again toward the opposite direction, the second rest takes place and afterwards it begins to lay a large number of threads again to complete a nest of a serration. About 4 hours after hatching, the larva begins to feed on the leaf at the nearest emargination of the leaf, putting its body at about two-third out of the nest. The first eating occurs on the emargination toward the base of the leaf, but sometimes toward the tip (Photo. 2). After the first eating, the larva rests for a moment and turns its body again expanding thread-bridge to the next serration to enlarge its nest. A day after hatching, the nest made of about 3 serrations is completed and the larva hides its body in the nest (Photo. 3). The moulting takes place at the end of the un-eaten side of the roll. When the larva finishes the first moulting, it enlarges the roll by eating one side of the roll and laying threads (Photo. 4). Usually the larva stays on the same leaf up to the full-grown stage, but when the leaf comes to worse condition the larva goes to another leaf along the stem by means of throwing the thread-bridge.

The nest of the lst and the 2 nd instar larvae are usually made of the serrated parts of the leaf, but those of the older larvae are modified in various way, for instance, a leaf half-rolled, a leaf completely rolled, two leaves tied together and so on.(Photo. 5~7). The eaten parts of the leaf are always found only one side of the nest in the lst and the 2 nd instars and both sides in the older instars only remaining the mid-rib of the leaf. When the larva eats up the leaf, it goes down toward the ground to the adjacent leaf where it makes a nest again before eating. When the larva becomes full-grown it ceases eating and begins to move along the stem toward the ground by means of threads in some distance, where, as soon as it stops to lay threads, it falls down to the ground. From this time the larva becomes to be able to move on its ventral surface and seeks for the surface of the ground to pupate.

The larva burrows to considerable depth of 30 cm and makes a pupal chamber.

FOOD SELECTION--The following 8 species of *Rubus* were used for the purpose of experiments of ascertaining food-selection of the larvae : *R. trifidus* THUNB. (cultivated by a farmer), *R. crataegifolius* BUNGE, *R. microphyllus* LINNÉ, *R. hirsutus* THUNB., *R. palmatus* THUNB., *R. crochorifolius* LINNÉ, *R. parvifolius* LINNÉ, *R. buergeri* DUCHESEN.

In each Petri dish (9.5 cm in diameter and 6 cm in depth) the leaves of two species of *Rubus* were preserved being cut in similar size and the 3 rd instar larva fed on *R. crataegifolius* were set free between them. One day later it was observed which leaves had been selected.

Each of 28 combinations was examined twice. The results are shown in Table 12, in which the species of the *Rubus* are arranged in the selecting order.

In laboratory the larvae were able to grow on the former 5 species, while in the field the larvae were found on 4 of them, *R. trifidus* excepted. On *R. cochorifolius* the eggs and the first instar larvae were found, but the older larvae have never been seen on it, and in laboratory the larvae only bited at it and were unable to grow on it. The larvae sometimes were able to grow on *R. parvifolius* when they were older than the 3 rd instar. The larvae could not grow on *R. buergeri* even in laboratory.

Three relative species of *Rubus*, i. e. *Fragaria hiloensis* DUCHESEN, *Duchesnea indica* FOCKE and *Arimoria pilosa* LEDEB., were examined, but the larvae were unable to grow on them.

From the above mentioned facts including host-selection of the adults, it may be considered the food-plants of the present species are *R. crataegifolius*, *R. palmatus*, *R. microphyllus* and *R. hirsutus* at Sasayama and this sawfly will probably be a pest of *R. trifidus* when it is cultivated.

The Pupa

The pupal chamber, in which the larva becomes to a prepupa and hibernate, is very delicate, ellipsoid in outline and about 11 mm long by about 7 mm broad. The prepupa almost always curves itself ventrad a s

Table 12. Selection of *Rubus* as food-plant by the larvae.

Species of *Rubus*	*trifidus*	*crataeg-ifolius*	*microp-hyllus*	*hirsutus*	*palma-tus*	*crochor-ifolius*	*pavifo-lius*	*buergeri*	No. Select-ion	No. Rejec-tion
trifidus	╲	+ −	+ +	+ +	+ +	+ −	+ −	+ −	10	4
crataegifolius	+ −	╲	+ −	+ −	+ −	+ +	+ −	+ +	9	5
microphyllus	− −	+ −	╲	+ −	+ +	+ +	+ +	+ −	9	5
hirsutus	− −	+ −	+ −	╲	+ −	− −	+ +	+ +	7	7
palmatus	− −	+ −	− −	+ −	╲	+ +	+ −	+ −	6	8
crochorifolius	+ −	− −	− −	+ +	− −	╲	+ +	+ −	6	8
pavifolius	+ −	+ −	− −	− −	+ −	− −	╲	+ +	5	9
buergeri	+ −	− −	+ −	− −	+ −	+ −	− −	╲	4	10

+ ; selected, − : rejected

the developed embryo before hatching. Judging from the osbervation through the glass of Petri dish, the prepupa may be able to change the direction by itself in its pupal chamber.

The prepupal period is very long, about 10 months from June to March of the following year.

The pupal period is rather short, namely the pupation takes place only before 10～14 days previous to emergence into adult.

The adult stays for a few days in pupal chamber after emergence.

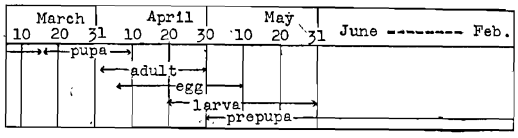
The Natural Enemy

The parasites have never been found in all stages. The following 2 spiders were observed attacking the mature larvae : *Dendryphantes rubrosquamulatus* DÖN. et ST. and *Jyoticus ephippiatus* SIMON. Sometimes it was observed that the adults were attacked by these spiders.

The Life Cycle

The life cycle of this sawfly is summarized in Table 13.

Table 13. Life cycle.



Other Sawflies found on *Rubus*.

The larvae of the following 5 species of sawflies have observed feeding on *Rubus* near Sasayama exclusive the present species :

1. *Pamphilius viriditibialis* TAKEUCHI, 1930
2. *Corymbas nipponica* TAKEUCHI, 1936
3. *Priophorus sp.*
4. *Blennocampa sp.*
5. *Metallus sp.*

The last species is leaf-miner, the 2nd to the 4th are free leaf-eaters and the 1st is most resemble to the present species, but may be separated by means of the following keys.

Key to species in ggs

Color unchangeable, pale yellow, often continually laid on the vein of the under side of the leaf ..... *P. viriditibialis*

Color changeable, reddish yellow to pale yellow, laid one by one on the vein of the under side of the leaf..... *P. lucidus*

Key to species in larvae

Head and patches of the body entirely black, appears from the late of June to July... ..... *P. viriditibialis*

Head and patches of the body brownish black, appears from the late of April to May .....*P. lucidus*

Summary

The present paper contains the observations on the life-history of *Pamphilius lucidus* ROHWER(1910), which are summarized as follows :

1). The sawfly has a generation a year. The life on the earth is about 2 months from April to May and that in the earth is about 10 months in prepupal and pupal stages. The details are as follows : adult about a week in male and about 2 weeks in female; incubation period about 10 days; larval period about 16 days; prepupal stage in the ground about 10 months; pupal stage about 12 days.

2). The female lays her eggs one by one out of the veins of the under side of the leaves, which are about 0.2～0.3 mm in width. One or two eggs are deposited on each leaf about 100 cm above the ground, and they increase both in length and width probably by absorption of the moisture.

3). The larvae have 5 instars, which conceal themselves in nests of rolled leaves made by means of threads and live always solitary.

4). Four species of *Rubus* are recognized as the food-plants of the larvae.

5). Two species of the spiders were found as the natural enemies of the larvae.

6). In addition to these data the resembled species fed on *Rubus* are described briefly.

Acknowledgements

We wish to express our heartiest thanks to Dr. K. IWATA for his kind advices, to Mr. T. KOHAYAKAWA for his advices as to the food-plants, to Mr. H. ARITA who gave us some valuable data, to Mr. Y. YAMAMOTO who kindly drew a text-figure, and also to Miss C. ŌKUMA for her identification of the spiders.

The present study has been supported in part by a grant in aid of Science Research from the Ministry of Education.

(Entomological Laboratory, Received Ang. 15, 1955)

References

CHAMBERS, V. H., 1952, *Trans. Soc. Brit. Ent.* XI(5) : 125-140.

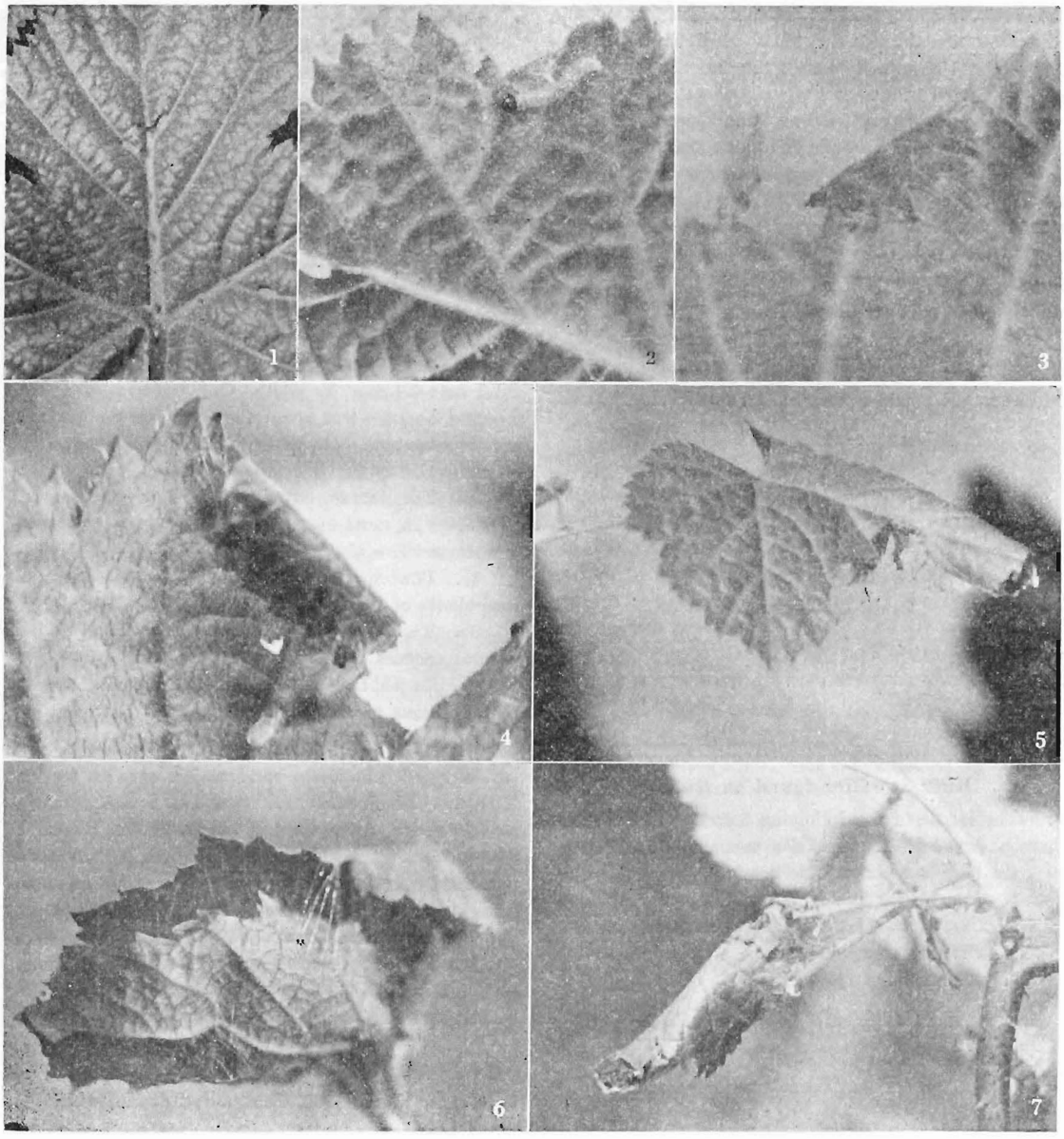
NITTO, M., ODA, K. & KATO, Y., 1955, *Bul. Gov. For. Exp. Sta.*, No. 79 : 15-42.

OHWI, J., 1953, Flora of Japan, Shibundo, Tokyo : 621-653.

TAKAGI, G., 1931, *Bul. For. Exp. Sta.*, Chosen, No. 12 : 1-72.

TAKEUCHI, K., 1938, *Tenthredo*, II (2) : 217-229.

TOZAWA, M., 1940, *Jour. Col. Agr.*, Tokyo, XIV(6) : 429-463.



Explantations of Photographs

1. The eggs on the veins of the leaf.
2. The lst instar larva, making its nest.
3. The nest of lst instar larva, the part of the leaf eaten abnormally.
4. The nest of the 2nd instar larva.
5. The nest of the 3rd instar larva.
6. The nest of the 4th instar larva, the leaf completely rolled.
7. The nest of the 5 th instar larva, two leaves tied together.

Food-plants are *R. crataegifolius*; 1-3 reared examples; 4-7 collected in the field.