THE BIOLOGY AND DYNAMICS OF THE OYSTERSHELL SCALE, *LEPIDOSAPHES ULMI* (L.) (HOMOPTERA : COCCIDAE), ON APPLE IN QUEBEC

by

SRIMATHIE SAMARASINGHE

A THESIS

Submitted to the Faculty of Graduate Studies and Research
of McGill University in partial fulfillment
of the requirements for the
degree of

DOCTOR OF PHILOSOPHY

July, 1965

ACKNOWLEDGEMENTS

The author wishes to express her sincere thanks and grateful appreciation to Dr. E. J. LeRoux, Associate Professor, McGill University, under whose direction this work was carried out, for his continued encouragement and guidance throughout the period of study; to members of Staff, Department of Entomology, Macdonald College, Que. for professional advice; and to summer student assistants Miss L. Scott, Mr. H. Nelson and Mr. W. Hoek for technical help rendered.

Thanks are also extended to Dr. Michael Kosztarab, Virginia, Dr. Z. Kawecki, Poland, Dr. Paul DeBach, California, Mr. F. T. Lord, of Kentville, N.S., Miss I. S. Creelman, Ottawa, Ont., Messrs. B. Parent, H. Hikichi, W. L. Putnam and C. V. G. Morgan, all of Research Branch, Canada Department of Agriculture, Professor Boulanger, Maine State University, Dr. K. Boratynski, London, Mr. G. W. Dekle, Florida, and Dr. S. K. Wiackowski, Poland, for kindly making available to me specimens and slides of *L. ulmi*, as well as information on this species, from their localities; to Dr. W. R. Richards and Mr. C. D. Miller, Entomological Research Institute, Canada Department of Agriculture, for identification of *L. ulmi* and its parasites; and to Dr. V. G. Marshall, Macdonald College, Que. for identification of Acarines.

Grateful appreciation is expressed to the Commonwealth Scholarship and Fellowship Committee for funds made available to me during the past three years through a Commonwealth Scholarship Award.

LIST OF ABBREVIATIONS

ABD1-8	abdominal segments
AN	anus
ANT	antenna
A SP	anterior spiracle
CL	claw
CR	crumena
CX	coxa
DG	digitules
E	eye
FE	femur
GL S	gland spine
GL T	gland tubercle
HD - PT	head and prothorax
HYP	hypopharynx
LB	labium
LBL C	labial clamp
LG	leg
MA MD	marginal macroducts
MD L	median lobes
MD R	mandibular retractor
MI D	microducts
MS T	mesothorax
MTH PTS	mouth parts
MT T	metathorax

LIST OF ABBREVIATIONS (continued)

MX R	maxillary retractor
PH	pharynx
PRS	prosoma
P S L	paired secondary lobe
P SP	posterior spiracle
PST	postsoma
PYG	pygidium
PV P	perivulvular pores
SE	setae
SB MD	sub marginal macroducts
SM MD	sub median macroducts
SP	spiracle
SP^1	spur
SP D	spiracular discs
S S D T	salivary syringe duct terminus
STL	stylets
TA	tarsus
TB	tibia
TR	trochanter
VV	vulva
W P	wax pores

TABLE OF CONTENTS

I INTRODUCTION

The quantification of population and mortality data for insect pests of apple is necessary if we are to gain fundamental insight in the dynamics of insect populations of the orchard ecosystem. The need to quantify has recently been emphasized (LeRoux, 1964a; 1964b) and the greater application, practical and scientific, of the quantitative results obtained for agricultural and forest insect pests has been demonstrated (LeRoux et al., 1963).

Studies herein reported on the biology and dynamics of the Oystershell scale, *Lepidosaphes ulmi* (L.) on apple in Quebec are an extension of the quantitative approach used above and are designed mainly: (a) to obtain distributional data of the natural populations of eggs, larvae, and adults of this species, and on its mortality factors; (b) to develop a quantitative sampling plan to determine with biometric precision and accuracy density levels of population and mortality factors of all stages of *L. ulmi*, within and between generations; and (c) to construct life tables for endemic and epidemic populations of *L. ulmi* with the object of determining 'key' regulating factors in increases and decreases of this pest.

To this end sampling data on populations of all stages of *L. ulmi* were collected from the Macdonald College apple orchard during the 1963 and 1964 growing seasons, and from the Royal Montreal Golf Club apple orchard, Ile Bizard, Quebec, during the 1964 growing season.

This thesis is a report on: (a) the life history and habits of *L. ulmi* developing on apple, (b) the biometric treatment of the sampling data obtained in 1963 and 1964 for the field populations studied, (c) the sampling plan and life tables developed for this species, and (d) the interpretation of population analyses and the application of the results.

II REVIEW OF LITERATURE ON L. ULMI

A. SYSTEMATIC POSITION

The Oystershell scale, originally described by Linnaeus in 1758 as Coccus ulmi, has over the years been given six generic names (Fernald, 1903) notably, Coccus (Linnaeus, 1758), Chermes (Geoffroy, 1762), Diaspis (Costa, 1835), Aspidiotus (Curtis, 1843), Mytilaspis (Baerensprung, 1849), Lepidosaphes (Shimer, 1868), and twelve specific names (Griswold, 1925). The more important synonyms for this species have been listed by Fernald (1903) and Kosztarab (1963). Fernald, in 1903, finally assigned to this coccid the specific name of Lepidosaphes ulmi (L.) a name under which the species is still recognized today.

The systematic position of L. ulmi is as follows:

Order	-	Homoptera
Sub order	-	Hemiptera
Super family	-	Coccoidea
Family	-	Coccidae
Sub family	-	Diaspidinae
Tribe	-	Diaspidini
Genus	-	Lepidosaphes
Species	-	ulmi

Specimens collected in the course of the present study (1963, 1964) from the Macdonald College and Ile Bizard apple orchards were identified by Dr. W. R. Richards of the Entomology Research Institute, Ottawa, as of Lepidosaphes ulmi (L.).

Réaumur (1738), who was the first careful European observer of this scale, noticed the resemblance of the shell of this insect to that of a mussel and gave it the name 'mussel scale', a name by which it is still commonly known in France, England and New Zealand. Early workers in the United States referred to it by several common names such as the apple bark louse (Shimer, 1868) and the Oystershell bark louse (Walsh, 1868). Richards (1961) who recently worked on the life history of the so called Oystershell scale _Quadraspidiotus_ _ostreaeformis_ (Curtis), in New Zealand, refers to _L._ _ulmi_ as the mussel scale. The common name now officially recognized for this species in North America, as approved by the Entomological Society of America (Laffoon 1960) is 'Oystershell scale'.

B. HISTORICAL STUDIES

Several authors have carried out studies on the life history, development, biology and morphology, of this insect (Fitch, 1856; Walsh, 1868; Shimer, 1868; Comstock, 1881; LeBaron, 1870, 1871; Riley, 1869, 1873; Newstead, 1900; Frank and Kruger, 1900; Bouchè, 1901; Quaintance and Sasscer, 1910, 1916; Ceasar, 1914; Tothill, 1919; Griswold, 1922, 1925; Shotwell, 1923; Heriot, 1931, 1934; Suter, 1932; Koronoes, 1934; Ferris, 1937; Boratynski, 1952b; Kosztarab, 1959, 1963; Ghauri, 1962). Comstock (1881) seems to have been the first to suggest that real differences exist between _L._ _ulmi_ developing on apple and on various ornamentals. Cockerell (1895) and Frank and Kruger (1900) independently found that females of this species developing on apple, plum, thorn, poplar and willow differed in the number of circumgenital pores. Glen (1920) counted the pores of L. ulmi developing on various host plants and reported real differences between the forms he examined of this species. Griswold (1922) examined a long series of female specimens from apple and lilac and concluded that generally the number of circumgenital pores is greater for forms of L. ulmi developing on lilac. Shotwell (1923), Suter (1932) and Balachowsky (1954) have also recognized different forms of L. ulmi on different host plants, and two races, one parthenogenetic and one bisexual, have been described by Thiem (1933) and Danzig (1959). In Canada Pickett et al. (1946), Lord (1947) and Lord and MacPhee (1953) have worked, generally, on populations of the Oystershell scale and its principal natural enemies, while in Moscow, Smirnov and Polejaeff (1934, 1935) have worked on the density of L. ulmi populations and on the sterility of females, and Yakubova (1935) has dealt with body size and fertility of the species. However, no author, anywhere, has to date made a detailed field study of this species and its natural mortality factors on apple.

C. GEOGRAPHICAL DISTRIBUTION

L. ulmi is widely distributed over the face of the earth occurring as a pest in all major apple growing regions of the world (Griswold, 1925), notably, in Europe, North and South United States, Canada, Hawaiian Islands, Japan, Africa, Australia, New Zealand, South America etc. This species is not known to be present in Tropical and Arctic regions. L. ulmi is of European origin and the first account of it in

North America, in Maine, was given by Perley (1796). Howard (1894) reports that by 1835 the coccid had spread to New England, by 1854 to New York, Pennsylvania and Ohio, by 1868 to Iowa and Missouri, and by 1872 to Georgia, down the Atlantic coast and to Washington, Oregon and British Columbia in the Pacific area.

It has not been possible to trace the exact date of entry of L. ulmi into Canada. Mention of the presence of the species in Ontario was first made by Bethune (1871) who commented in the First Annual Report of the Entomological Society of Ontario that a Mr. Glover, reported on in the 'Canada Farmer' for 1869, had saved two apple trees from bark lice destruction by dashing over them in early winter a quantity of lye left after soap making. Lacking proof of an exact date of entry of this species into this country I have accepted (with reservation) for purposes of this thesis the 1869 date as the earliest record of L. ulmi in Canada: i.e., a date two years earlier than that given for the first entry of the species into British Columbia.

In North America L. ulmi is primarily a pest of apple although it has a wide range of food plants. It is most commonly found on lilac, willow, pear, birch, elm, poplar, etc. (Comstock, 1916; Griswold, 1925). Quaintance and Sasscer (1910) list a hundred and twenty-eight host plants for this species.

In order to obtain complete information on the distribution of L. ulmi in different apple growing regions of Canada and Eastern United States, as well as to obtain an indication of the presence of the species in certain parts of Europe, requests were sent to workers in these areas for specimens and for information on host plants, types of infestations and presence or absence of male scales. Specimens of the coccid on host plants other than apple were also requested. The following is a list of workers to whom letters were addressed with notes on the pertinent information received.

C. V. G. Morgan, Entomology Laboratory, Summerland, B.C.
  Host plants: Apple, Native willow, Red osier dogwood, Poplar.
  Male scales: No record.
  Distribution: Common; during the last two years increased on apple.

A. Hikichi, Entomology Sub-station, Simcoe, Ontario.
  Host plants: Apple and White ash.
  Male scales: No record.
  Distribution: Rare, traces only.

Wm. L. Putnam, Vineland Station, Ontario.
  Host plants: Willow, Lilac, *Juglans cinerea*.
  Male scales: No record.
  Distribution: Rare, most scales destroyed by predators of parasites.

Dr. W. R. Richards, Entomology Research Institute, Ottawa.
  Only one slide from Ottawa, and a few from B.C. in the collection.
  Male scales: No record.

C. W. Maxwell, Research Officer, Research Branch, Fredericton.
  Host plants: Apple, Lilac and various shrubs used for hedges.
  Male scales: No record.
  Distribution: Very common pest.

F. T. Lord, Research Station, Kentville, N.S.
  Host plants: Apple.
  Male scales: No record.
  Distribution: Very common, and was, several years ago, about the worst pest of apple in Nova Scotia.

B. Parent, Research Station, St. Jean, Quebec.
  Host plants: Apple.
  Male scales: No record.
  Distribution: Common in all apple growing regions of south-western Quebec.

Dr. L. W. Boulanger, Professor of Entomology, University of Maine, Orono, Maine.
  Host plants: Apple.
  Male scales: Not present.
  Distribution: Rare.

Dr. M. Kosztarab, Associate Professor of Entomology, Virginia, Polytechnic Institute, Blacksburg, Virginia.
Host plants: _Catalpa speciosa_ (Warder) _Ribes_ sp. _Fraximus americana_, Poplar, _Salix_ sp., _Ptelea trifoliata_.
Male scales: Present on Ohio material.
Distribution: Michigan, Ohio, Virginia.

J. E. Appleby, Assistant Entomologist, Illinois Natural History Survey, Urbana, Illinois.
Host plants: _Cotoneaster divaricator_.
Male scales: Not found.
Distribution: Common.

G. W. Dekle, Div. of Plant Industry, Florida Department of Agriculture, Gainesville, Florida. Specimens sent from Ogden, Utah.
Host plants: _Paeonia_ sp.
Male scales: Present.
Distribution: Not given for Utah.

Dr. P. DeBach, Professor of Biological Control, Riverside, California.
Host plants: _Celastrum scandeus_ from material collected in Greece.
Male scales: Present.
Distribution: Not mentioned.

Dr. Z. Kawecki, Katedra Zoologii S. G. G. W. Warsaw, Poland.
Host plants: _Quercus_ sp.
Male scales: Present.
Distribution: Common.

Dr. K. Boratyski, Department of Zoology & Applied Entomology, Imperial College of Science & Technology, South Kensington, London. S.W.7.
Host plants: _Vaccinium myrtillus_, _Calluna vulgaris_.
Male scales: Present.
Distribution: Not mentioned.

Dr. W. Rings, Ohio Agricultural Expt. Station, Wooster, Ohio.
Host plants: Apple, Carolina and Lombardy poplar, Lilac, Horse chestnut, Buckeye, Ash, Cottonwood, Willows, Red twig dogwood.
Male scales: No information given.
Distribution: Common, prevalent and destructive on shade and forest trees.

In Canada _L. ulmi_ has been recorded (Fig. 1) in all apple growing regions of Quebec, Nova Scotia, New Brunswick, Ontario, British Columbia, Prince Edward Island, Alberta and Manitoba. A detailed list of Canadian localities (Creelman, 1965) from which the species has been reported is given in Table I.

TABLE I

Distribution records (1963-1965) for *L. ulmi* on apple as well as on other hosts in eight Canadian provinces.

British Columbia

Agassiz	Coldstream	Duncan[1]
Glenmore	Grand Forks Valley	Haney
Harrison	Kaslo[1]	Kaledon
Kamloops	Kelowna	Keremeos
Kuper Islands	Lillooet	Lulu Island
Mission	Naramata	Nelson
New Westminster	N. Nicoaman[1]	Okanagan Centre
Oliver	Osoyoos	Oyama
Peachland	Penticton	Port Coquitlam
Royal Oak	Rutland	Salmon Arm
Summerland	Trail	Vancouver
Vernon	Victoria	Westbank

Alberta

Brooks	Edmonton	Lethbridge

Manitoba

Morden	Winnipeg

Ontario

Alfred	Algoma	Almonte
Alviston	Apple Hill	Beamsville
Berlin (Kitchener)	Billings Bridge	Camp Borden[3]
Carnarvon	Cedar Springs	Chatham
Clarence	Clarksburg	Cobourg
Dutton	Eganville	Fonthill
Galt	Glen Sandfield	Gorrie
Grimsby[1]	Guelph	Hamilton
Ida	Ingersoll	Innerkip
Islington	Jordan Harbour[1]	Kinburn
London	Manitowaning	Markham
Marmora	Maxville	Mountain

TABLE I (cont'd)

Ontario (cont'd)

Niagara Falls
North Gower
Orillia
Osgoode Sta.
Oshawa
Ottawa
Parry Sound
Pembroke
Peterborough
Plantaganet
Port Hope
Princeton
St. Catharines
St. Thomas
Sault Ste. Marie
Simcoe
Sparta
Strathburn
Sunderland
Toronto
Vanburgh
Vineland
Vineland Sta.
Wemyss
Willowdale
Windsor

Quebec

Abbotsford
Athabaska
Ayer's Cliff
Beaconsfield[3]
Beaupre
Bonaventure[2]
Buckingham
Clarenceville
Compton[2]
Covey Hill
Cowansville
Dorchester[2]
East Angus
Frelighsburg[2]
Hemmingford
Huntingdon
Ile aux Coudres
Ile Bizard
Ile d'Orleans
Johnville
Kamouraska
La Trappe
Lotbiniere
Macdonald College
Magog
Marbleton
Montreal
North Hatley
Notre Dame de Grace
Pontiac[2]
Quebec
Riviere-du-Loup
Rougemont
Saguenay[2]
Ste. Anne de Bellevue
Ste. Anne de la Pocatiere
St. Boniface
St. Constant
St. Elphege
St. Felix de Kingsley
St. Hilaire
St. Jean
St. Lambert
St. Mathieu
St. Pascal
Ste. Rose de Watford
Wolfe[2]

New Brunswick

Barker's Point
Barton
Chatham[1]
Chipman[1]
Douglas
Fredericton
French Lake
Gagetown
Kingsclear[1]
Lakeville
Long Reach (Kings)
Lower Queensbury
Maple Glen (Northumberland)
Moncton
River Glade
Sackville
St. Andrews
Sussex Corners
Woodstock[1]

TABLE I (cont'd)

Nova Scotia

Annapolis Royal
Berwick
Canard
Chester
Glace Bay
Grafton
Kentville[1]
Meteghan[1]
New Glasgow
Sheffield Mills (Kings)
Truro[1]
Timberlea P.O. (Halifax Co.)
Westport
Weymouth[1]
Yarmouth

Prince Edward Island

Montague[1]
O'Leary[1]
Peake

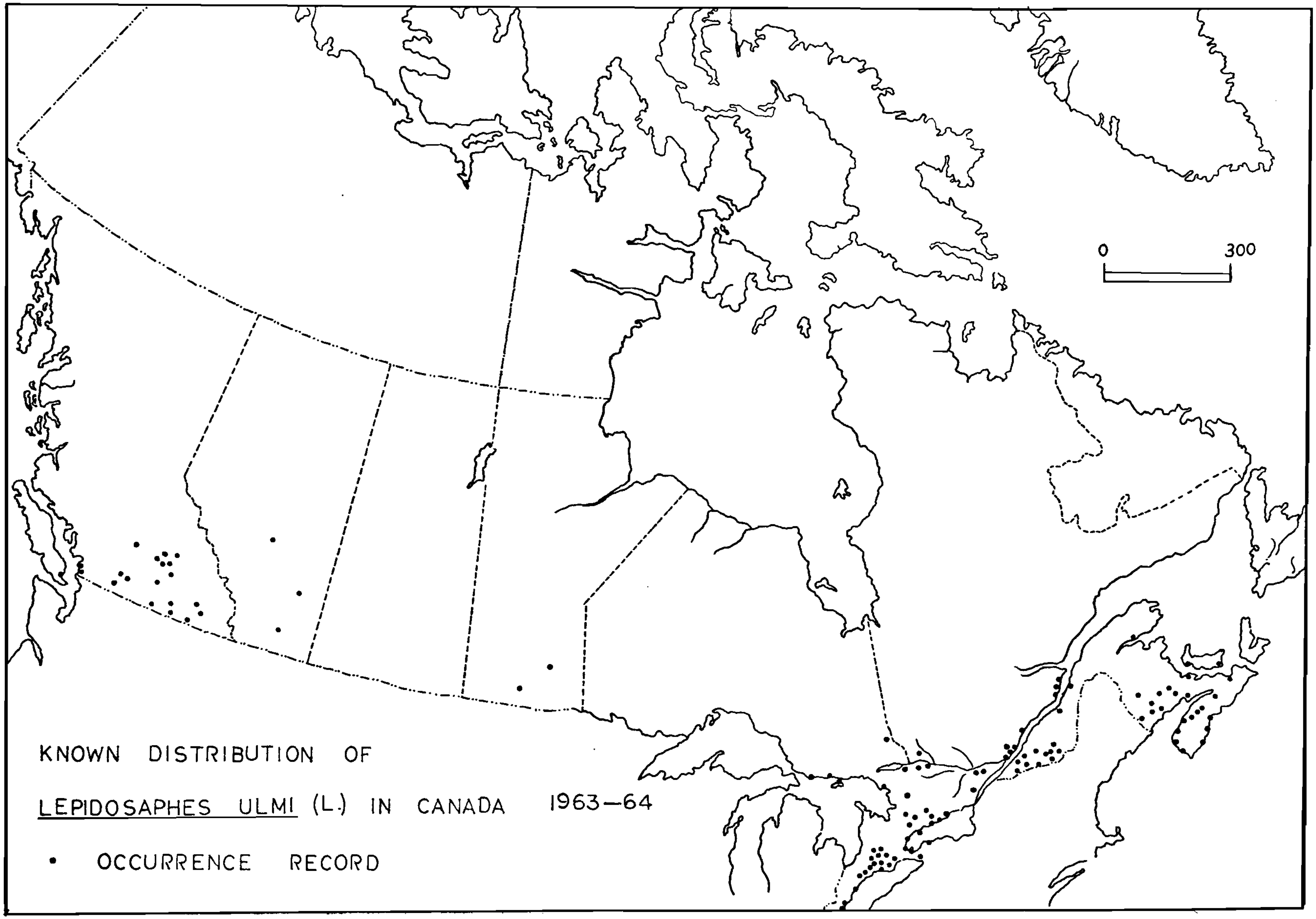
---

[1] Recorded by Tothill (1919).

[2] Recorded by B. P. Parent, Research Station, Canada Department of Agriculture, St. Jean, Que.

[3] Recorded by S. Samarasinghe and E. J. LeRoux, Macdonald College.

Fig. 1. Known distribution of *L. ulmi* in Canada 1963-64.



KNOWN DISTRIBUTION OF

<u>LEPIDOSAPHES ULMI</u> (L.) IN CANADA 1963—64

• OCCURRENCE RECORD

III EXTERNAL MORPHOLOGY OF L. ULMI

A. PRESERVING AND MOUNTING PROCEDURE

To check on the morphology of *L. ulmi* apple twigs containing all stages of the coccid were collected from the Macdonald College and Ile Bizard experimental plots during each of the 1963 and 1964 growing seasons. Twigs with scales were preserved in formal acetic alcohol; specimens removed from the twigs preserved in 70 per cent alcohol. For temporary mounts eggs were cleared in cedar oil three to five minutes and mounted in Hoyers medium. First- and second-stage larvae and adults were cleared in 10 per cent KOH for 10-15 minutes (under a desk lamp) and the gut contents pressed out of the body. Specimens were then transferred to 70 per cent alcohol for 10 minutes and then mounted in Hoyers. For permanent mounts larval and adult specimens, cleared as above, were transferred first into acetic acid alcohol for 10 minutes, stained in acid fuchsin for five to eight minutes, then transferred to 95 per cent and absolute alcohols, each for about ten minutes, then cleared in clove oil and mounted in Canada balsam. For permanent mounts, the mounting procedure except for slight changes in time, is essentially that followed by Kosztarab (1963).

B. DESCRIPTION OF STAGES

1. Eggs

Eggs of *L. ulmi* are minute, milky-white in colour, ellipsoidal in shape, narrowly elongate with sides parallel, and slightly rounded

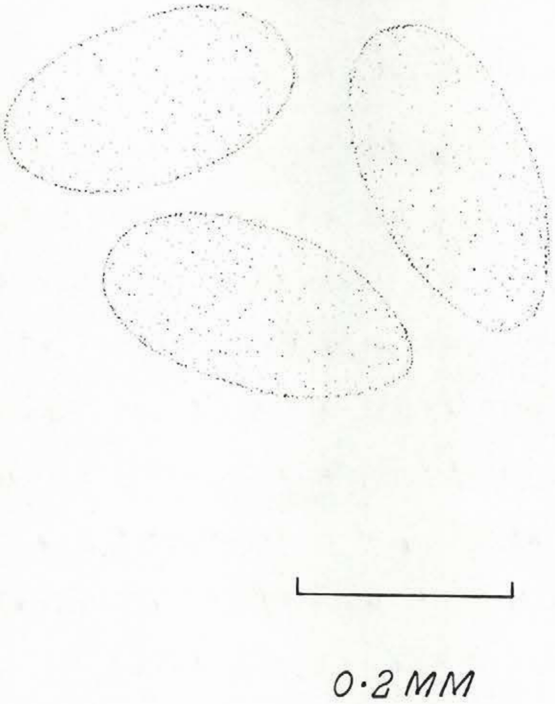


Fig. 1 A. External view of L. ulmi eggs found within scales.

at each end (Fig. 1A). Most often the eggs tend to lose their normal shape when compressed and closely packed beneath the parent scale (Plate III C). Specimens examined in the study varied in length from 0.27 mm. to 0.31 mm. and in width from 0.14 mm. to 0.15 mm. Measurements for eggs, larval and adult stages of the Macdonald and Ile Bizard populations are given in Table II.

Eggs were observed to be covered with a fine waxy powdery substance, which at low magnifications (X7) appear as minute prominences on the egg chorion. This waxy substance serves as an adhesive and keeps the eggs lightly glued to each other when they are under the parent scales.

Freshly laid eggs examined in September, and overwintered eggs examined in May, were milky-white in colour and opaque (Plate III C). This colour changes to a creamy-yellowish brown (Plate III D) a few days before hatching, at which time the developing embryo with folds in its anterior region can be observed within the egg. Approximately about two days later the mouthparts with a prominent ring-shaped labium appear. Coincident with this development is the faint appearance of the legs folded in position on the ventral side of the body. When the embryo has completed its development, the egg chorion splits lengthwise about half way down the egg surface and through this slit emerges the first-stage larva. Heriot (1931) who studied the incubation of *L. ulmi* eggs in greater detail has made similar observations.

2. First-stage larvae

The first-stage larvae are active little crawlers, elongate

TABLE 2

Mean length (L) and width (W) measurements (in mm.) for <u>L. ulmi</u> (L.) eggs, larvae 1 and 2 and adults developing on apple in the Macdonald College and Ile Bizard experimental plots 1963-64.

	MACDONALD 1963		MACDONALD 1964		ILE BIZARD 1964	
	L	W	L	W	L	W
			Eggs			
N	10		10		10	
Mean	.316	.155	.313	.156	.299	.141
Range	.26 - .36	.14 - .16	.29 - .32	.14 - .16	.26 - .32	.14 - .16
$S_{\bar{x}}$	.006	.006	.003	.003	.006	.04
			Larvae 1			
N	25		25		25	
Mean	.292	.133	.341	.153	.303	.157
Range	.24 - .32	.09 - .14	.30 - .36	.12 - .14	.24 - .35	.12 - .20
$S_{\bar{x}}$	.005	.003	.005	.004	.006	.004
			Larvae 2			
N	15		15		15	
Mean	.79	.42	.77	.36	.77	.36
Range	.75 - .82	.32 - .50	.70 - .87	.30 - .45	.55 - .87	.25 - .42
$S_{\bar{x}}$	.0001	.012	.012	.014	.023	.012
			Adults			
N	15		15		15	
Mean	1.31	.60	1.56	.73	1.42	0.65
Range	1.20 - 1.50	.50 - .75	1.50 - 1.67	.63 - .88	1.125 - 1.40	.55 - .75
$S_{\bar{x}}$	.039	.064	.020	.031	.037	.013

and ovoid in shape, extremely thin, and dorsoventrally flattened. They are creamy-white in colour, except for the extreme anterior and posterior regions which look slightly more sclerotized and yellowish-brown in colour than the rest of the body. The body size varies in length from 0.29 mm. to 0.34 mm. and in width from 0.13 mm. to 0.15 mm. (Fig. 2).

Larvae in this stage possess a pair of simple eyes, anterior and ventral to which is located a pair of six-segmented antennae. The basal segment (scape) of each antenna is broader than the other segments - the next four being similar in shape and appearance and the terminal sixth segment being narrowly elongate and ending in a distinct seta. Smaller setae numbering from three to five may also be found on the other segments. Ventral and mesal to the antennae is a pair of tubular spinnerets each having the characteristic shape of a figure of 8.

L. ulmi first-stage larvae have three pairs of short stout legs, each consisting of a coxa, trochanter, femur, tibia, tarsus, and pretarsus (single claw) (Fig. 2). Around the claw arises four knobbed digitules, paired, one pair slightly shorter than the other.

Segmentation in the abdominal region is distinct, each segment bearing a pair of short gland spines bulbous at the base. In the terminal region of the pygidium is a pair of widely separated median lobes mesal to which arises a pair of long filamentous thread-like setae. Carnigie (1955) refers to these structures in L. beckii as anal filaments and believes that they aid the crawlers in anchoring themselves when feeding and in righting themselves when overturned. He also claims that these structures serve as parachutes for crawlers

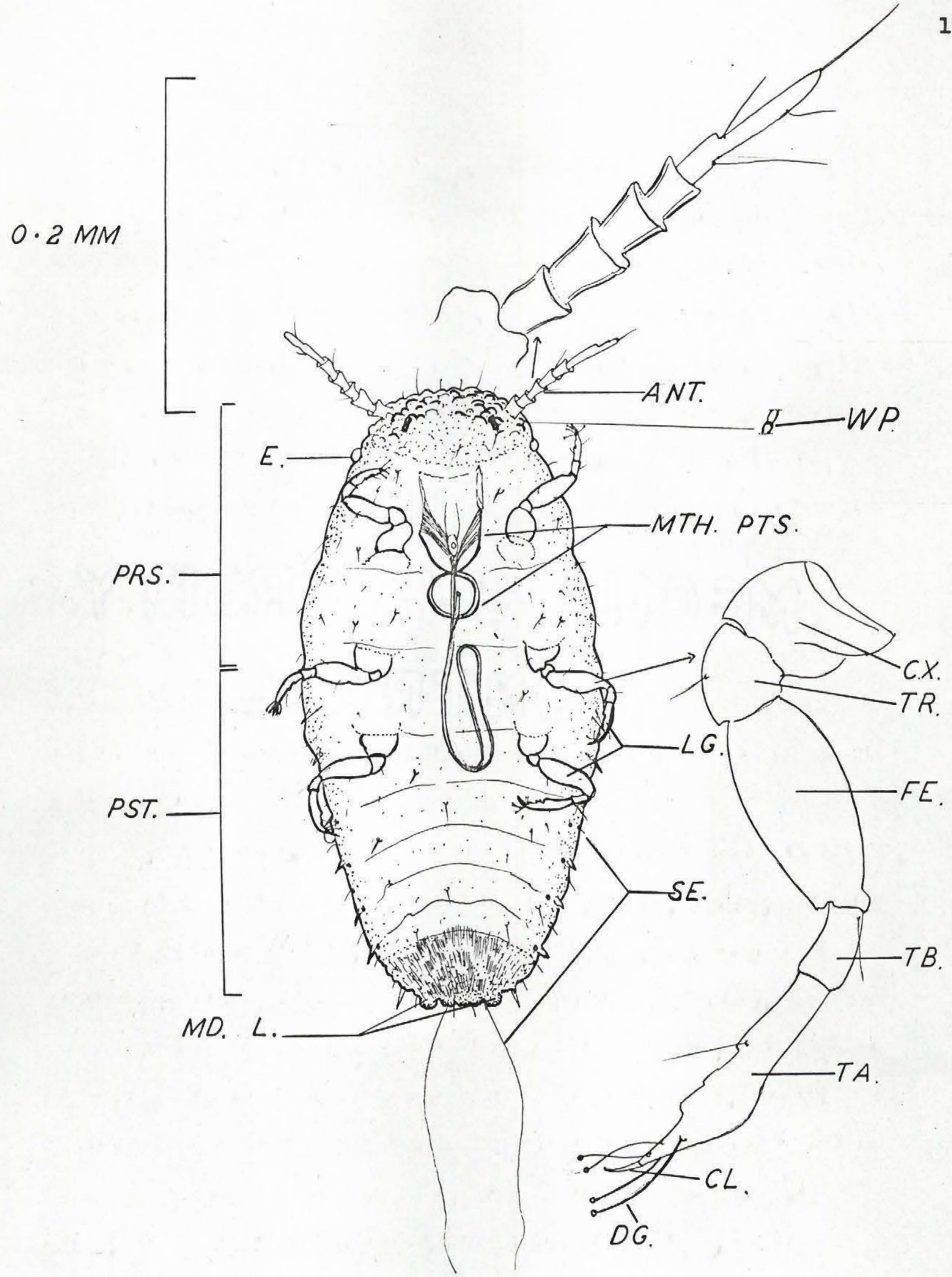
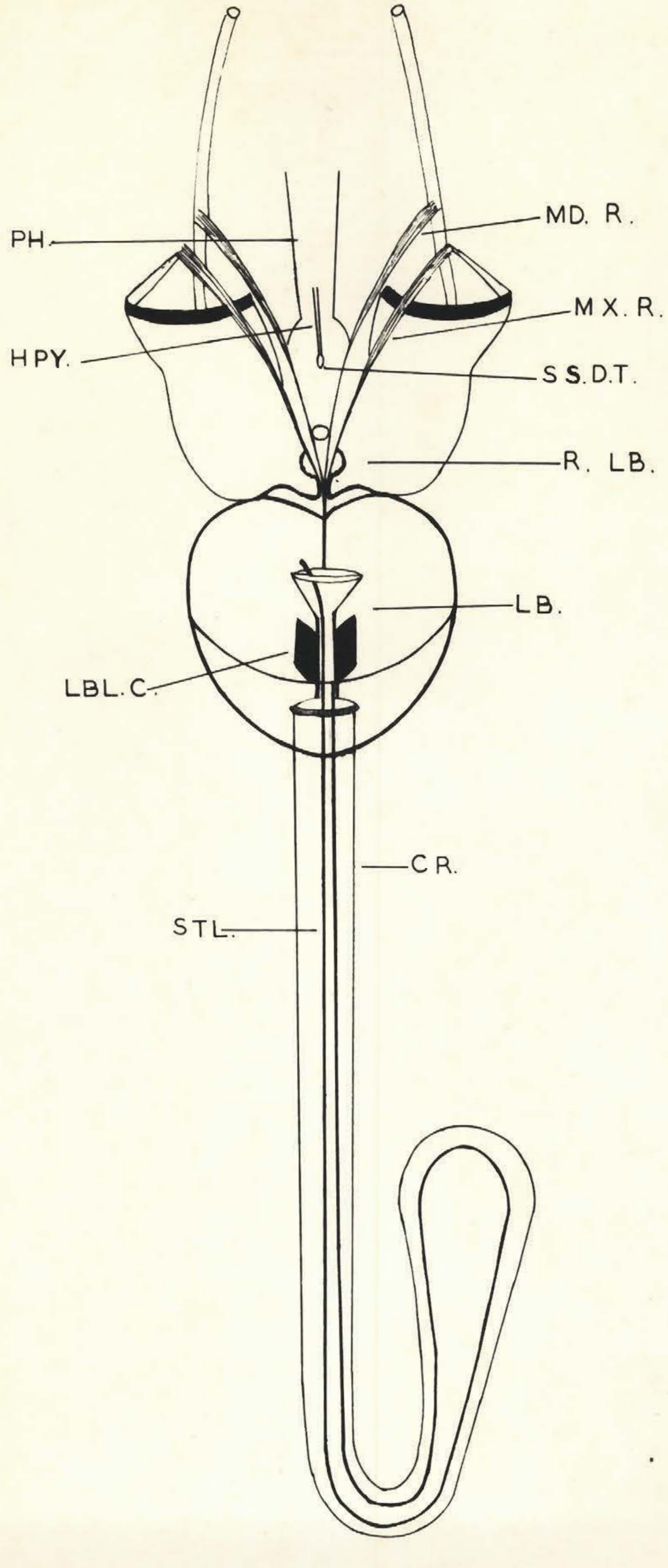


Fig. 2. Ventral view of the free living first-stage larva of L. ulmi.

Fig. 3. Diagrammatic representation of _L. ulmi_ first-stage larval mouthparts.


PH.
MD. R.
M X. R.
H PY.
S S.D.T.
R. LB.
LB.
LBL. C.
C R.
STL.

dispersed by the wind.

The mouthparts in the first-stage larvae are adapted for piercing and sucking and consist of a one-segmented labium and paired mandibular and maxillary stylets (Fig. 3). The stylets when retracted into the body are looped in an internal pouch, the crumena (normally very difficult to observe), which extends from the base of the labium to the abdominal region. The labium when viewed ventrally, is a cup-shaped ring like chitinous structure with the basal portion sunken into the face of the insect. Within the cup is the labial groove, and within this groove is located the labial clamp, a two piece, flap-like, sclerotized structure. Muscles attached to this sclerotized area regulate pressure on the bristle fascicle. A diagrammatic representation of the structure of the mouthparts of a newly-emerged first-stage larva is given in Figure 3. Heriot (1934) discusses the renewal and replacement of stylets in sucking insects and specifically refers to changes in these structures in _L. ulmi_, and Boranyovits (1953) discusses the biology of armoured scales in general and the development of the mouthparts in particular. On moulting the insect remains _in situ_, the dorsal skin hardens, thickens, and forms the first dorsal exuviae or scale covering (Fig. 5). The ventral exuviae is shed along with the mouthparts, legs, etc., and the newly-emerged second-stage larva comes briefly into contact with the bark surface.

3. Second-stage larvae

Second-stage _L. ulmi_ larvae are creamish-white in colour and distinctly pear-shaped (Fig. 4). The antennae are reduced each to a

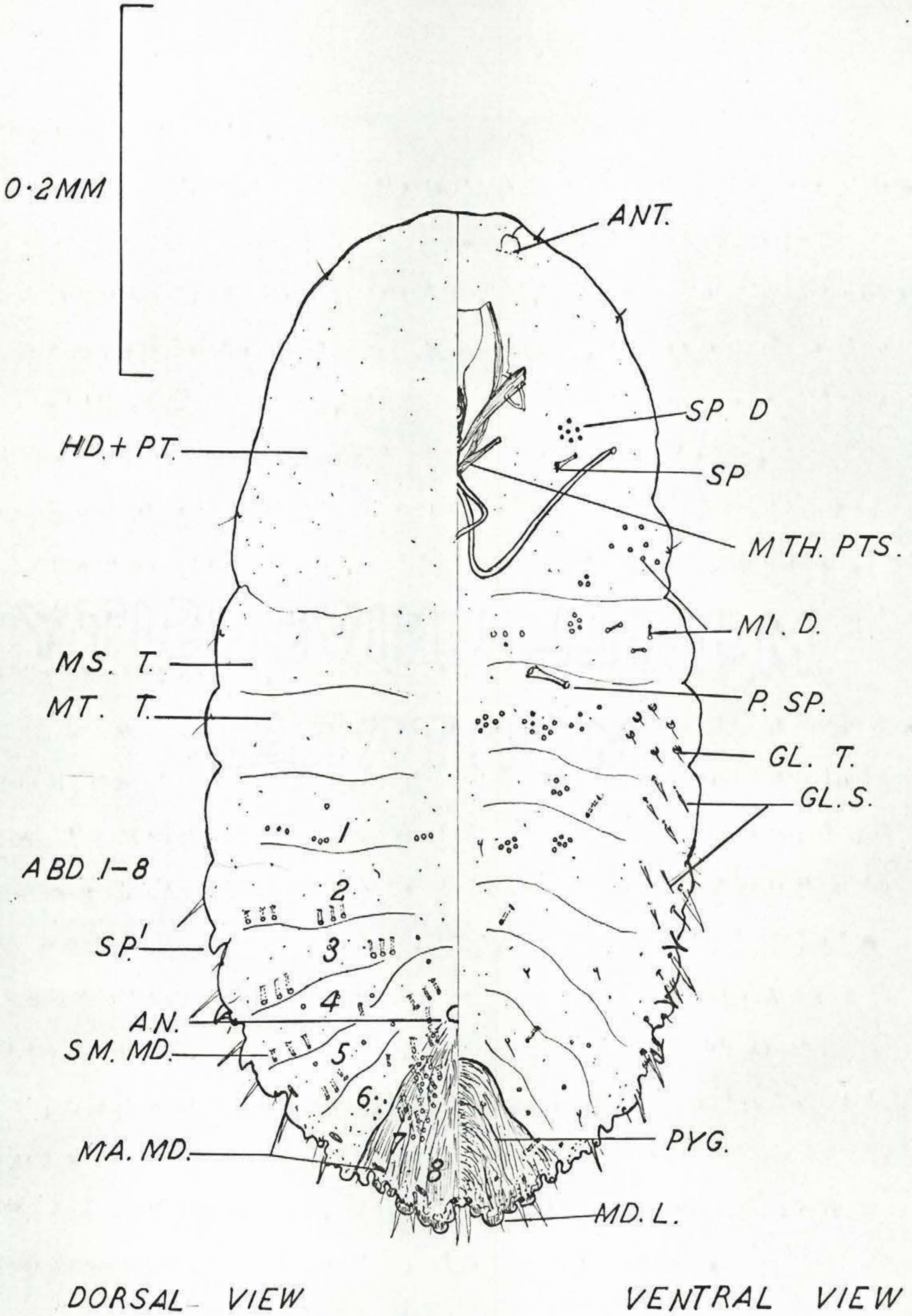


Fig. 4. Dorsal and ventral views of second-stage

L. ulmi larva.

single tubercle bearing a terminal seta, the legs are lost and the eyes have disappeared. The body size varies in length from 0.77 mm. to 0.79 mm. and in width from 0.36 mm. to 0.42 mm. The regions of the body are: (a) the head, indistinguishably fused to the prothoracic segment; (b) the meso- and the metathorax; and (c) eight visible, though fused abdominal segments. In the coccids generally, MacGillivray (1921) refers to the combined head and thorax as the cephalothorax, and McKenzie (1956) calls the combined head and first two thoracic segments the 'prosoma', and the metathorax and the abdomen as the 'post soma'.

Posterad of the body from the fifth segment onwards, segments are imperceptibly fused to form the region of the pygidium, a sclerotized yellowish-brown plate. In the second-stage larvae the median lobes have moved mesally, are larger and distinct, and are notched at their sides. Lateral to each median lobe is a smaller secondary lobe. Dorsally on each side of the pygidium are located four large gland openings each positioned approximately equidistant from the other. The first opening is found near the median lobe and the last near the fifth segment. Lateral to each gland opening is located a gland spine. The anus which is a circular opening is situated medially in the dorsum of the pygidial region. Small tubular microducts are located ventrally in the thorax, and larger macroducts dorsally in the abdomen. On moulting the dorsal skin or exuviae (Fig. 5) of the second-stage larva hardens, as in the case of the first moult, and forms the second scale covering. The ventral skin or exuviae is shed and the insect is again temporarily in contact with the bark. The long stylets (shed along

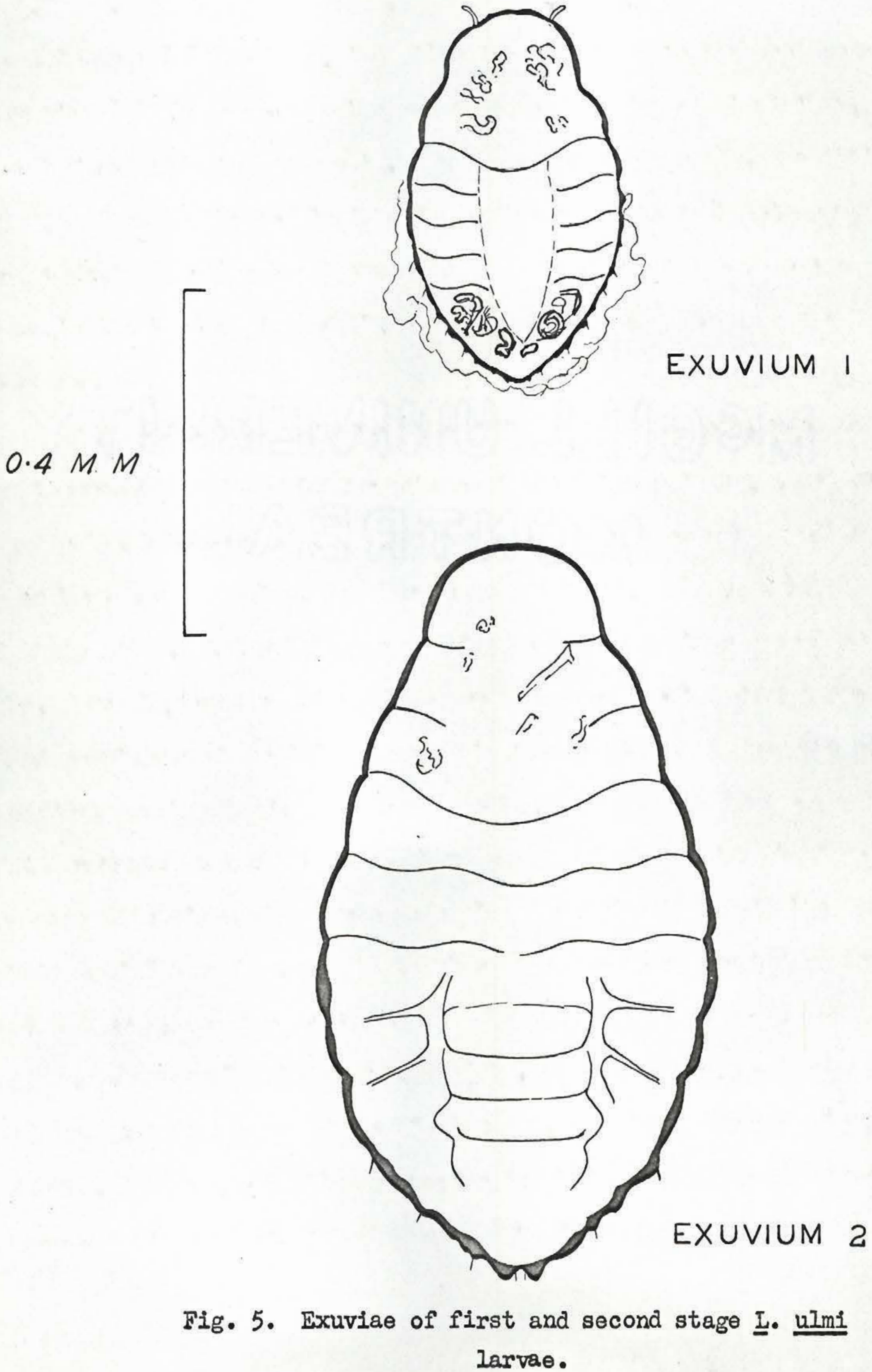


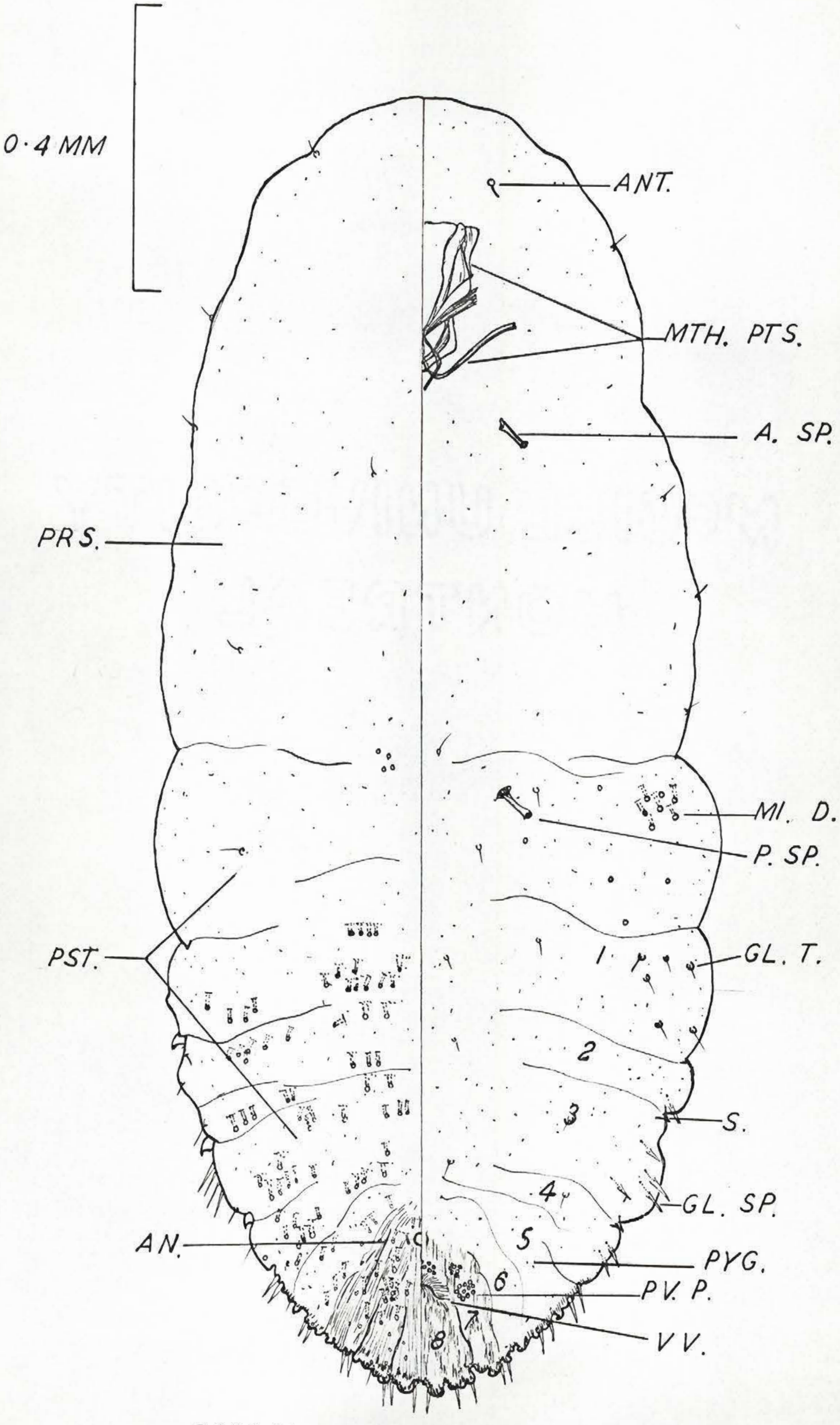
Fig. 5. Exuviae of first and second stage L. ulmi larvae.

with the ventral exuviae) remain embedded in the tissue of the host. As stated by Heriot (1934) and Boranyovits (1953) a new set of stylets is formed coiled within the head previous to each moult.

4. Adult females

The newly-formed adult female is similar in shape to the second-stage larva but is much larger in size and more complex in structure (Fig. 6). Body size for this stage varies in length from 1.31 mm. to 1.56 mm. and in width from 0.60 mm. to 0.73 mm. The adult female is easily recognized by the presence, ventrally, of a distinct vulva partly surrounded by groups of perivulvular pores. These pores, also known as circumgenital pores, are variable in number (approximately 5 to 17; Newstead, 1900) and are arranged in five groups: one anterior; two latero medial; and two lateral. The region of the pygidium is well-developed and the two median lobes are closer together than in the previous stage and notched at their sides. The secondary lobes are cleft. On each side of the pygidium are six gland openings, lateral to each of which is a pair of gland spines. On the lateral sides of the abdomen, in the region of the intersegmental lines of segments two and three, three and four, and four and five, we find a short heavily sclerotized spur. Located on the dorsal side of the body are well-defined macroducts, variable in number, which generally line the posterior limit of each abdominal segment. These ducts are named according to their position as marginal, sub marginal, or median. Small scattered groups of microducts are also located dorsally in the thoracic segments. Two pairs of thoracic spiracles, an anterior

Fig. 6. Dorsal and vemtral views of *L. ulmi* adult female.


0·4 MM
ANT.
MTH. PTS.
A. SP.
PRS.
MI. D.
P. SP.
PST.
1
2
3
4
5
6
8
GL. T.
S.
GL. SP.
AN.
PYG.
PV. P.
VV.
DORSAL
VENTRAL

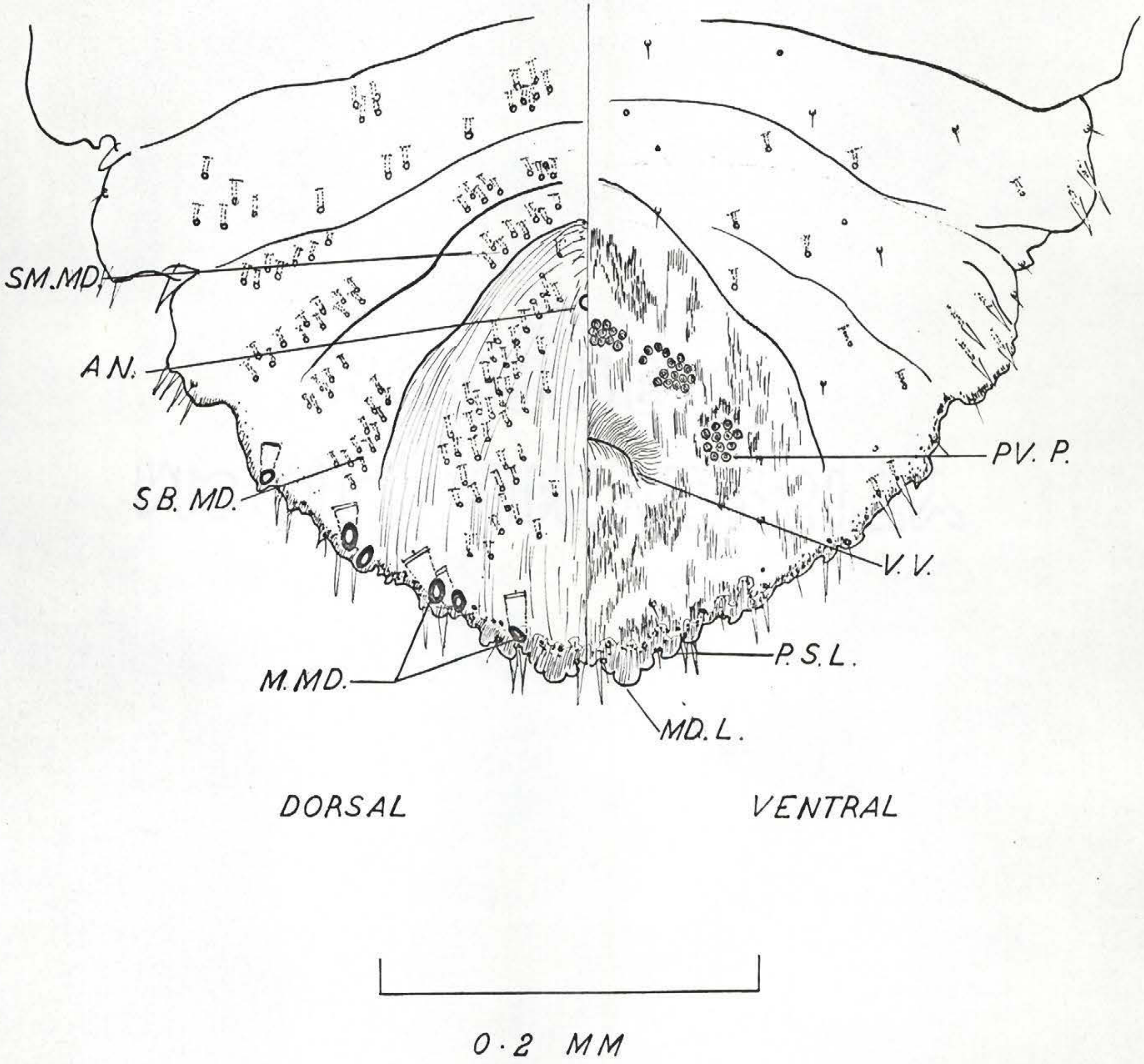


Fig. 7. Dorsal and ventral views of the pygidium of adult *L. ulmi* female.

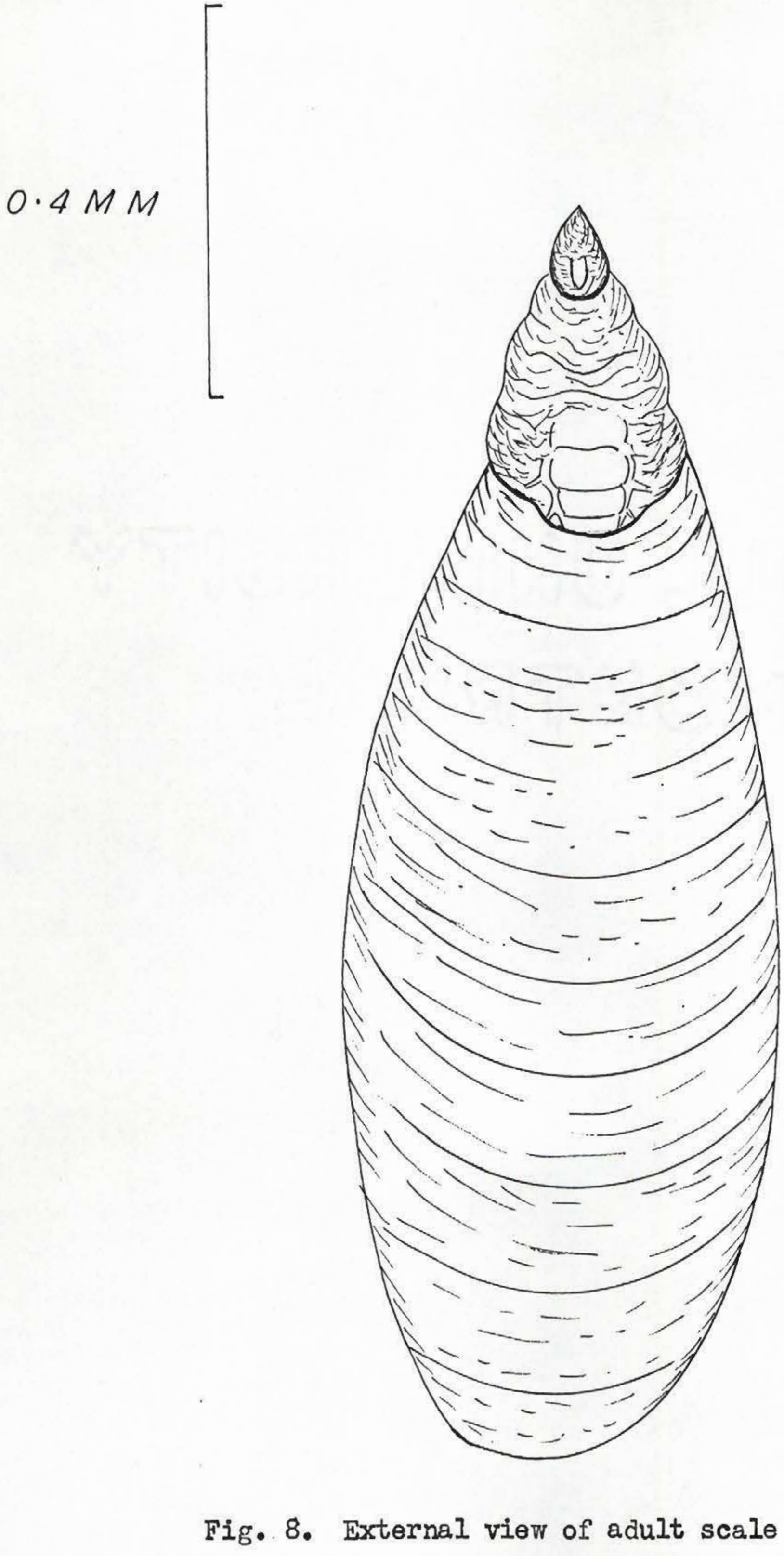


Fig. 8. External view of adult scale covering of *L. ulmi*.

mesothoracic pair (normally located above and alongside the mouthparts), and a posterior metathoracic pair (in the metathorax) are clearly visible in both the second-stage larva and the adult. Associated with the mesothoracic spiracle are one or more spiracular discs. The antennae are reduced to minute tubercles and the stylets are long coiled loops.

When fully developed the adult female fills up the entire space within the scale and lies completely concealed within it. The fully-formed scale is now made up of two larval exuviae (the first and second scales) and the adult scale. This structure is long and cylindrical and has faint concentric markings on its outer surface (Fig. 8). In length it is approximately 2.8 mm. and in width 0.74 mm. Adult scales are light-brown to dark-brown in colour, thick and shiny in texture. Old overwintered scales are greyish-brown in colour due to the bleaching action of weather.

C. CHARACTERS IMPORTANT IN THE IDENTIFICATION OF STAGES

To determine if stages of the Oystershell scale in different apple growing regions of Canada were identical to those found in the Macdonald College and Ile Bizard apple orchards, body lengths and widths of eggs and adults were measured for each population and compared (Table 3). Characters found typical and common to each of the stages in all populations are also listed as follows:

TABLE 3

Mean length (L) and width (W) measurements (in mm.) for *L. ulmi* eggs and adults developing on apple in the different apple growing regions of Canada and in Maine.

EGGS

	B.C.		ONT.		QUE.		N.B.		N.S.		MAINE	
	L.	W.	L.	W.	L.	W.	L.	W.	L.	W.	L.	W.
N	10		10		10		10		10		10	
Mean	.30	.16	.30	.15	.31	.17	.30	.17	.29	.15	.29	.15
Range	.28-.31	.14-.16	.28-.32	.13-.16	.29-.32	.14-.16	.29-.33	.13-.16	.26-.30	.13-.16	.28-.32	.14-.16
$S_{\bar{x}}$	.003	.003	.005	.004	.003	.003	.004	.001	.005	.004	.009	.003
ADULTS												
N	15		15		15		15		15		15	
Mean	1.47	.60	1.25	.59	1.25	.57	1.26	.68	1.33	.58	1.27	.57
Range	1.37-1.62	.52-.65	1.07-1.4	.45-.65	1.07-1.42	.50-.62	1.2-1.6	.50-.62	1.07-1.4	.50-.65	1.050-1.45	.30-.70
$S_{\bar{x}}$	.025	.011	.014	.031	.027	.011	.031	.011	.046	.012	.037	.016

Characters typical of *L. ulmi*

Stage				
Eggs	Milky white and opaque	Length .29-.30 mm. Width .14-.16 mm.	Ovoid with waxy particles on surface of chorion	Mean no. of eggs per scale usually 50-64
Larvae 1	Creamish white oval in shape and two yellowy brown areas at anterior and posterior extremities.	Length .29-.34 mm. Width .13-.15 mm.	Six segmented antennae with 3 to 6 spines	Legs end in single claw and 4 digitules 2 of which are shorter.
Larvae 2	Pear shaped creamish white, yellowish brown sclerotized posterior region.	Length .77-.79 mm. Width .36-.42 mm.	Antenna reduced to single tubercle with terminal seta.	Pygidial region has 4 large gland openings, 2 median lobes & 2 lateral lobes. Perivulvular pores & vulva not present. Legs absent.
Adults	Creamish yellow abdomen 2-4 segments with sclerotized spurs.	Length 1.25-1.47 mm. Width .57-.73 mm.		Region of pygidium has 6 large gland openings. Vulva with 5 groups of perivulvular pores regular in arrangement. Group of dorsal ducts extend from 6th segment to anus.
Adult scales[1]	Light brown to dark brown in colour. Long and narrow, thick and shiny texture, with semi-circular bands or rings on the surface. On the average is 2.8 mm. in length and 0.74 mm. in width.			

---

[1] Only female scales examined; male scales were not obtainable on apple anywhere.

Body measurements for stages of *L. ulmi* in the Macdonald College and Ile Bizard populations did not differ significantly from measurements obtained for similar stages in other populations. The mean number of eggs per scale for different populations ranged from 50 to 65, with the greatest numbers of eggs being found under the longest scales. This relationship between body length and egg numbers was particularly evident for scales of the Macdonald College and Ile Bizard 1964 populations. Yakubova (1935) showed a similar positive correlation for these characters. Using the characters mentioned above it has been possible to recognize all stages of *L. ulmi* examined in the course of this study. While it is true that many characters of *L. ulmi* larvae and adults are common to the Genus *Lepidosaphes*, it is equally true that characters such as shape, colour, arrangement and position of dorsal ducts, presence of spurs and groups and numbers of perivulvular pores are typical of the species and particularly prominent in adult *L. ulmi* females. For example, *L. ulmi* on *Catalpa speciosa* is reddish-yellow in colour (Kosztarab 1963) while it is creamish-white on apple, also *L. beckii* females on citrus, which show a very close resemblance to *L. ulmi* females on apple, lack the marginal sclerotized spurs, but have abdominal sclerotized bosses. The converse is true for *L. ulmi*. Hence, for field populations of the Oystershell scale on apple, characters specific to each stage as given above, coupled with information on habits and structure, will assure undoubted identification of the species.

IV. BIOLOGY AND LIFE HISTORY OF L. ULMI ON APPLE IN QUEBEC

A. LIFE HISTORY AND BEHAVIOUR

1. Adult scales

The Oystershell scale is a common, though not serious, pest of apple orchards in Quebec and is found in every major apple growing region of the province. The species leads an extremely quiescent life and at low densities infests mainly young twigs (Plate I, B and C) and terminal shoots of all age classes of apple trees. At high densities larger branches, bark, and fruit are invaded. At these densities the scales tend to crowd together, are variously curved in shape and overlap one another in dense accumulations (Plate II A). Damage to the trees results mainly from the removal of sap.

In Quebec *L. ulmi* has only one generation a year and overwinters in the egg stage. Overwintered eggs are always concealed beneath the parent scale, along with the shrivelled body of the female, and range in number from 20 to 110 per scale. Eggs are deposited in late August and early September of each year.

2. Hatching and emergence

Hatching of eggs takes place mainly in late May or early June and the length of the hatching period depends upon the weather. Several successive warm days (daily maximum of $70^{o}F$) in late May will result in maximum hatching of eggs while several days of cool weather (maximum of $60^{o}F$), during the same period, will delay maximum hatching till early June. For example, eggs on twigs taken in the Macdonald College apple orchard on May 12, 1963, and left at room temperature (72°F), hatched on the 23rd of May, while hatching of eggs in the field did not take place till the 6th of June. Similarly hatching of eggs in the Macdonald College orchard (protected) in 1963 and 1964 generally took place a week earlier than hatching at Ile Bizard (open). Hulley (1962) also reported that higher temperatures speed up the rate of egg development and correspondingly the rate of hatching.

In the present studies eggs at the posterior end of the scales were observed to hatch first. It is possible that these eggs which are laid first mature first. All newly-emerged first-stage larvae (crawlers) (Plate IV A) leave the parent scale through a small space left at the posterior extremity of the incomplete ventral scale. The parent scale is somewhat incompletely attached to the host plant at this point, thus providing the space necessary for escape. The first-stage larvae (Plate IV A) are the only dynamic forms of L. ulmi in the life history of this parthenogenetic strain on apple.

A count of empty egg shells under the scales will usually indicate the number of fertile eggs deposited by the females. The empty egg shells remaining after emergence of the larvae look like tiny bits of lens paper.

3. First-stage larvae

Newly-emerged crawlers remain inactive for a few minutes beneath the parent scale before moving slowly to the outside. Once out of the scales they crawl actively on twigs and branches, and sometimes on leaves, looking for a suitable feeding site on which to become attached to the host. Griswold (1925) reported that crawlers of *L. ulmi* take an hour to settle upon the host and Quayle (1938) that crawlers of *L. beckii* wander about the host for approximately three days, though most become settled within a day. Contrary to this, Carnigie (1955) found that the wanderings of *L. beckii* last for approximately two hours. Crawlers of *L. ulmi* observed in this study established themselves on the host in approximately 15 to 20 minutes (as revealed from laboratory observation) and many of the first-stage larvae tended to congregate in close proximity to the parent scale (Plate IV D).

In the populations studied, only a few first-stage larvae established themselves on fruit and trunk. Quite a number of larvae migrated to the developing leaves and died, and only those that established themselves on the wood and on the leaf midrib survived. Newstead (1900) and Carnigie (1955) made similar observations for crawlers of *L. ulmi* and *L. beckii*, respectively, on leaves and Newstead (1900) attributed survival of these forms on the midrib to the greater availability of sap.

Shortly after the onset of feeding the larvae begin to secrete a white cottony thread-like fluff which exudes, from the abdominal gland spines and spinnerets and from the wax pores in the region of the head. When secretion is completed only the head region remains uncovered (Plate IV C). If larvae are grouped together, strands of the waxy material become entwined to form a protective web or network over the group (Plate IV B). Ferris (1928) comments on the wax-secreting organs of the Coccidae and refers to a series of papers dealing with the histology of such organs.

After the waxy material has been secreted the body of the larva becomes flattened and the dorsal skin (exuviae) hardens and thickens to form the first scale which is golden-brown in colour. The ventral skin remains thin and transparent. After approximately two weeks from the date of first attachment on the host the larvae undergo their first moult. The ventral skin is shed along with the antennae and legs while the dorsal exuviae remains as the first scale (Fig. 5).

4. Second-stage larvae

The second-stage larva soon increases in size, becomes pear-shaped (Plate V C) and shows retrogression in the development of its morphological characters through the reduction of the antennae, and loss of eyes and legs. The second scale covering, which at first is waxy and transparent in nature, is soon secreted (Plate V B) slightly below and posterior to the first scale (exuvia). Secretion of a membranous thin and transparent ventral scale follows. Thus the developing insect becomes encapsulated between the two scale coverings (Plate V C).

The second-larval stage lasts approximately three weeks after which time the insect moults to the adult stage. The ventral part of the exuviae is shed and the hardened dorsal part remains as the second scale covering (Fig. 5).

5. Adult females

The adult female (Plate VII C) which is considerably larger in size than the second stage larva, fixes itself on to the host by means of its long stylets. These structures are considerably longer than the female body. The adult scale covering soon develops from beneath the second exuviae, while the ventral scale covering develops incompletely; i.e., only three fourths the distance of its body length. As a result a posterior opening or space (Plate III A) is left for escape to the outside of first-stage larvae. When fully developed the body of the adult female is greatly distended with eggs and oviposition begins. As the eggs are deposited the body of the female gradually shrinks and shifts to the extreme anterior end of the scale covering. The period of oviposition lasts for about a month after which time the female dies. Its body becomes dehydrated and remains as a yellowish-brown sac under the scale covering.

6. Male scales

Despite reports (mainly comments by workers in the field) the writer has not been able to find a single authenticated record of L. ulmi males on apple in Canada. The following workers have reported on the absence of males on apple: CANADA - Tothill (1919), Heriot (1931); UNITED STATES - Shimer (1868), Riley (1873), Comstock (1881), Griswold (1925); ENGLAND - Newstead (1900), Imms (1925); RUSSIA - Danzig (1959); GERMANY - Frank and Kruger (1900), Thiem (1931); AUSTRALIA - French (1891); NEW ZEALAND - Maskell (1887). In Canada, males are not present in the Canadian National Collection at Ottawa, nor have they been recorded by research workers of the Canada Department of Agriculture Stations (see Section - Geographical distribution) concerned with apple pest problems in various parts of the country. Attempts by the writer to obtain male scales from the thousands of *L. ulmi* specimens reared in the field and in the laboratory at Macdonald College, proved fruitless. Rearing procedures followed in these attempts in 1963 and 1964 for the Macdonald College and Ile Bizard populations are as follows: (a) Sleeve cages (Peterson 1934, 13:7) were placed over scale-infested branches in the field from the time first-stage larvae established themselves on the host in mid June to the time of egg deposition by adult female scales in early August. No male scales were obtained in these cages; (b) Emergence cages (Peterson 1934, 27:6) were placed in the laboratory and in the insectary and to these were added every two weeks from mid June to early August field-collected scale-infested twigs. These also yielded no male scales. In both instances, scales in cages were carefully examined daily and over ten thousand scales were individually checked during this period.

Host plants from different parts of Canada, principally, White ash, Willow, Lilac, Butternut, Red-osier dogwood and *Cotoneaster divaricator*, were also meticulously examined for male scales but none were found. Elsewhere, male scales have been reared from host plants other than apple as follows:

Host plant	Region	Author
Tilia cordata	Russia	(Danzig, 1959)
Elaeagnus argentea		
Populus berolinensis		
Salix linearis		
Betula verrucosa		
Acer ginnala		

Lonicera tatarica		
Padus maackii		
Syringa josikaea		
Rosa canina		
Philadelphus caucasicus		
Negundo aceroides		
Fraxinus excelsior		
Padus racemosa		
Vaccinium myrtillus	England	(Ghauri, 1962)
Calluna vulgaris		
Cysticus sp.	England	(Newstead, 1900)
Vaccinium myrtillus		
Catalpa speciosa	Ohio	(Kosztarab, 1963)

L. ulmi male specimens (Plate II C) were obtained on loan for examination and recognition from the following workers. A number of these specimens have been retained at Macdonald College.

Host plant	Region	Author
Catalpa speciosa	Ohio	Dr. M. Kosztarab Agricultural Experiment Station Virginia, U.S.A.
Celastrum scandens	Greece	Dr. P. DeBach University of California, Riverside, U.S.A.
Quercus sp.	Poland	Dr. Z. Kawecki Katedra Zoologii S.G.G.W. Warsaw, Poland.
Edulis superba	Ogden, Utah	Dr. G. W. Dekle Department of Agriculture, Florida, U.S.A.

7. Parthenogenesis

It can be concluded from the above studies that *L. ulmi* on apple in Canada produces viable young from unfertilized eggs only, and that these young give rise solely to a race of thelytokously parthenogenetic females. Wigglesworth (1939) has observed such parthenogenetic races in *Lecanium hesperidum* and *Lecanium hemisphaericum* and Pierantoni (1910) and Kuwana (1922) have erroneously reported parthenogenesis for the hermaphrodite species *Icerya purchasi* (Pierantoni, 1914; Hughes-Schrader, 1925, 1926, 1927).

It is conceivable that *L. ulmi* on first becoming established in Canada exhibited the phenomenon of facultative parthenogenesis, (hence the occasional unauthenticated report of males by field workers) to be followed later through environmental selection or mutation by the total parthenogenetic condition. However this possibility is remote since as generally reported the absence of males on apple is universal. It would therefore appear more likely that *L. ulmi* on apple in Canada was parthenogenetic from the start and this possibility should be further investigated (Danzig, 1959).

Considering the ephemeral nature of the adult male it can be argued that parthenogenesis is of advantage to *L. ulmi* under Canadian conditions since in theory the reproductive potential of the species is not impaired through changes in sex ratio. Furthermore as *L. ulmi* is sedentary a high reproductive potential should increase the species ability to exploit rapidly an environment which is favourable to it, and help as well in counteracting the extremely high mortalities the insect suffers in all of its stages under field conditions. It appears nevertheless that the question of whether or not the absence of males in the populations of L. ulmi on apple in Canada can in the long run be beneficial to the species, cannot be solved until recourse is made to cytological studies.

8. Sex ratio

Since individuals of the 1963-64 generations of L. ulmi studied in the Macdonald College and Ile Bizard experimental apple orchards were exclusively parthenogenetic females 'sex ratio' was not an entry in life tables developed for these populations.

9. Fecundity

Fecundity of L. ulmi on apple, in major apple growing regions of Canada during the period 1962-65 (Table 4), was not found to differ significantly between regions. Nor was the range (40-68) in mean number of eggs per female obtained significantly different from means and ranges reported for the species on apple elsewhere: Quaintance and Sasscer (1910), 40 to 100 eggs; Imms (1916), a mean of 37.2 eggs; Cooley, Parker and Regan (1924), a few to 56 eggs; Griswold (1925) 20 to 108 eggs; Heriot (1931), 21 to 77 eggs. The mean number of eggs (86.4) per female for L. ulmi developing on poplar was also of the same order (Girault 1909).

10. Seasonal life history

Data on the seasonal development of L. ulmi, on apple at Macdonald College and Ile Bizard, Quebec, 1963-64, are given in Table 5 and illustrated in Figure 9. L. ulmi was observed to spend approximately nine months in the egg stage, two weeks, each, in the first- and

TABLE 4

Mean eggs per female (with range and standard error) for populations of *L. ulmi* developing on apple in different apple growing regions of Canada and in Maine, U.S.A.

	ONT.			QUEBEC			N.S.	MAINE
		Macdonald College			Ile Bizard			
GEN.	1964-65	1962-63	1963-64	1964-65	1963-64	1964-65	1964-65	1964-65
N	10	25	25	25	25	25	10	10
Mean	50.04	59.48	64.04	38.32	68.84	40.12	54.72	52.80
Range	30-66	10-88	30-96	19-62	48-86	23-60	44-61	40-74
$S_{\bar{x}}$	3.41	4.09	.75	2.76	1.89	1.65	4.92	4.33

second-larval stages and about six weeks in the adult stage. In 1963, in both experimental plots, cool weather in late May and early June prolonged the hatching period of eggs with the result that there was a certain amount of overlapping in the subsequent larval and adult stages. In Canada *L. ulmi* has one generation a year only. Glen (1920), however, reports that in Illinois the species is double brooded.

11. Methods of distribution

As mentioned earlier, *L. ulmi*, despite its sedentary nature occurs in every part of the world where apple is grown. Authors generally agree that the species originally must have been transported from one country to another through the interchange of nursery stock. However, distribution within a region or an orchard cannot be explained solely on this basis. It appears that local distribution of the species takes place through the movement of first-stage crawlers from tree to tree (Quayle, 1911) or through wind transport. The sudden appearance of *L. ulmi* in long established orchards, and the rapid movement of the insect within the orchard once entry is gained supports the wind movement contention. Sherman (1913) suggested that *L. ulmi* crawlers on apple may be dispersed by wind and Quayle (1916), Stofberg (1937), Ebeling (1950) and Bodenheimer (1951) have observed a similar phenomenon for crawlers on citrus. Sherman (1913) claims, however, that the majority of crawlers so transported die.

The young crawlers may also be distributed from place to place while clinging to the feet of birds, or to the body of insects, a phenomenon not uncommon at high densities of *L. ulmi* in the crawler stage (Newstead, 1900; Quaintance and Sasscer, 1910). Howard and

TABLE 5

Seasonal development of L. ulmi on apple, in the Macdonald College and Ile Bizard experimental plots, 1962-64.

Stage	Macd. College 1962-63	Macd. College 1963-64	Ile Bizard 1963-64
Eggs	May 12 1963	May 12 1964	May 14 1964
Larvae 1	June 6 1963	May 25 1964	June 6 1964
Early larvae 2	June 11 1963	June 9 1964	June 11 1964
Mature larvae 2	July 2 1963	July 3 1964	July 7 1964
Early adults	July 23 1963	July 14 1964	July 20 1964
Mature adults	August 1 1963	July 23 1964	July 28 1964
Ovipositing adults	August 6 1963	August 6 1964	August 11 1964

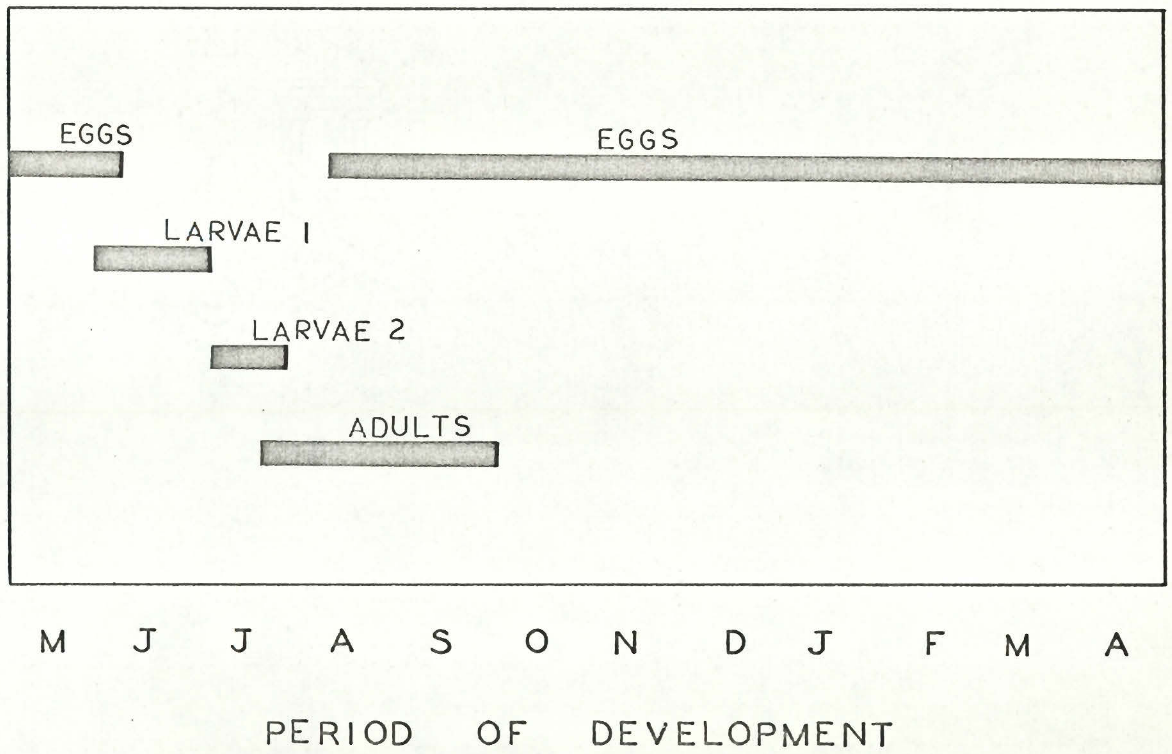


Fig. 9. Seasonal development of L. ulmi on apple in Quebec.

Marlatt (1896) report that *Microweisea misella* (Lec.) and *Paria canella* (Fab.), two beetles, and *Monomorium minutum* (Mayr), a black ant, were observed to act as important carriers of the San Jose scale. The present writer has also observed a number of coccinellid beetles and thrips larvae transporting crawler stages of *L. ulmi* in the course of this study.

12. Predators and parasites

Predators and parasites, important in control of L. ulmi stages at Macdonald College and Ile Bizard, Quebec, 1963-64, were:

PREDATORS - *Hemisarcoptes malus* (Shimer), *Tydeus coccophagus* (Erwing), *Typhlodromous* (I.) *pomi* (Parrot), *Typhlodromous* (I.) *rhenanus* (Oudemans), *Thyreophagus entomophagus* (Laboulbene)[1], *Oppia nova* (Oudemans)[1], *Lorryia* sp., *Chelytia* sp., *Oribatei* sp.[1]; and undertermined larvae of thrips and coccinellid species.

PARASITES - *Aphytis mytilaspidis* (Le Baron), *Aphelinus mali* (Haldeman), *Tetrastichus minutus* (Howard) and one species each of *Eulophini* and *Trichogrammatidae*.

Of the predators, *Lorryia* sp., *Chelytia* sp. and *O. nova* are new records for *L. ulmi* in Canada; of the parasites, *T. minutus* is a new record. *H. malus* and *A. mytilaspidis* were the only two species really important in the control of *L. ulmi*.

---

[1] Scavengers (Lignieres, 1893; Stammer, 1959; Oudemans, 1902; Erwing and Webster, 1912).

a. Hemisarcoptes malus (Shimer)

H. malus in all stages of development feed on eggs, larvae and adults (Plate VII C) of L. ulmi and occasionally on pupae of A. mytilaspidis and by preference fed on eggs of the coccid. Feeding took place under the scales throughout the year but principally during the period September to May - the period of the egg stage of the host. L. ulmi eggs attacked by H. malus become brown in colour, shrivelled, and then break into pieces (Plate VI D). As many as eight mites were found under a single L. ulmi scale killed by these predators. Shimer (1868), Walsh (1868), Riley (1873), Lignieres (1893), Jarvis (1910), and Tothill (1919) have all reported H. malus as a predator of L. ulmi eggs.

Superficially H. malus adults are approximately the same size, colour, and shape as L. ulmi eggs but can be differentiated from them by the long bristles attached to the tarsi of the posterior legs. On closer examination (X200) the species can be seen to have cup-like suckers on the end of the tarsi and a pale brown integument in the immediate vicinity of the legs.

The mites oviposit white small oval eggs under the host scale throughout the growing season and these eggs are about half the size of L. ulmi eggs.

b. Aphytis mytilaspidis (Le Baron)

A. mytilaspidis has been recorded on L. ulmi in Canada, U.S.A., Europe, Switzerland and Africa, and on eighteen other coccid species (Thompson 1953), all belonging to the family Diaspinae. Fitch (1856) was the first to observe this parasite on L. ulmi and comments on the larva of the chalcid and on the exit holes made by the adult on the host scales. Walsh (1868) made similar observations. Detailed accounts of the species behaviour and life history followed (Le Baron, 1870, 1871; Howard, 1881; Imms, 1916; Griswold, 1925). More recently work on integrated control programs by Pickett et al. (1946, 1953), Lord (1947, 1949, 1956) and Lord and MacPhee (1953) has stressed the importance of A. mytilaspidis (and H. malus) in control of the Oystershell scale in Nova Scotia. A. mytilaspidis were observed to feed on all stages of L. ulmi except first-stage crawlers. In the field the species completes three generations a year overwintering as a third generation fully-mature larva under the host scale (Plate VI A). Generally A. mytilaspidis (Plate VII B) lays one egg (0.16 mm. long X 0.08 mm. wide) per scale, although as many as three were found occasionally. The developing chalcid larva (0.14 mm. long X 0.10 mm. wide) is bright yellow in colour and, prior to pupation, excretes a copious amount of brown ovoid pellets under the scale. On pupation the mature larva transforms to a yellowish, elongate, pupa (0.65 mm. long X 0.32 mm. wide; Plate VII A) with its head directed towards the wider posterior extremity of the scale covering. Griswold (1925) reports that pupae may be found either with the head directed posteriorly or anteriorly. Shortly after emergence from the pupal case the adult (0.84 mm. long X 0.35 mm. wide) lies on its back and cuts out on the dorsal scale a small, circular exit hole (Plate II D) through which it escapes to the outside. Oviposition takes place on the developing early second-stage larvae, the egg generally being deposited on the dorsum of the insect. Griswold (1925) has observed A. mytilaspidis to lay eggs normally on the dorsum and sometimes on the venter of *L. ulmi*.

The first generation for *A. mytilaspidis* is from mid June to mid July; the second, from mid July to August; the third, from late August to the following May. A considerable overlapping of stages in the summer generations gives rise to a continuous emergence of adults until September.

c. The terms predator and parasite

A. mytilaspidis was observed to be both predacious and parasitic (Plate VI C). In the first generation it develops on the second-stage *L. ulmi* larvae; in the second on young and mature adults; in the third on ovipositing females. It feeds externally on all stages of the host, one chalcid larva requiring only one *L. ulmi* larva or adult to complete its development. But if it develops on the ovipositing adult, it will feed as well on many of the eggs. Fitch (1856) and Jarvis (1910) have also observed *A. mytilaspidis* larvae to prey on *L. ulmi* eggs.

Smith (1916) in an attempt to clarify host relationships exhibited by entomophagous insects redefined the terms predation and parasitism, stating generally that a parasitic insect is one which passes its entire larval stage within or upon a single host individual, while a predacious insect will feed externally on several individuals. He realized, however, that this definition was not consistent in all cases and concluded that there is no distinct line of demarkation between these two phenomena. The definition of a parasite, he claimed, was really based on whether or not the parasite belonged to a parasitic group and not on its method of feeding. Clausen (1940) and Metcalf and Flint (1962) later defined a parasite as one developing externally or internally on a single host individual eventually causing death of the individual. Cameron (1956) states, however, that in general "no matter how we define parasitism it is merely one example, an extremely common one, of the individual law of eat and be eaten" and concludes that "predators are so to speak parasitic on the race whereas parasites are predators on the individual, both preserve the balance of nature". Sweetman (1958) made several distinctions such as permanency of residence during mature and immature stages, intimacy of association, morphological modifications etc., in order to distinguish between these two terms but finally concluded that no line of demarkation exists between predation and parasitism, the true parasitic habit having evolved from the predatory habit.

Bearing the above comments in mind it must be concluded that since *A. mytilaspidis* can develop successfully either on a single *L. ulmi* larva or adult, or on an adult and its eggs, it must be considered both a predator and a parasite.

V STUDIES ON THE POPULATION DYNAMICS OF L. ULMI

A. INTRODUCTION

Population ecology as we know it today was developed in the 1900's mainly along three broad lines. Firstly, from the early 1920's to the late 1940's, various population theories, a priori in nature, were advanced to explain in general terms the mechanisms of population control (Nicholson, 1933; Nicholson and Bailey, 1935; Smith, 1935; Thompson, 1939; Solomon, 1949). Secondly, throughout the 1950's an a posteriori approach to the problem was emphasized. In this approach statistical techniques and designs were introduced and employed in the collection and analysis of population data (Morris and Miller, 1954; Morris, 1955, 1957; Stark, 1958, 1959; LeRoux and Reimer, 1959). Thirdly, from the late 1950's onwards the emphasis was placed on the mathematical modelling of population processes to pinpoint factors important in population regulation (Watt, 1960, 1961; Holling, 1963, 1964). These approaches constitute a scientifically acceptable inductive-deductive method to the study of population ecology - which method requires that theories on the regulatory action of mortality factors in populations be checked by experiment. Hence, today a study of the population dynamics of a species must of necessity include:
(a) the measurement of population changes from generation to generation, and (b) the measurement of factors responsible for these changes (Morris, 1957).

Essential and preliminary to such measurements is the collection of reliable statistics on the distribution of life stages, within and between generations of a species, and on factors responsible for mortalities in these stages (Morris, 1955, 1960; LeRoux and Reimer, 1959).

With the above points in mind studies on the population dynamics of *L. ulmi* on apple were carried out at Macdonald College and Ile Bizard, Quebec, in 1963 and 1964 with the object of pinpointing factors mainly responsible for population increases and decreases of this species. To this end, *L. ulmi* stages and mortalities were intensively sampled and life tables developed from the data obtained.

B. EXPERIMENTAL PLOTS

The experimental plots consisted of commercial stands of apple trees: 270 trees at Macdonald College, Quebec (Plate VIII) and 300 trees at Ile Bizard, Quebec (Plate IX). Trees in both plots were of the MacIntosh variety, 35-40 years old, and in full production. The soil at Macdonald College was of the Chateauguay soil series type (granular clay loam, pH 6.3; Lajoie and Baril, 1954), and at Ile Bizard of the brown podzolic type (Chicot fine sandy loam; Lajoie and Baril, 1954). Neither plot was subject to any serious disturbance save for the mowing of the undercover during the summer and the light pruning of trees in the spring. No insecticides were used at Macdonald College, and only two fungicidal sprays[1] were applied in early June,

---

[1] Captan (N-trichloromethylmercapto-4-cyclohexene-1:2dicarboximide). 2 lbs. per 100 gallons.

1964, at Ile Bizard for the control of apple scab. In each orchard sampling was limited to a group of six trees: the group at Macdonald College being located on the periphery of the orchard; the group at Ile Bizard being located in the centre of the orchard.

C. SAMPLING PROCEDURE

To determine the inter- and intra-tree variation in numbers of L. ulmi stages and mortalities per two leaf clusters each tree crown was arbitrarily divided into eight sampling sections, i.e., two levels, A and B, and four quadrants N, S, E, and W, per level. From each quadrant a sample of 2 leaf clusters (i.e., 48 two leaf cluster samples, or 96 leaf clusters, per sampling per plot) was collected at random and examined in the laboratory under a binocular microscope for stages of L. ulmi and related mortalities. Samples were taken weekly in both plots throughout the growing seasons of (May to September) 1963 and 1964. It must be pointed out, however, that at extremely high densities of L. ulmi, when scales are found on the bark of larger branches and trunk, a bark surface unit is more satisfactory. A total of 34 samplings, i.e., 16 samplings from Macdonald College, 1963, and 9 samplings each, from Macdonald College and Ile Bizard, 1964, were taken. Samples of L. ulmi eggs (the overwintering stage) were kept in cold storage (33° - 38°F) pending examination in the laboratory and samples of first- and second-stage larvae and adults (the summer stages) kept at room temperature to prevent mortality due to cold.

D. TIMING OF SAMPLES

Estimates of densities for L. ulmi stages and mortalities were obtained concurrently by direct sampling, i.e., insects themselves (scales) whether killed by predators or weather etc., were examined and counted. Four age intervals were sampled, notably, eggs, first- and second-stage larvae, and adults. Only L. ulmi first-stage crawlers are dynamic in nature, all other stages being sedentary.

1. Eggs

Eggs were sampled from early to late May. Scales in each sample were carefully removed from the wood of the leaf clusters and eggs located underneath the scales, examined, and counted. Unblemished white eggs were classed as normal; brown and partly eaten ones classed as killed by mite predators; unbroken creamish-white eggs, emptied of fluid contents, classed as killed by the parasite A. mytilaspidis. Desiccated eggs were light-brown in colour and slightly shrivelled, eggs killed by frost were light brown in colour but otherwise undamaged, and unhatched eggs taken in first-stage larval counts (that died from unknown physiological causes) were white and appeared normal. These egg mortalities were classed as 'others' in the life table since individually they were not sufficiently high to be categorized separately. Griswold (1925) similarly reported that unhatched L. ulmi eggs on lilac were white, undamaged and appeared normal.

2. First-stage larvae

First-stage larvae were examined in early June. Those that were partly eaten were classed as killed by predators and those that were brown and shrivelled as killed by desiccation, overcrowding, starvation etc. In 1963 emergence of first-stage larvae at Macdonald College was prolonged due to cold weather (maximum of 60°F) and sampling during this period was continued for over a period of two weeks. By contrast, in 1964, when the weather was warmer (maximum of 70°F), first-stage larvae in both plots emerged within a week. Predators and parasites were not observed to attack first-stage larvae crawling on the host and mortalities in this stage were observed to come mainly from overcrowding, starvation, wind dispersion and desiccation.

3. Second-stage larvae

Second-stage larvae were sampled from early to late July. Mortalities in this stage were mainly accountable to the predator H. malus, with a few larvae being killed by coccinellid and thrips larvae, and to the parasite A. mytilaspidis. Larvae killed by predators were partly or completely eaten except for the hard parts; those killed by desiccation were brown and shrivelled; those parasitized had a parasite larva attached to them or were completely devoid of body contents with only the larval integument remaining.

4. Adults

Adults were sampled from late July to early August. Mortality symptoms in this stage were the same as for second-stage larvae. Earlier workers have reported birds as predators of L. ulmi adults and eggs (Lowe, 1899; Newstead, 1900; Forbush, 1908; Griswold, 1925) but the writer saw no visible signs of bird predation in the samples examined at Macdonald College. Fecundity estimates per female, per generation per plot, were obtained from samples of adult scales collected, during the period of oviposition. Tables listing counts obtained for all stages and some mortalities (mites and parasites) of L. ulmi, in both experimental plots for 1963 and 1964, are given in Part II of the Appendix.

E. STATISTICAL METHODS AND RESULTS

All counts of stages and mortalities untransformed (Morris, 1955; LeRoux and Reimer, 1959) were subjected to an analysis of variance. An example of the model used is given in Table 6. Sampling variations for individual counts in the two plots are also given in Tables 7, 8 and 9, and estimates of mean densities, coefficients of variation, standard errors, components of variance (S_s^2 and S_t^2) and cost ratios, for stages and mortalities of L. ulmi sampled, given in Tables 10 to 15.

1. Components of Variance

The analyses revealed that the error variance components, between trees (S_t^2) were generally significant at the one per cent level for all stages and mortalities of L. ulmi in both plots, but were not significant within trees (S_s^2). The inter-tree density ranges (Table 16) for the Macdonald College and Ile Bizard plots were with a few exceptions generally in the twenty fold range. Transformations were not applied where inter-tree range in densities were less than thirty fold, (Morris, 1955; LeRoux and Reimer, 1959). Inter-tree error variances have also been found to account for major sampling

TABLE 6

The method used to calculate the analysis of variance for the distribution of the various stages of L. ulmi (L.) and their mortalities on apple at Macdonald College and Ile Bizard, Que., with additional calculations essential to the formulation of a sampling for this species.

ANALYSIS OF VARIANCE

Number .... Stage .... Date ....

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F.	F_{05}	F_{01}
Between Trees	....	5 (MST)	...	$\frac{\text{M.S. Trees}}{\text{M.S.R.}}$	2.48	3.58
Within Trees						
Levels	....	1	....	$\frac{\text{M.S. Levels}}{\text{M.S.R.}}$	4.11	7.39
Quadrants	....	3	....	$\frac{\text{M.S. Quadrants}}{\text{M.S.R.}}$	2.86	4.38
Levels x Quadrants	....	3	....	$\frac{\text{M.S. Levels x Quadrants}}{\text{M.S.R.}}$	2.86	4.38
Error	....	35 (MSR)	...	....		

$$C = \frac{TG^2}{48} =$$

$$B = \underline{\text{Trees SS}} = \frac{(T1^2 + T2^2 \ldots\ldots\ldots\ldots T6^2)}{8} - C =$$

$$L = \text{Levels Ss} = \frac{(TA - TB)^2}{48} =$$

$$Q = \underline{\text{Quadrants SS}} = \left(\frac{(\text{Total NA} + \text{Total NB})^2 \ldots 4 \text{ values}}{12} \right) - C =$$

$$LQ = \text{Levels x Quadrants} = \frac{TNA^2 + \ldots\ldots\ldots\ldots TNB^2}{6} - C - L - Q$$

$$\text{Error SS} = (\text{Sum of } y^2 \text{ from 1 to 48}) - C - B - L - Q - LQ =$$

Calculations necessary to formulate a sampling plan

$\bar{x} = \frac{T}{48}$ $\%\ \text{S.E.} = \frac{S_{\bar{x}}\ 100}{\bar{x}} =$ $\text{C.V.}_n = \frac{100}{\bar{x}} \sqrt{\frac{s^2{}_s}{n} + s^2{}_t} =$

$\text{S.E.}\ (S_{\bar{x}}) = \sqrt{\frac{MST}{48}}$

TABLE 7

Significance of variation due to trees, levels, quadrants, and levels x quadrants, between samples, for all life stages and related mortalities of the 1962-63 generation of *L. ulmi* (L.) in Macdonald College, Quebec.

Date Sampled	Stages and Mortalities	Trees	Levels Ratio A/B	Quadrants	Levels x Quadrants
12/5/63	Total Eggs	x	-	-	-
	Killed by predators	-	-	x	-
	A. mytilaspidis	-	-	-	-
	H. malus & others	x	-	-	-
24/5/63	Total Eggs	-	-	-	-
	Killed by predators	-	-	-	-
	H. malus & others	-	-	-	-
9/6/63	Total Larvae 1	x	-	-	-
	Parasitized L_1	-	-	-	-
	Unhatched eggs	-	-	-	-
	H. malus & others	-	-	-	-
17/6/63	Total Larvae 1	xx	-	-	-
	Parasitized L_1	xx	-	-	-
	Killed by predators	x	-	-	-
	Unhatched eggs	-	-	-	-
	H. malus & others	-	-	-	-
24/6/63	Total Larvae 1	xx	-	xx	-
	Parasitized L_1	xx	-	-	-
	Killed by predators	-	-	-	-
	H. malus & others	-	-	-	-
24/6/63	Total Larvae 1	xx	x(0.70)	x	-
	Parasitized L_1	-	-	-	-
	Killed by predators	xx	x	-	-
	H. malus & others	-	-	-	-
2/7/63	Total Larvae 1	xx	x(0.67)	-	-
	Parasitized L_1	-	-	-	-
	Killed by predators	xx	-	-	-
	H. malus & others	xx	-	x	-

TABLE 7 (cont'd)

Date Sampled	Stages and Mortalities	Trees	Levels Ratio A/B	Quadrants	Levels x Quadrants
2/7/63	Total Larvae 1	x	x(0.63)	-	-
	Parasitized L_1	-	xx(0.17)	-	-
	Killed by predators	xx	x(1.60)	xx	xx
	H. malus & others	xx	-	-	-
10/7/63	Total Larvae 2	xx	-	-	-
	Parasitized L_2	x	-	-	-
	Killed by predators	xx	x(0.74)	-	-
	H. malus & others	x	-	-	-
10/7/63	Total Larvae 2	x	-	-	xx
	Parasitized L_2	-	-	-	-
	Killed by predators	xx	-	-	-
	H. malus & others	-	-	-	-
18/7/63	Total Larvae 2	xx	x(0.37)	-	-
	Parasitized L_2	xx	-	-	-
	Killed by predators	x	-	-	-
	H. malus & others	-	-	-	-
18/7/63	Total Larvae 2	xx	-	x	-
	Parasitized L_2	-	-	-	-
	Killed by predators	xx	-	xx	-
	H. malus & others	-	-	-	-
27/7/63	Total Larvae 2	xx	-	-	-
	Parasitized L_2	x	-	-	-
	Killed by predators	-	-	-	-
	H. malus & others	-	-	-	-
27/7/63	Total Larvae 2	xx	-	-	-
	Parasitized L_2	x	-	-	-
	Killed by predators	-	-	-	-
	H. malus & others	xx	-	-	-
6/8/63	Total Adults	x	xx	-	-
	Killed by predators	xx	-	x	-
	Parasitized Adults	xx	-	-	-
	H. malus & others	x	-	-	-
6/8/63	Total Adults	xx	x	-	-
	Killed by predators	xx	-	-	-
	Parasitized Adults	xx	-	-	-
	H. malus & others	xx	-	-	-

TABLE 8

Significance of variation due to trees, levels, quadrants, and levels x quadrants, between samples, for the life stages and related mortalities of the 1963-64 generation of *L. ulmi* (L.) Macdonald College, Quebec.

Date Sampled	Stages and Mortalities	Trees	Levels Ratio A/B	Quadrants	Levels x Quadrants
12/5/64	Total Eggs	-	-	-	-
	Killed by predators	xx	x(0.62)	-	-
	Parasitized eggs	-	-	-	-
	H. malus & others	-	-	xx	-
	Scales of 1963 gen.	-	-	-	-
	A. mytilaspidis	-	-	-	-
9/6/64	Total Larvae 1	x	-	-	-
	Killed by predators	x	-	-	-
	Desiccated L_1	-	-	-	-
	Unhatched eggs	-	-	-	-
3/7/64	Total Larvae 2	xx	x(0.52)	-	-
	Killed by predators	xx	x(0.60)	-	-
	Parasitized L_2	x	x(0.25)	-	-
	H. malus & others	-	-	-	-
	A. mytilaspidis	x	x(0.30)	-	-
23/7/64	Total Larvae 2	x	-	-	-
	Killed by predators	-	-	-	-
	Parasitized L_2	-	-	-	-
	H. malus & others	-	-	-	-
	A. mytilaspidis	x	-	-	-
30/7/64	Total Adults	-	x(0.48)	-	-
	Killed by predators	-	-	-	-
	Parasitized adults	-	xx(0.42)	xx	xx
	A. malus & others	-	-	-	-
	A. mytilaspidis	-	x(0.43)	-	-
6/8/64	Total Adults	-	-	-	-
	Killed by predators	-	-	x	-
	Parasitized adults	-	-	-	-
	H. malus & others	-	-	-	-
	A. mytilaspidis	-	-	x	-

TABLE 8 (cont'd)

Date Sampled	Stages and Mortalities	Trees	Levels Ratio A/B	Quadrants	Levels x Quadrants
14/8/64	Total Adults	-	-	-	-
	Killed by predators	xx	-	-	-
	Parasitized adults	-	-	-	-
	_H_. _malus_ & others	-	-	-	-
	_A_. _mytilaspidis_	-	-	-	-
28/8/64	Total Adults	-	-	-	-
	Killed by predators	x	-	-	-
	Parasitized adults	-	-	x	-
	_H_. _malus_ & others	x	-	-	-
	_A_. _mytilaspidis_	xx	-	-	-
23/9/64	Total Adults	-	-	-	-
	Killed by predators	x	-	-	-
	Parasitized adults	x	-	-	-
	_H_. _malus_ & others	-	-	-	-
	_A_. _mytilaspidis_	x	-	-	-

xx	Significant at the 1% level
x	Significant at the 5% level
-	Non significant

TABLE 9

Significance of variation due to trees, levels, quadrants, and levels x quadrants, between samples, for the life stages and related mortalities of the 1963-64 generation of L. ulmi (L.) Ile Bizard, Quebec.

Date Sampled	Stages and Mortalities	Trees	Levels Ratio A/B	Quadrants	Levels x Quadrants
14/5/64	Total Eggs	xx	-	-	-
	Killed by predators	xx	-	-	-
	H. malus & others	xx	-	-	-
	Scales of the 1963 gen.	-	-	-	-
11/6/64	Total Larvae 1	xx	-	-	-
	Killed by predators	xx	-	-	-
	Desiccated L_1	xx	-	-	-
	Unhatched eggs	xx	-	-	-
7/7/64	Total Larvae 2	xx	-	-	-
	Killed by predators	x	-	x	-
	H. malus & others	xx	x(2.49)	-	-
20/7/64	Total Larvae 2	xx	-	-	-
	Killed by predators	xx	-	-	-
	H. malus & others	-	-	-	-
28/7/64	Total Adults	-	-	-	-
	Killed by predators	-	-	-	-
	H. malus & others	xx	-	-	-
3/8/64	Total Adults	-	-	-	-
	Killed by predators	-	-	-	-
	H. malus & others	-	-	-	-
11/8/64	Total Adults	-	-	-	-
	Killed by predators	x	-	-	-
	H. malus & others	-	-	-	-
26/8/64	Total Adults	xx	-	x	-
	Killed by predators	-	-	x	-
	H. malus & others	xx	-	-	-
23/9/64	Total Adults	xx	-	x	-
	Killed by predators	xx	-	-	-
	H. malus & others	xx	-	-	-

errors in other natural populations (Stark, 1952; Morris and Reeks, 1954; Morris, 1955; LeRoux and Reimer, 1959). While L. ulmi variation in numbers between Quadrants, and between Quadrants X Levels, were not significant, L. ulmi numbers in level B were generally higher, though not significantly so than in level A. This as observed in each generation may be due to the tendency of the dynamic first-stage larvae to move to the lower level of the trees. For L. beckii on citrus, Quayle (1938), Ebeling (1950) and Carnigie (1955) report that first-stage larvae were most abundant on the shady side of the trees.

With a few exceptions, standard errors of means for L. ulmi stages were 20 per cent or less for samples taken at Macdonald College and 40 per cent or less for samples taken at Ile Bizard. Higher error values had generally to be accepted for major mortality factors (H. malus and A. mytilaspidis; Hansen et al. 1953). In all cases the degree of error reflected the degree of inter-tree variability obtained. Error variances indicated therefore, that for populations of L. ulmi and its major mortality factors (mainly H. malus and A. mytilaspidis) at Macdonald College and Ile Bizard, Quebec, estimates of absolute densities could be obtained by sampling any portion of the tree crowns, preferably the lower levels.

2. Allocation of sampling resources

Sampling costs for all counts were estimated as C_t, the time required to move from tree to tree and prepare for sampling, a period of 20 minutes, and C_s, the time needed to take and examine a sample of two leaf clusters. For L. ulmi stages and mortalities, C_s was estimated as 95 minutes for eggs, 80 minutes for first-stage larvae,

TABLE 10

Estimates of mean densities, coefficient of variation, standard error, percentage standard error, and variance components obtained per sample of stages and mortality factors of L. ulmi (L.) in the Macdonald College Experimental Plot for the 1962-63 generation.

Stages and Mortalities	$\bar{x}$	C.V.$_{\underline{n}}$	S.E.($S_{\bar{x}}$)	% S.E.	Variance component S_s^2	S_t^2
1st sampling - early May						
Eggs						
Total	292.37	162.86	80.8	27.67	86433	28356.31
Killed by H. malus	37.70	70.25	10.8	28.64	6072	0
H. malus	3.89	268.63	2.37	60.92	96	21.75
2nd sampling - late May						
Total	404.12	61.68	91.20	22.50	394829	653.78
Killed by H. malus	43.41	176.73	12.70	29.25	4638	388.87
H. malus	4.67	124.17	1.20	25.69	69.34	0
1st sampling - early June						
Larvae 1						
Total	154.35	126.72	34.51	22.40	22566	4327
Unhatched eggs	35.08	245.50	19.80	56.40	16956	266.75
H. malus	3.75	204.82	1.68	44.80	117	2.25
Parasitized	0.43	185.60	.14	32.55	.44	.08
2nd sampling - mid June						
Total	153.00	111.80	33.00	21.56	13960	4835
Killed by H. malus	44.08	217.92	18.00	43.10	5593	1275.87
Parasitized	0.79	201.60	0.31	39.24	1.22	0.46
H. malus	3.10	216.75	1.85	59.67	64.00	3.13
3rd sampling - late June						
Total	107.87	102.12	24.30	22.29	4821	2941
Killed by H. malus	6.37	188.28	2.54	39.87	195	145
Parasitized	0.58	194.36	0.23	39.65	0.69	0.25
H. malus	0.91	142.70	0.32	35.16	3.90	.14

TABLE 10 (cont'd)

Stages and Mortalities	$\bar{x}$	C.V.$_n$	S.E.($S_{\bar{x}}$)	% S.E.	Variance component S_s^2	S_t^2
4th sampling - late June						
Total	106.39	105.28	25.00	23.50	4103	3296
Killed by *H. malus*	23.0	138.88	6.90	30.00	455	235
Parasitized	1.14	173.64	0.40	35.08	4.2	.45
H. malus	1.10	159.98	0.35	31.81	3.0	.38
5th sampling - early July						
Total	81.12	83.64	15	18.5	2592	1045
Killed by *H. malus*	31.60	126.40	8.80	27.84	939	349
Parasitized	0.91	110.09	0.24	26.30	2.40	.09
H. malus	2.08	182.60	0.86	41.34	9.0	3.13
6th sampling - early July						
Total	73.08	95.20	14.4	19.72	3086	862
Killed by *H. malus*	23.97	127.18	6.90	28.78	277.0	257
Parasitized	1.02	113.68	.24	2.35	2.54	.10
H. malus	1.33	236.0	.66	49.62	5.0	2.00
1st sampling - early July Larvae 2						
Total	65.56	78.52	11.7	16.66	1516	632
Killed by *H. malus*	23.31	94.38	4.8	20.59	316	102
Parasitized	1.45	62.01	0.50	34.4	3.88	0.49
H. malus	1.94	179.22	.58	30.00	8.00	2.48
2nd sampling - early July						
Total	64.14	72.25	11.9	18.59	2384	550
Killed by *H. malus*	24.85	136.68	7.4	29.77	702	248
Parasitized	1.25	192.00	0.52	41.60	6.66	.84
H. malus	1.29	102.46	0.12	26.35	3.0	.33
3rd sampling - mid July						
Total	79.39	98.28	17.00	21.5	2774	1366
Killed by *H. malus*	24.87	96.48	4.8	19.30	448	85.87
Parasitized	2.41	168.49	0.84	34.85	9.34	3.09
H. malus	1.38	123.80	0.34	24.64	3.00	0.35
4th sampling - mid July						
Total	67.66	110.25	16.00	23.50	2130	1412
Killed by *H. malus*	24.04	137.28	5.60	23.29	403	144
Parasitized	1.46	89.57	0.35	24.13	5.50	.08
H. malus	1.48	170.90	0.27	18.24	6.60	.78

TABLE 10 (cont'd)

Stages and Mortalities	$\bar{x}$	C.V.$_{\underline{n}}$	S.E.($S_{\bar{x}}$)	% S.E.	Variance component	
					S_s^2	S_t^2
5th sampling - late July						
Total	55.04	101.36	12.08	21.90	1430	695.25
Killed by *H. malus*	17.68	88.70	3.1	17.53	218	33.00
Parasitized	1.02	192.13	0.40	39.21	2.53	0.68
H. malus	1.10	109.08	.28	25.45	3.00	0.10
6th sampling - late July						
Total	63.16	115.34	15.13	24	2851	1021
Killed by *H. malus*	19.16	107.73	4.1	6.85	356	58.75
Parasitized	0.89	179.20	.33	37.07	1.85	0.92
H. malus	1.16	149.12	.35	30.17	2.00	0.50
1st sampling - early August						
Adults						
Total	42.89	39.44	8.50	19.80	1212	282
Killed by *H. malus*	10.33	72.75	2.90	28.15	72.57	41.43
Parasitized	1.10	190.80	.45	40.90	2.90	0.92
H. malus	0.47	182.32	.04	2.08	.60	.15
2nd sampling - early August						
Total	42.70	88.16	8.4	19.5	867	333.50
Killed by *H. malus*	10.18	126.42	2.9	28.48	84.50	39.93
Parasitized	1.04	176.91	0.40	38.50	1.94	.75
H. malus	0.54	149.85	.20	37.03	.62	.22

TABLE 11

Estimates of mean densities, coefficient of variation, standard error, percentage standard error, and variance components obtained per sample of stages and mortality factors of *L. ulmi* (L.) in the Macdonald College Experimental Plot for the 1963-64 generation.

Stages and Mortalities	$\bar{x}$	C.V.$_{\underline{n}}$	S.E.($S_{\bar{x}}$)	% S.E.	Variance component s_s^2	s_t^2
1st sampling - early May						
Eggs						
Total	2394	51.98	307.75	12.86	3698465.8	105957
Killed by *H. malus*	716.44	105.70	156.89	21.90	304239	109652
Killed by *A. mytilaspidis*	43.04	71.60	6.24	14.49	999	109
H. malus	29.15	115.93	6.83	23.43	911	166.50
A. mytilaspidis	24.40	67.65	3.54	14.51	401	24.88
1st sampling - early June						
Larvae 1						
Total	448.50	100.98	96.88	21.60	177377	34145
Killed by *H. malus*	166.96	125.67	45.59	27.31	33272	8308
Killed due to desiccation	84.04	123.90	22.41	26.67	10252	1728
Unhatched eggs	671.54	104.98	155.01	23.08	602289	68882
1st sampling - early July						
Larvae 2						
Total	94.35	103.32	28.17	29.86	8935	3645.86
Killed by *H. malus*	64.19	104.16	19.47	30.3	3580	1828
Parasitized	6.48	159.58	2.87	44.29	130	33.25
H. malus	2.40	149.97	1.64	68.30	121	1.00
A. mytilaspidis	6.33	159.40	2.88	45.49	130	33.35
2nd sampling - late July						
Total	43.83	117.19	14.49	33.05	3709	798.25
Killed by *H. malus*	27.85	136.00	10.86	38.90	2405	408.50
Parasitized	1.65	121.20	.62	37.58	9.91	1.04
H. malus	1.40	94.96	.38	27.14	2.99	.49
A. mytilaspidis	.65	153.80	.29	44.62	1.30	.35

TABLE 11 (cont'd)

Stages and Mortalities	$\bar{x}$	C.V.$_{\underline{n}}$	S.E.($S_{\bar{x}}$)	% S.E.	Variance component	
					S_s^2	S_t^2
1st sampling - late July						
Adults						
Total	18.31	29.48	2.51	13.7	287	2.13
Killed by *H. malus*	6.40	84.24	1.61	25.51	73.5	6.31
Parasitized	6.98	44.39	0.92	13.18	24.03	2.12
H. malus	2.69	57.98	.62	23.05	7.74	1.36
A. mytilaspidis	7.38	38.75	.94	12.74	59.70	0
2nd sampling - early August						
Total	19.10	25.10	1.56	8.17	495	0
Killed by *H. malus*	6.17	42.93	0.85	13.84	43.97	0
Parasitized	7.75	36.89	.62	7.95	59.57	0
H. malus	2.27	113.20	.74	32.59	13.00	1.68
A. mytilaspidis	8.27	36.27	.82	9.91	73.54	0
3rd sampling - mid August						
Total	13.23	29.48	2.09	15.80	222	0
Killed by *H. malus*	2.96	152.00	1.285	43.41	27.69	6.41
Parasitized	6.52	44.15	1.06	16.26	67.23	0
H. malus	2.15	54.40	.47	21.86	9.01	0.24
A. mytilaspidis	6.48	44.43	1.08	16.67	67.26	0
4th sampling - late August						
Total	21.58	24.07	.85	3.93	501	0
Killed by *H. malus*	4.38	107.30	1.28	29.2	25.18	6.55
Parasitized	11.71	30.70	1.50	12.80	121.50	0
H. malus	1.85	154.98	.48	25.94	4.07	.89
A. mytilaspidis	2.64	208.2	1.54	58.33	20.16	11.96
5th sampling - late September						
Total	17.56	67.37	3.36	19.13	223.95	39.90
Killed by *H. malus*	6.72	66.96	1.31	19.49	33.25	6.12
Parasitized	9.10	94.32	2.43	.27	96.29	23.50
H. malus	1.56	51.28	.30	19.23	3.64	.09
A. mytilaspidis	9.10	94.32	2.43	.27	96.29	23.50

TABLE 12

Estimates of mean densities, coefficient of variation, standard error, percentage standard error, and variance components obtained per sample of stages and mortality factors of L. *ulmi* (L.) in the Ile Bizard Experimental Plot for the 1963-64 generation.

Stages and Mortalities	$\bar{x}$	C.V.$_{\underline{n}}$	S.E.($S_{\bar{x}}$)	% S.E.	Variance component S_s^2	S_t^2
1st sampling - early May						
Eggs						
Total	4518	177.08	2701	59.78	16102399	41798402
Killed by *H. malus*	709.81	196.00	441.08	62.14	323434	1126888
H. malus	38.23	301.61	30.77	80.49	8446	4623.88
1st sampling - early June						
Larvae 1						
Total	876.79	137.61	399.17	45.53	770994	859644
Killed by *H. malus*	547.77	153.72	265.99	48.56	496518	362446
Killed due to desiccation	148.23	180.90	78.31	52.83	22426	33990
Unhatched eggs	1526.13	236.40	1027.15	67.30	4918550	5715674
1st sampling - early July						
Larvae 2						
Total	104.38	113.28	35.82	34.32	24396	4649
Killed by *H. malus*	19.38	162.52	9.54	49.23	1262	338.25
H. malus	4.44	157.50	2.20	49.55	41.50	23.79
2nd sampling - mid July						
Total	81.75	147.60	37.23	45.54	12393	6765
Killed by *H. malus*	31.81	180.5	17.61	55.36	3179	1463
H. malus	11.56	136.67	4.92	42.56	574.9	73.51
1st sampling - late July						
Adults						
Total	40.56	103.07	14.13	34.84	5213	546.80
Killed by *H. malus*	12.91	205.40	8.50	65.84	1040	303.88
H. malus	9.27	185.70	5.56	59.98	328.5	144.51

TABLE 12 (cont'd)

Stages and Mortalities	$\bar{x}$	C.V.$_n$	S.E.($S_{\bar{x}}$)	% S.E.	Variance component s_s^2	s_t^2
2nd sampling - early August						
Total	41.02	111.78	15.78	38.47	6676	660.90
Killed by H. malus	19.58	167.00	11.00	56.18	2690	387
H. malus	33.06	189.00	22.05	66.70	14419	1112
3rd sampling - mid August						
Total	60.95	12.3	10.7	17.54	6385	0
Killed by H. malus	32.02	109.2	11.36	35.48	2294	487.78
H. malus	24.60	23.54	7.16	29.11	2454	.88
Parasitized	1.00	109.00	.40	40.00	5.10	.31
4th sampling - late August						
Total	39.25	168.15	21.7	55.28	3197.4	2421.95
Killed by H. malus	30.79	162.92	16.6	52.21	6572.7	852.99
H. malus	31.27	229.68	23.3	74.51	5797	2533
5th sampling - late September						
Total	19.97	147	9.56	47.87	704	461.23
Killed by H. malus	15.50	196.72	9.95	64.19	713.66	504.79
H. malus	6.43	163.28	3.38	52.56	147.26	50.11

TABLE 13

Estimates of the coefficient of variation, mean, standard error, percentage standard error, variance components, cost ratio, number of samples and the number of trees needed for a specified standard error of the mean (10 per cent) obtained per sample of stages and mortality factors of *L. ulmi* (L.) Macdonald College, 1962-63 generation.

Sample no.	Stage	C.V.$_n$	$\bar{x}$	S.E.	% S.E.	S_s^2	S_t^2	S_s^2/S_t^2	C_t/C_s	n	$nt=\frac{(C.V._n)^2}{p}$
1	Total eggs	162.86	292.37	80.8	27.67	86433	28356.31	3.05	.06	.42	265
	Killed by predators	70.25	37.70	10.80	28.64	6072	0	-	.06	-	-
	H. malus & others	268.63	3.89	2.37	60.92	96	21.75	4.41	.06	.51	721
2	Total eggs	61.68	404.12	91.20	22.50	394829	653.78	603.92	.06	.84	312
	Killed by predators	176.73	43.41	12.70	29.25	4638	388.87	11.93	.06	-	-
	H. malus & others	124.17	4.67	1.20	25.69	69.34	0	-	.08	.64	154
1	Total larvae 1	126.72	154.35	34.51	22.40	22566	4327	5.21	.08	.64	154
	Parasitized L1	185.60	0.43	.14	32.55	.44	.08	5.50	.08	-	-
	H. malus & others	204.82	3.75	1.68	44.80	117	2.25	52.0	.08	2.04	160
2	Total larvae 1	111.80	153.00	33.00	21.56	13960	4835	2.89	.11	.56	139
	Killed by predators	217.92	44.08	18.00	43.10	5593	1275.87	4.38	.11	.69	474
	Parasitized L1	201.60	.79	.31	39.24	1.22	.46	2.65	.11	-	-
	H. malus & others	216.75	3.10	1.85	5967	64.0	3.13	20.45	.11	1.49	469
3	Total larvae 1	102.12	107.87	24.30	22.29	4821	2941	1.64	.16	.51	104
	Killed by predators	188.28	6.37	2.54	39.87	195	145	1.34	.16	.46	354
	Parasitized L1	194.36	.58	.23	39.65	.69	.25	2.76	.16	-	-
	H. malus & others	142.70	.91	.32	35.16	3.90	.14	27.86	.11	1.75	203

TABLE 13 (cont'd)

Sample no.	Stage	$C.V._{\underline{n}}$	$\bar{x}$	S.E.	% S.E.	s_s^2	s_t^2	s_s^2/s_t^2	C_t/C_s	$\underline{n}$	$nt=\frac{(C.V._n)^2}{p}$
4	Total larvae 1	105.28	106.39	25.00	23.50	4103	3296	1.24	.16	.44	110
	Killed by predators	138.88	23.00	6.90	30.00	455	235	1.94	.16	.55	192
	Parasitized L1	173.64	1.14	0.40	35.08	4.2	.45	9.33	.16	1.22	-
	H. malus & others	159.98	1.10	.35	31.81	3.0	.38	7.89	.16	1.12	255
5	Total larvae 1	83.64	81.12	15.00	18.50	2592	1045	2.48	.21	.72	69
	Killed by predators	126.40	31.60	8.80	27.84	934	349	2.69	.21	.75	159
	Parasitized L1	110.09	0.91	0.24	26.30	2.40	.09	26.66	.21	2.36	
	H. malus & others	182.60	2.08	0.86	41.34	9.00	3.13	2.88	.21	.77	333
6	Total larvae 1	95.20	73.08	14.40	19.72	3086	862	3.58	.16	.77	90
	Killed by predators	127.18	23.97	6.90	28.78	277	257	1.08	.16	.41	161
	Parasitized L1	113.68	1.02	0.24	2.35	2.54	.10	25.40	.16	2.01	
	H. malus & others	236.00	1.33	0.66	49.62	5.00	2.00	2.50	.16	.63	556
1	Total larvae 2	78.52	65.56	11.70	16.66	1516	632	2.40	.21	.71	61
	Killed by predators	94.35	23.31	4.80	20.59	316	102	3.10	.21	.80	88
	Parasitized L2	62.01	1.45	0.50	34.40	3.88	0.49	7.92	.21	1.28	38
	H. malus & others	179.22	1.94	.58	30.00	8.00	2.48	3.23	.21	82	321
2	Total larvae 2	72.25	64.14	11.90	18.59	2384	550	4.33	.21	.95	52
	Killed by predators	136.68	24.85	7.4	29.77	702	248	2.83	.21	.77	186
	Parasitized L2	192.00	1.25	0.52	41.60	6.66	.84	7.93	.21	1.29	368
	H. malus & others	102.46	1.29	0.12	26.35	3.0	.33	9.09	.21	1.38	104
3	Total larvae 2	98.28	79.39	17.00	21.50	2774	1366.12	2.03	.16	.57	96
	Killed by predators	96.48	24.87	4.80	19.30	448	85.87	5.22	.16	.91	92
	Parasitized L2	168.49	2.41	.84	34.85	9.34	3.09	3.02	.16	.69	283
	H. malus & others	123.80	1.38	.34	24.64	3.00	.35	8.57	.16	1.17	153

TABLE 13 (cont'd)

Sample no.	Stage	$C.V._{\underline{n}}$	$\bar{x}$	S.E.	% S.E.	S_s^2	S_t^2	S_s^2/S_t^2	C_t/C_s	$\underline{n}$	$nt=\frac{(C.V._n)^2}{p}$
4	Total larvae 2	110.25	67.66	16.00	23.50	2130	1412	1.51	.16	.49	121
	Killed by predators	137.28	24.04	5.60	23.29	403	144	2.80	.16	.66	188
	Parasitized L2	89.57	1.46	0.35	24.13	5.50	.08	68.75	.16	3.32	80
	H. malus & others	170.90	1.48	0.27	18.24	6.60	.78	8.46	.16	1.16	292
5	Total larvae 2	101.36	55.04	12.08	21.90	1430	695.25	2.06	.16	.57	102
	Killed by predators	88.70	17.68	3.10	17.53	218	33.00	6.61	.16	1.03	78
	Parasitized L2	192.13	1.02	.40	39.21	2.53	.68	3.72	.16	.77	369
	H. malus & others	109.08	1.10	.28	25.45	3.00	.10	30.00	.16	2.19	118
6	Total larvae 2	115.34	63.16	15.13	24.00	2851	1021	2.79	.16	.67	132
	Killed by predators	107.73	19.16	4.10	6.85	356	58.75	6.06	.16	.98	115
	Parasitized L2	179.20	0.89	.33	37.07	1.85	.92	2.01	.16	.56	321
	H. malus & others	149.12	1.16	.35	30.17	2.00	.50	4.00	.16	.80	222
1	Total adults	39.44	42.89	8.50	19.80	1212	282	4.30	.21	.95	15
	Killed by predators	72.75	10.33	2.90	28.15	72.57	41.43	1.75	.21	.60	52
	Parasitized adults	190.80	1.10	.45	40.90	2.90	.92	3.15	.21	.81	364
	H. malus & others	182.32	0.47	.04	2.08	.60	.15	4.00	.21	.91	332
2	Total adults	88.16	42.70	8.40	19.50	867	33350	2.60	.21	.73	77
	Killed by predators	126.42	10.18	2.90	28.48	84.50	39.93	2.12	.21	.66	159
	Parasitized adults	176.91	1.04	.40	38.50	1.94	.75	2.59	.21	.73	312
	H. malus & others	149.85	0.54	.20	37.03	.62	.22	2.82	.21	.76	224

TABLE 14

Estimates of the coefficient of variation, mean, standard error, percentage standard error, variance components, cost ratio, number of samples and the number of trees needed for a specified standard error of the mean (10 per cent) obtained per sample of stages and mortality factors of _L. ulmi_ (L.) Macdonald College, 1963-64 generation.

Sample no.	Stage	$C.V._{\underline{n}}$	$\bar{x}$	S.E.	% S.E.	S_s^2	S_t^2	S_s^2/S_t^2	C_t/C_s	$\underline{n}$	$nt=\frac{(C.V._{\underline{n}})^2}{p}$
1	Total eggs	51.98	2394	307.75	12.86	3698465	105957	34.91	.16	2.39	26
	Killed by predators	105.70	716.44	156.89	21.90	304239	109652	2.77	.16	.66	111
	Parasitized eggs	71.60	43.04	6.24	14.49	999	109	9.17	.16	1.21	51
	H. malus & others	115.93	29.15	6.83	23.43	911	166.50	5.47	.16	.93	134
	A. mytilaspidis	67.65	24.40	3.54	14.51	401	24.80	16.12	.16	1.60	45
1	Total larvae 1	100.98	448.50	96.88	21.60	177377	34145	5.19	.20	1.01	101
	Killed by predators	125.67	166.96	45.59	27.31	33272	8308	4.00	.20	.89	157
1	Total larvae 2	103.32	94.35	28.17	29.86	8935	3645.86	2.45	.90	1.48	106
	Killed by predators	104.16	64.19	19.47	30.30	3580	1828				
	Parasitized L2	159.58	6.48	2.87	44.29	130	33.25	3.91	.90	1.87	254
	H. malus & others	149.97	2.40	1.64	68.30	121	1.00	121	.90	10.4	224
	A. mytilaspidis	159.40	6.33	2.88	45.49	130	33.35	3.90	.90	1.86	254
2	Total larvae 2	117.19	43.83	14.49	33.05	3709	798.25	4.65	.90	2.03	137
	Killed by predators	136.00	27.85	10.86	38.90	2405	408.50	5.89	.90	2.30	184
	Parasitized L2	121.20	1.65	0.62	37.58	9.91	1.04	9.53	.90	2.92	146
	H. malus & others	94.96	1.40	0.38	27.14	2.99	.49	6.10	.90	2.30	90
	A. mytilaspidis	153.80	.65	0.29	44.62	1.30	.35	3.71	.90	1.84	236

TABLE 14 (cont'd)

Sample no.	Stage	C.V.$_{\underline{n}}$	$\bar{x}$	S.E.	% S.E.	S_s^2	S_t^2	S_s^2/S_t^2	C_t/C_s	$\underline{n}$	$nt=\frac{(C.V._n)^2}{p}$
1	Total adults	29.48	15.31	2.51	13.7	287	2.13	134.74	.89	10.95	8
	Killed by predators	84.24	6.40	1.61	25.51	73.5	6.31	11.65	.89	3.20	70
	Parasitized adults	44.39	6.98	0.92	13.18	24.03	2.12	11.33	.89	3.17	19
	H. malus & others	57.98	2.69	0.62	23.05	7.74	1.36	5.69	.89	7.10	33
	A. mytilaspidis	38.75	7.38	0.94	12.74	59.70	0	59.70	.89	-	-
2	Total adults	25.10	19.10	1.56	8.17	495	0	495	.89	-	-
	Killed by predators	42.93	6.17	0.85	13.84	43.97	0	43.97	.89	-	-
	Parasitized adults	36.89	7.75	0.62	7.95	59.57	0	59.57	.89	-	-
	H. malus & others	113.20	2.27	0.74	32.59	13.00	1.68	7.74	.89	2.62	128
	A. mytilaspidis	36.29	8.27	0.82	9.91	73.54	0	73.54	-	-	-
3	Total adults	29.48	13.23	2.09	15.80	222	0	222	.89	-	-
	Killed by predators	152.00	2.96	1.28	43.41	27.69	6.41	4.32	.89	1.95	231
	Parasitized adults	44.15	6.52	1.06	16.26	67.23	0	67.23	.89	-	-
	H. malus & others	62.31	2.15	.47	21.86	9.01	0.24	37.54	.89	5.76	38
	A. mytilaspidis	44.43	6.48	1.08	16.67	67.26	0	67.26	.89	-	-
4	Total adults	24.07	21.58	.85	3.93	501	0	501	.67	-	-
	Killed by predators	107.30	4.38	1.28	29.20	25.18	6.55	3.84	.67	1.60	115
	Parasitized adults	30.70	11.71	1.50	12.80	121.50	0	121.50	.67	-	-
	H. malus & others	96.72	1.85	.48	25.94	4.07	.89	4.57	.67	1.74	93
	A. mytilaspidis	208.20	2.64	1.54	58.33	20.16	11.96	1.69	.67	1.06	432
5	Total adults	67.37	17.56	3.36	19.13	223.95	39.90	5.61	.67	2.23	45
	Killed by predators	66.96	6.72	1.31	19.49	33.25	6.12	5.43	.89	2.20	44
	Parasitized adults	94.32	9.10	2.43	0.27	96.29	23.50	4.10	.89	1.91	88
	H. malus & others	51.28	1.56	.30	19.23	3.64	.09	40.44	.89	5.99	26
	A. mytilaspidis	94.32	9.10	2.43	0.27	96.29	23.50	4.10	.89	1.91	88

TABLE 15

Estimates of the coefficient of variation, mean, standard error, percentage standard error, variance components, cost ratio, number of samples and the number of trees needed for a specified standard error of the mean (10 per cent) obtained per sample of stages and mortality factors of *L. ulmi* (L.) Ile Bizard. 1963-64 generation.

Sample no.	Stage	C.V.$_{\underline{n}}$	$\bar{x}$	S.E.	% S.E.	S_s^2	S_t^2	S_s^2/S_t^2	C_t/C_s	$\underline{n}$	$nt = \frac{(C.V._n)^2}{p}$
1	Total eggs	177.08	4518	2701	59.78	16102399	41798402	.39	.50	.44	313
	Killed by predators	196.00	709.81	441.08	62.14	323434	1126888	.29	.50	.38	384
	H. malus & others	301.61	38.23	30.77	80.49	8446	4623.88	1.83	1.50	.95	909
1	Total larvae 1	137.61	876.79	399.17	45.53	770994	859644	.90	1.33	1.09	189
	Killed by predators	153.72	547.77	265.97	48.56	496518	362446	1.37	1.33	1.35	236
1	Total larvae 2	113.28	104.38	35.82	34.32	24396	4649	5.25	1.33	2.65	128
	Killed by predators	162.50	19.38	9.54	49.23	1262	338.25	3.73	1.33	2.22	264
	H. malus & others	157.50	4.44	2.20	49.55	41.50	23.79	1.74	1.33	1.52	248
2	Total larvae 2	147.60	81.75	37.23	45.54	12393	6765	1.83	1.33	1.56	217
	Killed by predators	180.5	31.81	17.61	55.36	3179	1463	2.17	1.33	1.70	325
	H. malus & others	136.67	11.56	4.92	42.56	574.9	73.51	7.82	1.33	3.20	186
1	Total adults	103.07	40.56	14.13	34.84	5213	546.80	9.53	2.00	4.30	106
	Killed by predators	205.40	12.91	8.50	65.84	1040	303.88	3.42	2.00	2.61	421
	H. malus & others	185.70	9.27	5.56	59.98	328.50	144.51	2.27	2.00	2.12	344
2	Total adults	111.78	41.02	15.78	38.47	6676	660.90	10.10	2.00	4.49	124
	Killed by predators	167.00	19.58	11.00	56.18	2690	387	6.95	2.00	3.70	278
	H. malus & others	189.00	33.06	22.05	66.70	14419	1112	12.97	2.00	5.00	357

TABLE 15 (cont'd)

Sample no.	Stage	$C.V._{\underline{n}}$	$\bar{x}$	S.E.	% S.E.	S_s^2	S_t^2	S_s^2/S_t^2	C_t/C_s	$\underline{n}$	$nt=\frac{(C.V._n)^2}{p}$
3	Total adults	12.30	60.95	10.7	17.54	6380	0	-	2.00	-	-
	Killed by predators	109.20	32.02	11.36	35.48	2294	487.78	4.70	2.00	3.06	119
	H. malus & others	23.54	24.60	7.16	29.11	2454	0.88	2789	2.00	74	5
	Parasitized adults	109.00	1.00	.40	40.00	5.10	.31	17	2.00	5.00	118
4	Total adults	168.15	39.25	21.7	55.28	3197.40	2421.95	1.32	2.00	1.62	282
	Killed by predators	162.92	30.79	16.60	52.21	6572.70	852.99	7.71	2.00	3.92	265
	H. malus & others	229.68	31.27	23.30	74.51	5797	2533	2.28	2.00	2.13	527
5	Total adults	147	19.97	9.56	47.87	704	461.23	1.53	2.00	3.06	216
	Killed by predators	196.72	15.50	9.95	64.19	713.66	504.79	1.41	2.00	1.68	386
	H. malus & others	163.28	6.43	3.38	52.56	147.26	50.11	2.94	2.00	2.42	266

TABLE 16

Inter tree range of densities for all stages and mortalities of *L. ulmi* (L.) on apple, Macdonald College and Ile Bizard Experimental Plots 1963-64.

Stage sampled	x̄ number/tree	Range of densities
	Macdonald 1963	
Total eggs	2339	1195 - 5410
Killed by predators	301.67	126 - 714
H. malus & others	31.17	5 - 125
Total eggs	3233	568 - 4395
Killed by predators	347.33	49 - 780
H. malus & others	37.33	10 - 69
Total larvae 1	1234.83	394 - 2148
Unhatched eggs	280.67	0 - 1044
Total larvae 1	1224	210 - 2024
Killed by predators	352.67	25 - 870
Parasitized L1	6.33	0 - 15
H. malus & others	24.83	2 - 74
Total larvae 1	863.00	208 - 1472
Killed by predators	51.00	17 - 149
Parasitized L1	4.67	3 - 15
H. malus & others	7.33	1 - 13
Total larvae 1	851.17	136 - 1341
Killed by predators	184.00	77 - 452
Parasitized L1	9.17	3 - 24
H. malus & others	8.83	5 - 21
Total larvae 1	649.00	95 - 892
Killed by predators	252.83	66 - 475
Parasitized L1	7.33	0 - 13
H. malus & others	16.67	1 - 47
Total larvae 1	584.67	111 - 826
Killed by predators	191.83	80 - 451
Parasitized L1	8.17	0 - 15
H. malus & others	10.67	1 - 35
Total larvae 2	524.50	143 - 776
Killed by predators	186.50	65 - 292
Parasitized L2	11.67	1 - 26
H. malus & others	15.50	2 - 43

TABLE 16 (cont'd)

Stage sampled	$\bar{x}$ number/tree	Range of densities
Total larvae 2	513.16	172 - 705
Killed by predators	198.83	87 - 463
Parasitized L2	10.00	1 - 27
H. malus & others	10.33	0 - 19
Total larvae 2	635.17	143 - 1091
Killed by predators	199.00	82 - 313
Parasitized L2	19.33	7 - 39
H. malus & others	11.00	2 - 20
Total larvae 2	541.33	156 - 1066
Killed by predators	192.33	96 - 358
Parasitized L2	11.67	0 - 17
H. malus & others	11.83	1 - 27
Total larvae 2	440.33	102 - 764
Killed by predators	141.50	44 - 238
Parasitized L2	8.17	2 - 24
H. malus & others	8.83	4 - 17
Total larvae 2	505.33	91 - 860
Killed by predators	153.33	48 - 266
Parasitized L2	7.17	1 - 19
H. malus & others	9.33	1 - 22
Total adults	343.17	95 - 555
Killed by predators	82.67	37 - 165
Parasitized adults	8.83	1 - 24
H. malus & others	3.83	1 - 11
Total adults	341.67	128 - 537
Killed by predators	81.50	32 - 189
Parasitized adults	8.33	0 - 20
H. malus & others	4.33	0 - 10
	Macdonald 1964	
Total eggs	19150.50	12851 - 25487
Killed by predators	5731.50	1643 - 10254
Parasitized eggs	344.33	136 - 496
A. mytilaspidis	195.16	90 - 256
H. malus & others	233.16	26 - 380

TABLE 16 (cont'd)

Stage sampled	$\bar{x}$ number/tree	Range of densities
Total larvae 1	3588.00	1764 - 5882
Killed by predators	1335.66	459 - 2929
Killed due to desiccation	672.33	261 - 1467
Unhatched eggs	5372.33	1238 - 9225
Total larvae 2	754.83	371 - 1768
Killed by predators	513.50	219 - 1243
Parasitized L2	51.83	8 - 139
A. mytilaspidis	50.67	5 - 138
H. malus & others	19.17	0 - 83
Total larvae 2	350.67	106 - 786
Killed by predators	222.83	47 - 553
Parasitized L2	13.17	1 - 31
A. mytilaspidis	5.17	0 - 15
H. malus & others	11.17	0 - 22
Total adults	146.50	94 - 219
Killed by predators	51.17	23 - 92
Parasitized adults	55.83	30 - 71
A. mytilaspidis	59.00	33 - 77
H. malus & others	21.50	6 - 37
Total adults	152.83	108 - 183
Killed by predators	49.33	28 - 72
Parasitized adults	62.00	48 - 80
A. mytilaspidis	66.17	49 - 87
H. malus & others	18.17	0 - 37
Total adults	105.83	56 - 156
Killed by predators	23.67	3 - 66
Parasitized adults	52.17	27 - 76
A. mytilaspidis	51.83	25 - 77
H. malus & others	17.17	4 - 31
Total adults	172.67	103 - 226
Killed by predators	35.00	10 - 79
Parasitized adults	93.67	55 - 139
A. mytilaspidis	21.00	6 - 56
H. malus & others	250.16	36 - 1181
Total adults	140.50	54 - 209
Killed by predators	53.83	15 - 91
Parasitized adults	72.83	5 - 128
H. malus & others	12.50	2 - 18

TABLE 16 (cont'd)

Stage sampled	$\bar{x}$ number/tree	Range of densities
	Ile Bizard 1964	
Total eggs	36140.67	484 - 137143
Killed by predators	5678.50	149 - 22051
H. malus & others	305.83	2 - 1527
Total larvae 1	7014.33	89 - 18575
Killed by predators	4382.17	26 - 12746
Killed due to desiccation	1185.83	27 - 4026
Total larvae 2	835.0	146 - 2057
Killed by predators	155.0	7 - 488
H. malus & others	35.50	3 - 88
Total larvae 2	654.0	136 - 2042
Killed by predators	254.50	28 - 913
H. malus & others	92.50	12 - 273
Total adults	342.50	117 - 849
Killed by predators	103.33	10 - 438
H. malus & others	74.17	8 - 294
Total adults	328.17	82 - 875
Killed by predators	156.67	10 - 565
H. malus & others	264.50	11 - 1123
Total adults	487.67	182 - 832
Killed by predators	256.17	37 - 666
H. malus & others	196.83	15 - 334
Total adults	246.33	29 - 1138
Killed by predators	314.0	70 - 1172
H. malus & others	250.17	36 - 1181
Total adults	159.83	34 - 525
Killed by predators	124.0	10 - 515
H. malus & others	51.50	11 - 183

34 minutes for second-stage larvae and 32 minutes for adults. Cost ratios C_t/C_s are given in Tables 17 and 18.

3. Calculation of:

a. Optimum number of samples per trees

Cost ratios, along with ratios of inter-tree and intra-tree error variances, S_s^2/S_t^2, were used to calculate the optimum number of samples per tree, $\underline{n} = \sqrt{(S_s^2/S_t^2)(C_t/C_s)}$, needed to minimize cost of collection and examination of stages and mortalities of L. ulmi developing on apple trees of the 35-40 year age class.

b. Optimum number of trees per plot

On the basis of these estimated $\underline{n}$ values and means for all samples, the coefficient of between-tree variation was calculated as $C.V._{\underline{n}} = \frac{100}{\bar{x}}\sqrt{\frac{S_s^2}{\underline{n}} + S_t^2}$ and the number of trees, $\underline{n}_t$, to be sampled for a specified standard error of 10, 20, and 30 per cent precision of the mean, estimated as $\underline{n}_t = \frac{(C.V._{\underline{n}})^2}{p}$ (Table 19).

4. Suggested sampling plan

A suggested sampling plan was derived from the above data (Table 20). This plan indicates that for life table studies of uniform L. ulmi populations, developing at low to medium densities on 35-40 year old apple trees, estimates of absolute population densities having a 10 per cent standard error of the mean, may be obtained by sampling for eggs 8 leaf clusters from 89 trees; for first-stage larvae 4 leaf clusters from 106 trees; second-stage larvae 4 leaf clusters from 108 trees; and for adults, 10 leaf clusters from 37 trees. Individual sampling plans for the Macdonald and Ile Bizard plots are given in

TABLE 17

Estimation of numbers of n 2-cluster samples required to minimize the cost of collection and examination for all stages of *L. ulmi* (L).

Stage	Mean ratio of variance components S_s^2/S_t^2	Cost ratio C_t/C_s	$n = \sqrt{\left(\frac{S_s^2}{S_t^2}\right)\left(\frac{C_t}{C_s}\right)}$
Macdonald 1962-63			
Eggs	303.49	.06	4.26
Larvae 1	2.84	.15	.65
Larvae 2	2.52	.18	.67
Adults	3.45	.21	.85
Macdonald 1963-64			
Eggs	34.91	.16	2.39
Larvae 1	5.19	.20	1.01
Larvae 2	3.55	.90	1.78
Adults	70.18	.85	7.72
Ile Bizard 1963-64			
Eggs	.39	.50	.44
Larvae 1	.90	1.33	1.09
Larvae 2	3.54	1.33	2.16
Adults	5.62	2.00	3.35

TABLE 18

Estimation of numbers of n 2-leaf cluster samples required to minimize cost of collection and examination for L. ulmi (L.) mortalities on apple from predators and parasites, as well as for the predator H. malus and the parasite A. mytilaspidis.

Stage	Mean ratio of variance components s_s^2/s_t^2	Cost ratio C_t/C_s	$n = \sqrt{\left(\frac{s_s^2}{s_t^2}\right)\left(\frac{C_t}{C_s}\right)}$
Macdonald College 1962-63			
Eggs killed by predators	11.93	0.06	.84
H. malus	56.74	0.06	1.84
A. mytilaspidis	26.90	0.06	1.27
L_1 killed by predators	4.68	0.16	.86
Parasitized L_1	-	-	-
H. malus	19.35	0.15	1.70
A. mytilaspidis	-	-	-
L_2 killed by predators	4.43	0.18	.89
Parasitized L_2	15.92	0.17	1.64
H. malus	10.62	0.18	1.38
A. mytilaspidis	15.92	0.17	1.64
Adults killed by predators	1.14	0.21	.48
Parasitized adults	2.87	0.21	.77
H. malus	3.40	0.21	.84
A. mytilaspidis	2.87	0.21	.77
Macdonald College 1963-64			
Eggs killed by predators	2.77	0.16	.66
Parasitized eggs	9.17	0.16	1.21
H. malus	5.47	0.16	.93
A. mytilaspidis	16.12	0.16	1.60

TABLE 18 (cont'd)

Stage	Mean ratio of variance components S_s^2/S_t^2	Cost ratio C_t/C_s	$\underline{n} = \sqrt{\left(\frac{S_s^2}{S_t^2}\right)\left(\frac{C_t}{C_s}\right)}$
L_1 killed by predators	4.00	0.20	.89
Parasitized L_1	-	-	-
_H_. _malus_	-	-	-
_A_. _mytilaspidis_	-	-	-
L_2 killed by predators	3.93	0.90	1.88
Parasitized L_2	6.36	0.90	2.39
_H_. _malus_	63.55	0.90	7.56
_A_. _mytilaspidis_	3.80	0.90	1.84
Adults killed by predators	13.88	0.85	3.35
Parasitized adults	7.72	.89	2.62
_H_. _malus_	10.20	.85	2.94
_A_. _mytilaspidis_	7.72	.89	2.62
Ile Bizard 1963-64			
Eggs killed by predators	0.29	0.50	.38
_H_. _malus_	1.83	0.50	.95
L_1 killed by predators	1.37	1.33	1.35
_H_. _malus_	-	-	-
L_2 killed by predators	2.71	1.33	1.89
_H_. _malus_	4.78	1.33	2.52
Adults killed by predators	1.41	2.00	1.68
_H_. _malus_	2.94	2.00	2.42

TABLE 19

Estimation of numbers of trees required to be sampled for a 10, 20, and 30 per cent standard error of the mean, on the basis of *n* 2-leaf cluster samples for stages and mortalities of *L. ulmi* (L.) on apple.

Stage	No. of samples	No. of trees		
		10%	20%	30%
Macdonald 1962-63 gen.				
Eggs	5	151	37	17
Larvae 1	1	111	27	12
Larvae 2	1	94	24	11
Adults	1	46	12	5
Macdonald 1963-64 gen.				
Eggs	3	26	6	3
Larvae 1	2	101	25	11
Larvae 2	2	122	30	13
Adults	8	27	7	3
Ile Bizard 1963-64 gen.				
Eggs	1	313	78	34
Larvae 1	2	189	47	20
Larvae 2	3	172	43	19
Adults	4	182	45	19

TABLE 19 (cont'd)

Stage	No. of samples		No. of trees	
		10%	20%	30%
MORTALITIES				
Macdonald College 1962-63 gen.				
Eggs killed by predators	1	312	78	34
H. malus	2	721	180	80
A. mytilaspidis	2	169	36	16
Larvae 1 killed by predators	1	268	66	29
Parasitized Larvae 1	-	-	-	-
H. malus	2	363	92	40
A. mytilaspidis	-	-	-	-
Larvae 2 killed by predators	1	124	30	13
Parasitized Larvae 2	2	243	60	26
H. malus	2	201	50	21
A. mytilaspidis	2	243	60	26
Adults killed by predators	1	105	21	11
Parasitized adults	1	338	84	37
H. malus	1	278	69	30
A. mytilaspidis	1	338	84	37
Macdonald College 1963-64 gen.				
Eggs killed by predators	1	111	27	12
Parasitized eggs	2	51	12	5
H. malus	1	134	33	14
A. mytilaspidis	2	45	11	5
Larvae 1 killed by predators	1	157	39	17
Parasitized Larvae 1	-	-	-	-
H. malus	-	-	-	-
A. mytilaspidis	-	-	-	-

TABLE 19 (cont'd)

Stage	No. of samples	No. of trees		
		10%	20%	30%
Larvae 2 killed by predators	2	146	36	16
Parasitized Larvae 2	3	200	49	21
H. malus	7	157	39	16
A. mytilaspidis	2	245	61	27
Adults killed by predators	4	115	28	12
Parasitized adults	3	53	13	5
H. malus	3	63	13	6
A. mytilaspidis	3	260	65	28
Ile Bizard 1963-64 gen.				
Eggs killed by predators	1	384	96	42
H. malus	1	909	227	101
Larvae 1 killed by predators	2	236	58	26
H. malus	-			
Larvae 2 killed by predators	2	294	73	32
H. malus	3	217	54	24
Adults killed by predators	2	293	73	32
H. malus	3	299	73	33

TABLE 20

Suggested sampling plan for life-table studies of L. ulmi (L.) based on counts obtained in the Macdonald College, Quebec, apple orchard for the 1962-63 and 1963-64 generations.

Stage	No. of clusters per tree	No. of trees for a S. E. of		
		10%	20%	30%
Eggs	8	89	22	10
Larvae 1	4	106	26	12
Larvae 2	4	108	27	12
Adults	10	37	10	4

Table 19. For higher and lower L. ulmi density estimates upward or lower revisions of numbers of samples and trees required for the same precision would have to be made.

F. LIFE TABLES

1. Introduction

The technique followed in the development of life tables for the Oystershell scale on apple in the Macdonald College and Ile Bizard experimental plots was essentially that used by Morris and Miller (1954).

Deevey (1947) reviewed the early development and use of life tables and was the first worker to apply the technique to the study of natural populations. His approach, however, lacked sophistication and the tables he developed were of only limited usefulness to subsequent population studies. Morris and Miller (1954) in their pioneering work on epidemic populations of the Spruce budworm, Choristoneura fumiferana (Clem.), revised the life table approach and formulated a number of fundamental requirements to the technique, notably, (a) the universe for which the life table is prepared should be homogeneous; (b) sampling should be timed in relation to the life history of the insect; (c) accuracy and precision must be maintained in the collection of sampling date; (d) confidence limits should be established for means of samples; and (e) the life table should be a reliable indicator of the basic data on population, fecundity, and mortality factors. The technique as proposed by Morris (1954) has since been used to study successfully the dynamics of a number of forest, orchard and field pests (Stark, 1958, 1959; Kiritani and Hokyo, 1962; Harcourt, 1963; Pottinger, 1964; Paradis and LeRoux, 1965).

Morris (1959) further modified the technique used mainly in the identification of 'key' mortalities involved in population changes from generation to generation and in the prediction of these changes. Varley and Gradwell (1960) suggested a similar modification which provided for the graphical representation of effects of estimated mortalities ('k' values) on variation in total mortality (K). These methods, however, do not improve (Paradis and LeRoux, 1965) the precision obtained in the determination of 'key' factors for population data collected by means of the life table approach Morris and Miller (1954) and Morris (1955, 1957, 1959) and the examination of survival ratios by means of correlation coefficient analysis (Watt, 1961, 1962). Holling (1963) has since suggested that the experimental component analysis method be coupled to the life-table approach for a more detailed explanation of the causes of population fluctuations.

2. Nature of life tables

The following columns proposed by Morris *et al*. (1963) were used in the development of life tables for *L. ulmi* on apple.

x	age interval
N_x	number alive at the beginning of each age interval
M_xF	causative mortality factor within the age interval
M_x	number dying with the age interval
100M/N	M_x as a percentage of N_x
S_x	survival rate within x
N_2	number of eggs observed in the next generation

A total of 81 life tables (Appendix Part 1), 62 for quadrants, 16 for trees, and 3 for plots, were developed on the basis of sampling data obtained for two consecutive generations (1963-1964) of L. ulmi in the Macdonald College apple orchard and one generation (1964) in the Ile Bizard apple orchard. Each life table covered four age intervals, notably, eggs, first- and second-stage larvae and adults. Quantitative estimates of each stage, and of factors causing mortality within the stage, provided the basic data for the construction of life tables.

Actual eggs were determined by direct population sampling at the beginning of each generation, and expected eggs determined as the number of 'normal' females multiplied by 64, the mean number of eggs laid by a normal female. Mean eggs per female in each generation was obtained by counting the number of eggs deposited under 25 scales (Table 4).

To determine the number of 'normal' females in each generation (see life table for Quadrant 1N, tree No. 1 Macdonald College, 1964) the number of females present at the end of the generation prior to egg laying, in this case 2.3 was multiplied by 64, the mean number of eggs known to be deposited by a normal female. In Quadrant 1N, however, each female laid only 30.11 eggs. Therefore the 2.3 females are not normal, they are only $(\frac{30.11}{64})$ normal. The reduction due to reduced fecundity (a mortality factor) is $(\frac{64 - 30.11}{64})$ X 2.3 or 1.22. Hence the number of normal females for table 1N = 2.3 - 1.22 = 1.08 and expected eggs for 1N Quadrant was 1.08 X 64 = 69.12. When eggs were counted in this quadrant at the beginning of the N_2 generation the mean number obtained per female was 31.33 which constitutes a further adult female mortality of

$$(\text{i.e. } \frac{\text{Expected eggs - Actual eggs}}{\text{Expected eggs}} \text{ X } 100) = 54.67\%$$

In this quadrant then the number of females that actually oviposited was 0.49.

The Index of population trend (I) was calculated as follows:

$$I = \frac{N_2 \text{ eggs per two leaf clusters}}{N_1 \text{ eggs per two leaf clusters}} \text{ X } 100$$

N_2 = number of eggs observed in following generation

N_1 = number of eggs in the present generation

3. Survival ratios

Watt (1961, 1962) recognized the need to examine possible effects of survival ratios on population trend from data obtained in life tables and proposed a mathematical model for this purpose. Inherent in the application of the model is the use of correlation coefficient analysis. For L. ulmi the following equation is applicable:

$$I = S_E \; S_{L1} \; S_{L2} \; S_{A1} \; S_{A2} \; F$$

I	index of population trend in a given generation
S_E	survival of eggs to eclosion (number of first-stage larvae/ number of eggs)
S_{L1}	survival of first-stage larvae (number of second-stage larvae/number of first-stage larvae)
S_{L2}	survival of second-stage larvae (number of adults/ number of second-stage larvae)
S_{A1}	survival of adults (number of actual eggs/number of expected eggs)
S_{A2}	proportion of ovipositing adults (ovipositing adults/adults)
F	the mean fecundity per female

In the analysis the different survival ratios were considered as independent variables and the index of population trend as the dependent variable. Values for each age interval in relation to trend were calculated as follows:

$$r^2YX = \frac{(\Sigma XY - \frac{\Sigma X \Sigma Y}{\underline{n}})^2}{(\Sigma X^2 - \frac{(\Sigma X)^2}{\underline{n}})(\Sigma Y^2 - \frac{(\Sigma Y)^2}{\underline{n}})}$$

where,

r^2 is the correlation coefficient squared,

X the survival ratio of each age interval,

Y the trend index and

$\underline{n}$ the number of replicates (number of life tables).

The correlation coefficient (r) values were then tested for significance using the formula for 't' given by Steel and Torrie (1960), i.e. :

$$t = \frac{r}{\sqrt{(1 - r^2)/(\underline{n} - 2)}}$$

The 't'-values and the ratios used are given in Tables 21 to 23.

4. Interpretation of life table data

To facilitate interpretation of life table data obtained on populations of L. ulmi at Macdonald College, 1963-64, and at Ile Bizard, 1964, mean life tables - pooled from Quadrant tables per generation per plot - were prepared (Tables 24 to 26). From these tables it was seen that L. ulmi generation mortalities, 1963 to 1964, ranged from 96.44 to 99.97 per cent - accounting for population increases (Macdonald College, 1964) when below the L. ulmi constant mortality

TABLE 21

Correlation between the index of population trend and the survival ratios within each age interval for the 1962-63 generation of *L. ulmi* (L.) Macdonald College, Quebec.

Quadrants	$\frac{\text{Larvae 1}}{\text{Eggs}}$	$\frac{\text{Larvae 2}}{\text{Larvae 1}}$	$\frac{\text{Adults}}{\text{Larvae 2}}$	Oviposi- $\frac{\text{ting♀♀}}{\text{Adults}}$	Potential eggs per	Actual $\frac{\text{eggs}}{\text{Expected eggs}}$	Trend Index	Generation Survival
N	.476	.445	.368	.059	64	22.744	6.731	.0046
S	.739	.557	.406	.367	64	16.168	63.546	.0614
E	.307	.384	1.134	.489	64	1.150	4.797	.0651
W	.821	.562	.469	.094	64	9.487	12.358	.0203
N	.996	1.099	.820	.439	64	1.099	27.738	.3943
S	.633	.832	1.083	.440	64	.223	3.584	.2512
E	.491	.490	.721	.364	64	1.561	6.308	.0631
W	.178	.581	.815	.441	64	1.481	3.534	.0372
N	.615	.562	.623	.055	64	.933	2.103	.0117
S	.246	.738	.444	.153	64	.236	.792	.0123
E	.313	.599	.324	.437	64	1.452	2.451	.0263
W	.323	.893	.703	.361	64	4.108	19.214	.0730
N	.281	.424	.883	.399	64	2.627	7.068	.0420
S	.409	.484	.675	.148	64	6.935	8.741	.0196
E	.338	.744	.358	.316	64	4.095	7.472	.0285
W	.146	.512	.577	.246	64	1.739	1.183	.0106
N	.095	.575	.801	.588	64	1.532	2.512	.0256
S	.199	.452	.273	.375	64	10.803	6.345	.0091
E	1.357	.098	1.244	.445	64	5.742	27.166	.0739
W	.271	.740	.661	.235	64	6.443	12.827	.0311
N	.095	.835	.507	.264	64	15.216	10.295	.0105
S	.459	.655	1.342	.181	64	6.763	31.671	.0731
E	.312	.600	.869	.196	64	7.126	15.202	.0319
W	.214	.814	.716	.248	64	6.061	11.913	.0309
Correlation coefficient	.512	.579	.142	.090	-	.400	-	.270
t values	2.7978*	3.3276**	0.7474	.3863		2.0513		1.0098

* Significance at the 5% level for r = .404; ** Significance at the 1% level for r = .515; t = 2.819 at the 1% level of significance.

TABLE 22

Correlation between the index of population trend and the survival ratios within each age interval for the 1963-64 generation of *L. ulmi* (L.) Macdonald College, Quebec.

Quadrants	Larvae 1 / Larvae 2	Larvae 2 / Larvae 1	Adults / Nymphs 2	Ovipositing♀♀ / Adults	Potential eggs per	Actual eggs / Expected eggs	Trend Index	Generation Survival
N	.243	.064	.178	.045	64	.453	.008	.0001
S	.022	.081	.120	.059	64	1.021	.008	.0001
E	.101	.415	.127	.006	64	2.058	.004	.00003
W	.159	.268	.405	.081	64	.938	.089	.0010
N	.101	.060	.865	.053	64	1.125	.020	.0002
S	.908	.107	.160	.068	64	.447	.069	.0010
E	.270	.028	.343	.089	64	.769	.015	.0002
W	.156	.170	.211	.018	64	.228	.007	.0001
N	.248	.090	.359	.030	64	.496	.016	.0002
S	.309	.186	.912	.191	64	1.108	.710	.0100
E	.190	.117	.255	.003	64	.024	.001	.00001
W	.018	.286	.549	.091	64	.446	.016	.0003
N	.008	.565	.658	.021	64	.186	.002	.0001
S	.134	.040	.835	.020	64	.964	.006	.0001
E	.085	.217	.340	.031	64	.466	.012	.0002
W	.149	.207	.170	.051	64	.664	.005	.0001
N	.073	.152	.221	.006	64	2.121	.003	.00001
S	.265	.166	.160	.019	64	.546	.009	.0001
E	.134	.301	.070	.032	64	.521	.006	.0001
W	.151	.268	.193	.017	64	.205	.008	.0001
N	.097	.187	.274	.049	64	.967	.016	.0002
S	.087	.065	1.717	.020	64	.992	.013	.0002
E	.056	.437	.336	.044	64	.539	.023	.0004
W	.163	.052	1.420	.001	64	1.139	.013	.00002
Correlation coefficient	0.237	0.007	0.227	0.811	-	.134	-	.0082
t values	1.1304	.0104	1.0913	6.5403**	-	.6351	-	0.4225

** Significance at the 1 per cent level for r = .515
t = 2.819 at the 1% level of significance.

TABLE 23

Correlation between the index of population trend and the survival ratios within each age interval for the 1963-64 generation of L. ulmi (L.) Ile Bizard, Quebec.

Quadrants	Larvae 1 / Eggs	Larvae 2 / Larvae 1	Adults / Nymphs 2	Ovipositing♀♀ / Adults	Potential eggs per	Actual eggs / Expected eggs	Trend Index	Generation Survival
N	.166	.066	.175	.058	64	.199	.004	.0001
S	.075	.058	.454	.006	64	.903	.025	.00001
E	.079	.028	.773	.126	64	.625	.014	.0002
W	.112	.032	.361	.047	64	.289	.004	.0001
N	.220	.022	.523	.014	64	.124	.002	.00004
S	.513	.169	.819	.026	64	.123	.075	.0018
E	.171	.205	.137	.033	64	.362	.010	.0002
W	.135	.317	.341	.003	64	.040	.002	.0001
N	.193	0.526	.151	.003	64	.040	.003	.0001
S	1.048	0.028	.888	.019	64	.115	.032	.0005
E	0.194	0.042	.153	.138	64	.272	.011	.0002
W	0.056	0.180	2.265	.042	64	.250	.061	.0010
N	.271	.358	.525	.144	64	.461	.466	.0073
S								
E								
W								
N								
S								
E								
W								
N	.203	.320	1.298	.147	64	.653	.792	.0124
S								
E								
W								
Correlation coefficient	0.015	0.418	0.333	0.633*		0.416	-	0.840**
t values	.052	1.5954	1.2242	2.8008		1.5878	-	5.3503

** Significance at the 1% level for $r = 0.661$; * Significance at the 5% level for $r = 0.532$; $t = 3.055$ at the 1% level of significance.

rate of 98.44 per cent, and decreases (Macdonald College and Ile Bizard, 1965) when above.

Survival within each age-interval of each generation is illustrated in Figure 10 in histogram form. Within these intervals, the percentage number of hosts killed by H. malus - most important mortality factor acting in any generation - was:

	Macdonald College 1963	Macdonald College 1964	Ile Bizard 1964
Eggs	71	83	85
First-stage larvae	20	36	63
Second-stage larvae	33	66	32
Adults	29	24	63

and the percentage killed by A. mytilaspidis - the next most important factor - being:

	Macdonald College 1963	Macdonald College 1964	Ile Bizard 1964
Eggs	0	1.41	-
First-stage larvae	-	-	-
Second-stage larvae	2.29	6	-
Adults	2.58	47	-

H. malus and A. mytilaspidis mortalities, based on mean numbers of L. ulmi killed per two leaf clusters, from May to September (Figs. 11 and 12), were positively correlated with host densities in both plots, 1964, being higher in the egg and adult stages and lower in the larval stages. For these factors at Macdonald College, 1964, percentage predation was high (Fig. 13) when parasitism was low and vice versa. At Ile Bizard only traces of A. mytilaspidis were obtained.

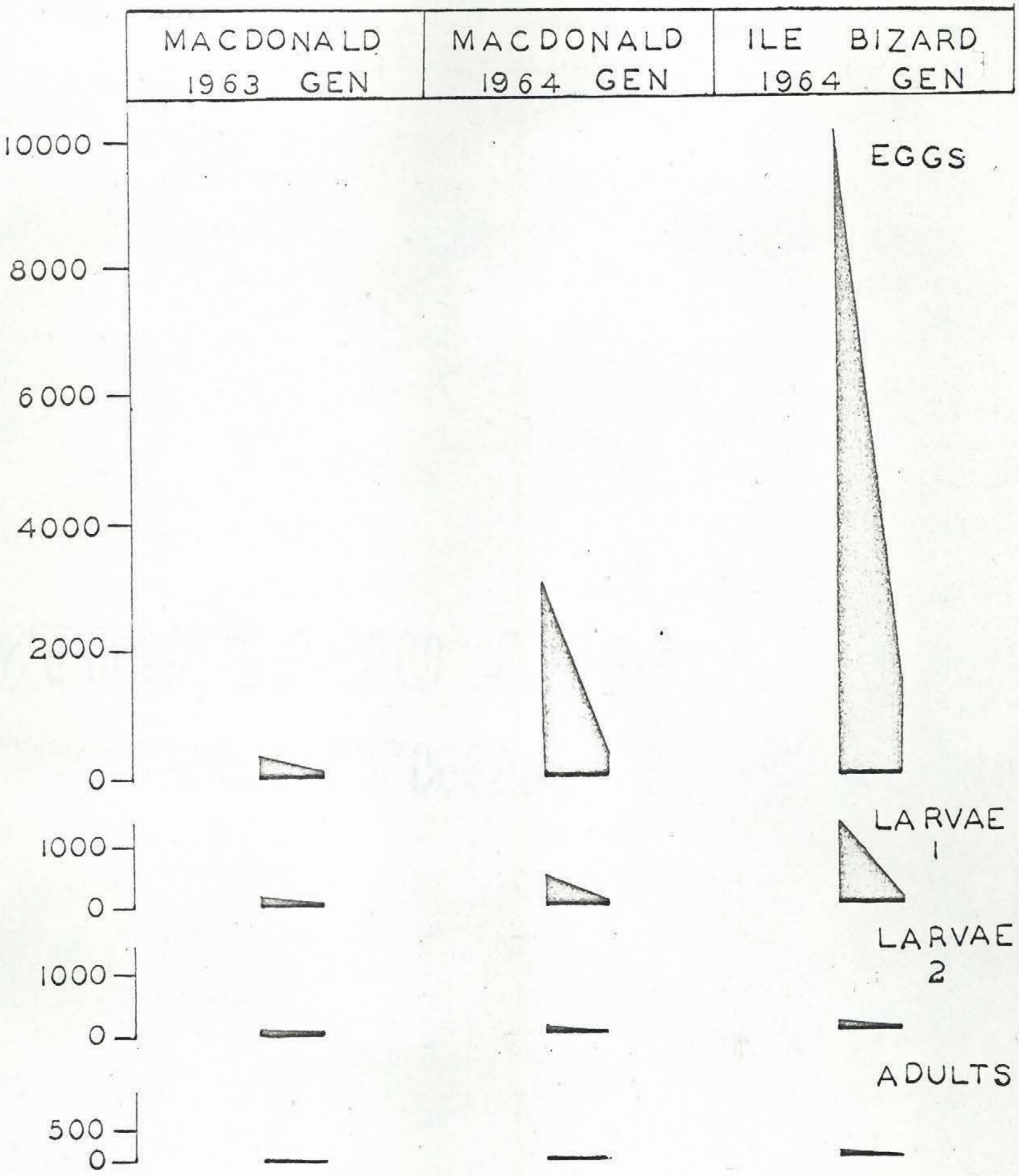


Fig. 10. Histograms indicating survival within each age interval of L. ulmi in two generations Macdonald College Que. 1963-64 and in one generation Ile Bizard Que. 1964.

Fig. 11. Histograms indicating mean L. ulmi numbers and mortalities obtained for two leaf clusters at Ile Bizard, Quebec, for the period May to September 1964.

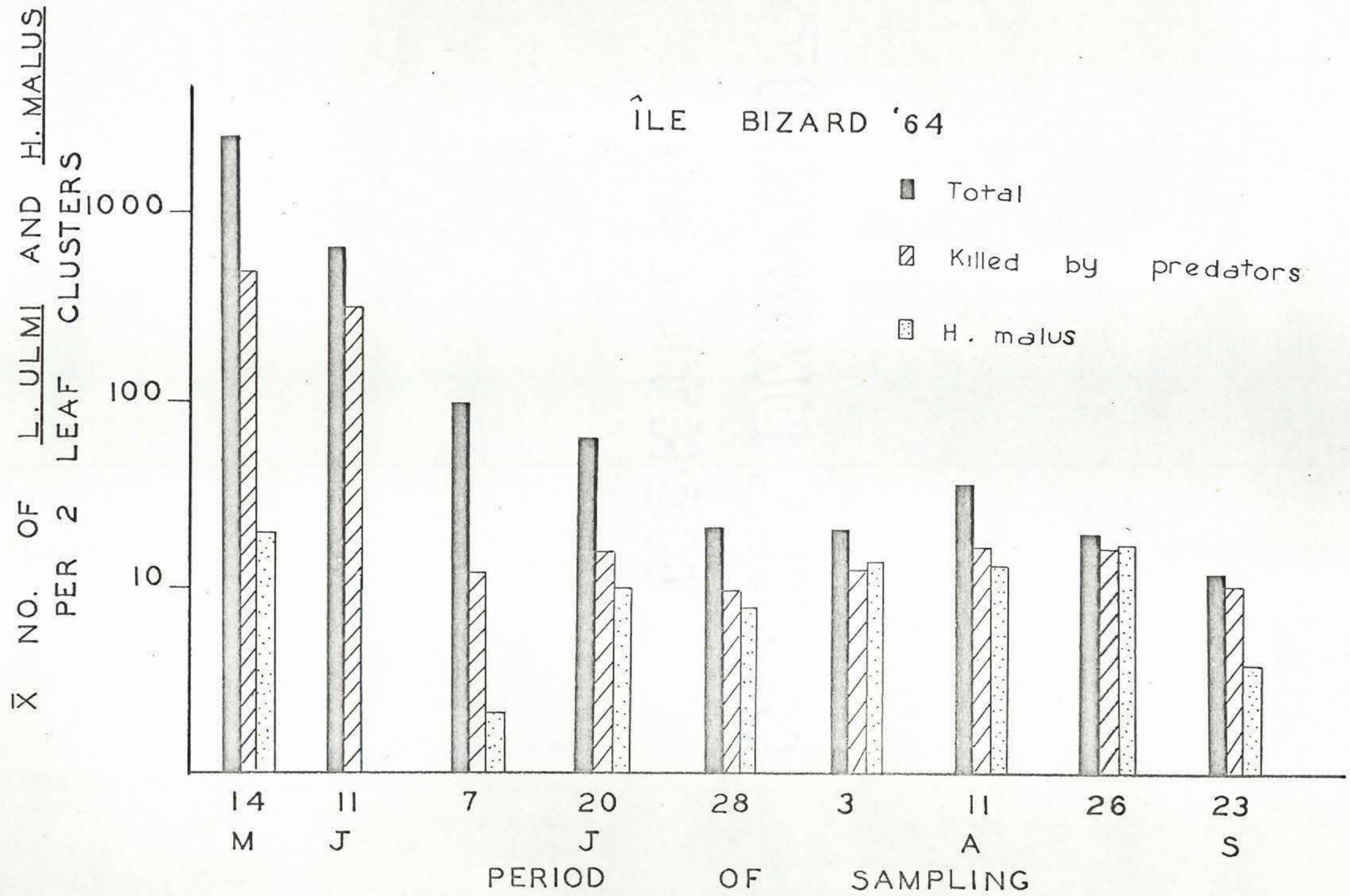
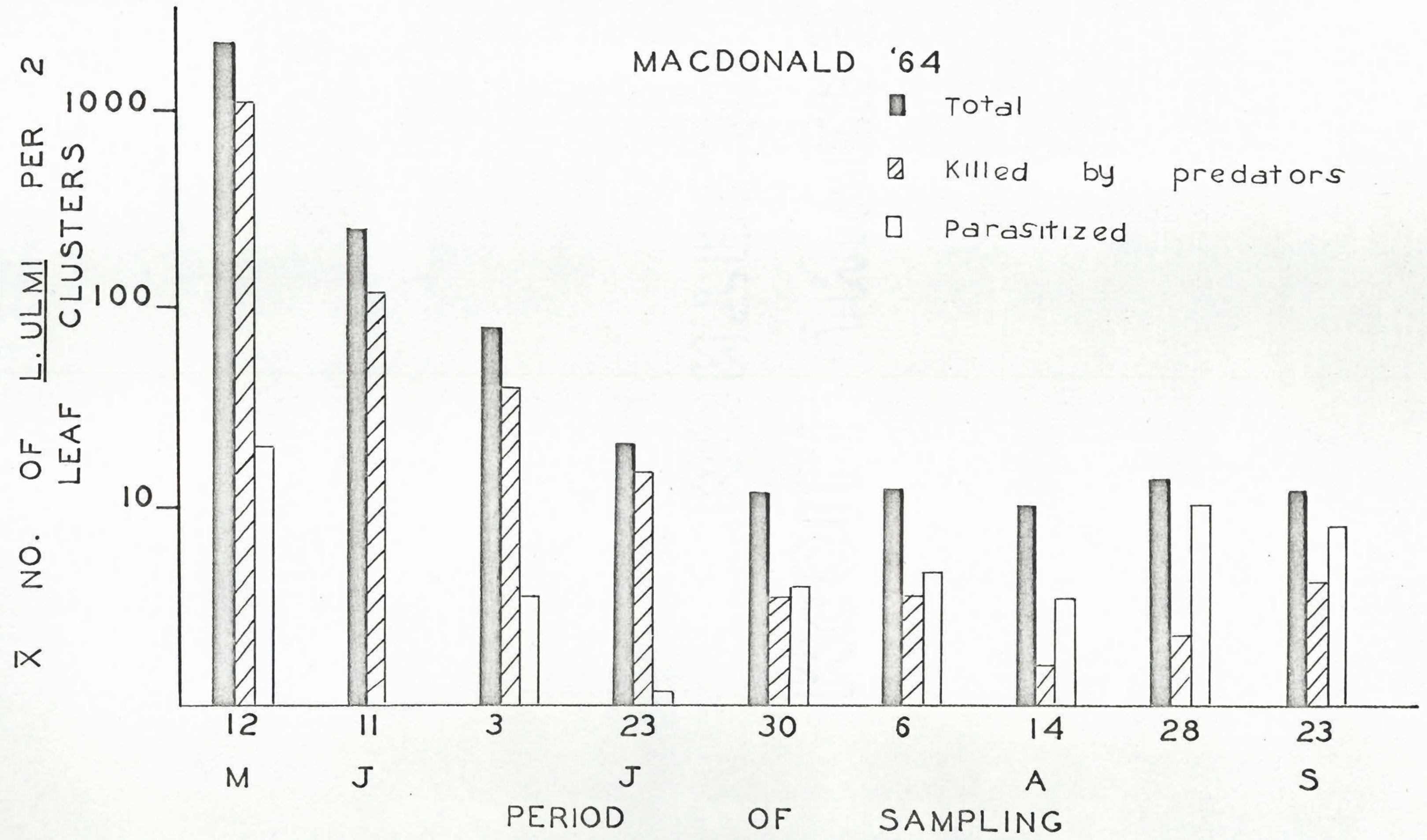

ÎLE BIZARD '64
Total
Killed by predators
H. malus
X̄ NO. OF L. ULMI AND H. MALUS PER 2 LEAF CLUSTERS
1000
100
10
14
M
11
J
7
20
J
28
3
11
A
26
23
S
PERIOD OF SAMPLING

Fig. 12. Histograms indicating mean L. ulmi numbers and mortalities obtained per two leaf clusters at Macdonald College, Quebec, for the period May to September 1964.


MACDONALD '64
▮ Total
▨ Killed by predators
☐ Parasitized
X̄ NO. OF L. ULMI PER 2 LEAF CLUSTERS
1000
100
10
12
11
3
23
30
6
14
28
23
M
J
J
A
S
PERIOD OF SAMPLING

Additional checks made from Quadrant life tables (actual eggs over expected eggs) confirmed that the action of predators and parasites on eggs and adults resulted in marked L. ulmi generation losses. Survivorship curves (Fig. 14) and mortality curves (Fig. 15) for each generation illustrate further, graphically, the positive correlation that exists between predators, parasites and L. ulmi host densities.

Combined desiccation and frost mortalities were low for eggs, and desiccation mortalities alone somewhat higher for first-stage larvae. Percentage mortalities for these factors are as follows:

		Macdonald College		Ile Bizard
		1963	1964	1964
Desiccation + Frost	Eggs	0	0.63	0.31
Desiccation	First-stage larvae	0	18	17

The relative absence of these mortalities in the egg stage is likely due to the protection afforded eggs by the parent scale covering against extremes in temperature. Webster (1915) reports that in the field eggs of L. ulmi can withstand winter temperatures of up to -31°F. The higher desiccation mortalities recorded for first-stage larvae appear to result from overcrowding and competition for feeding sites (fluid source) at emergence.

Percentage mortalities for predators and parasites within L. ulmi age intervals were extremely variable (Table 27) ranging for predators from 13-91 (eggs, Macdonald '63) and for parasites from 27-67 (adults, Macdonald '64). The range for all other mortalities was considerably less variable. According to Morris (1957) variation

Fig. 13. Survivorship curves for the 1963-64 _L_. _ulmi_ populations at Macdonald College and Ile Bizard, Quebec, experimental plots.

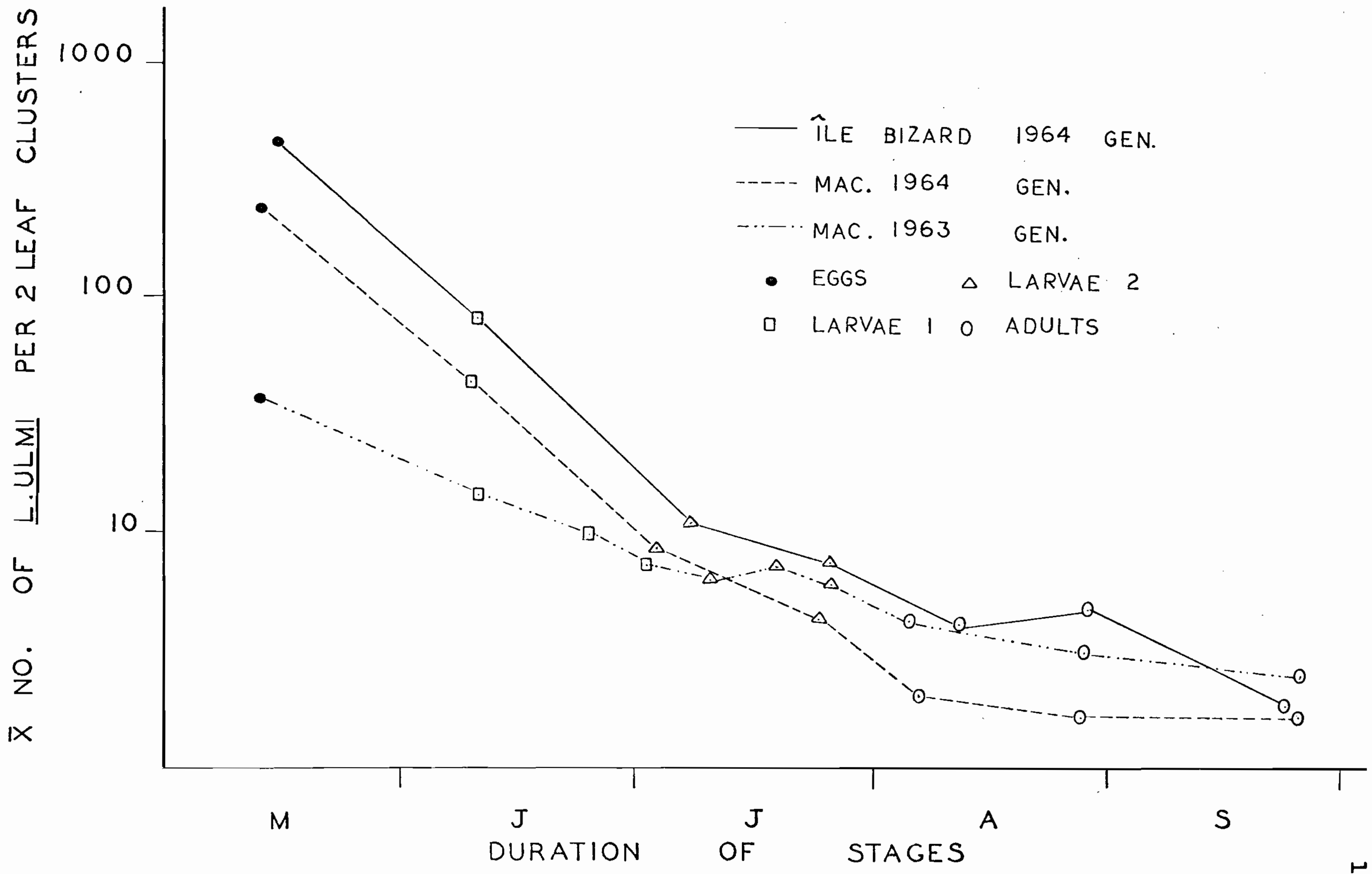
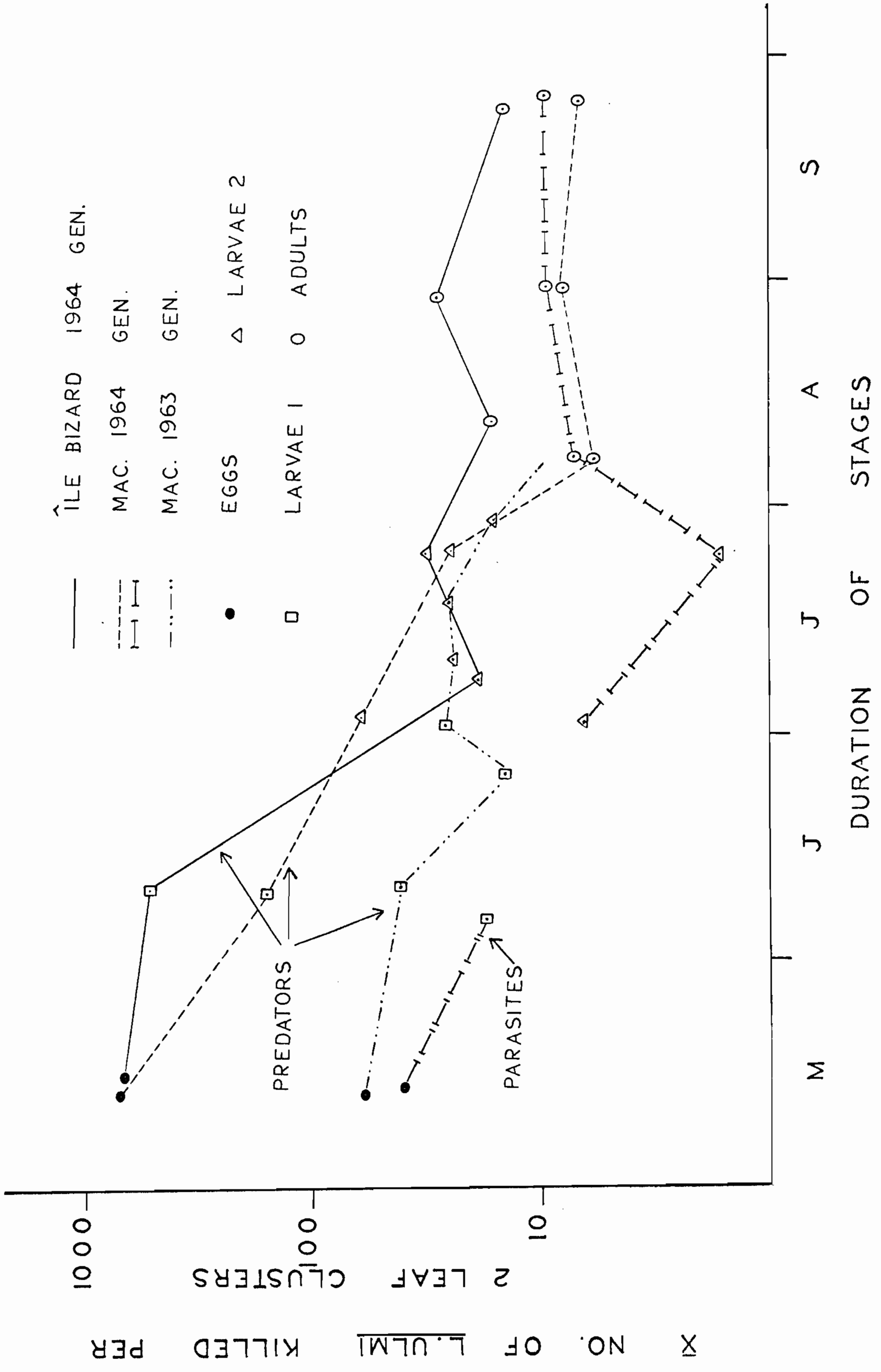

X̄ NO. OF L. ULMI PER 2 LEAF CLUSTERS
1000
100
10
M
J
J
A
S
DURATION OF STAGES
ÎLE BIZARD 1964 GEN.
MAC. 1964 GEN.
MAC. 1963 GEN.
EGGS
LARVAE 2
LARVAE 1
ADULTS

Fig. 14. Mortality curves for the 1963-64 *L. ulmi* populations at Macdonald College and Ile Bizard, Quebec, experimental plots.


ÎLE BIZARD 1964 GEN.
MAC. 1964 GEN.
MAC. 1963 GEN.
● EGGS
□ LARVAE I
△ LARVAE 2
○ ADULTS
PREDATORS
PARASITES
1000
100
10
X NO. OF L. ULMI KILLED PER 2 LEAF CLUSTERS
M
J
J
A
S
DURATION OF STAGES

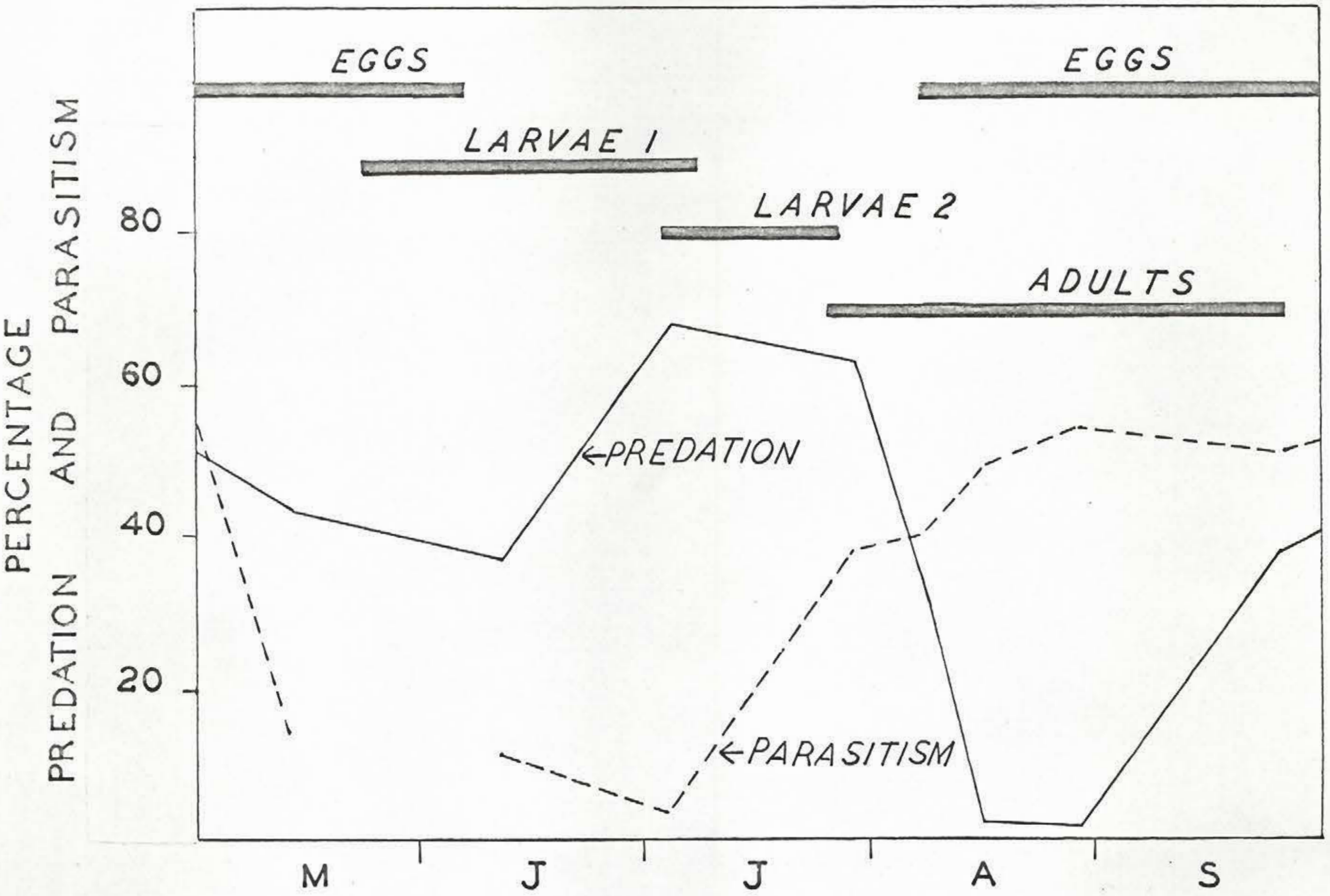
is an important attribute of mortality - an attribute shown in subsequent studies to be an integral part of 'key' factors for a number of orchard species (LeRoux, Paradis and Hudon, 1963; Paradis and LeRoux, 196S; Pottinger, 1964). Correlation coefficient analyses of survival ratios (Tables 21 to 23), based on quadrant life tables, revealed that at Macdonald College. 1962-63, eggs and first-stage larvae accounted for a significant 51 and 58 per cent of the variance on trend, respectively, and that at Ile Bizard and Macdonald College, 1963-64, ovipositing adults alone accounted for a significant 63 and 81 per cent, respectively, of the variance. The magnitude of the variance for this age interval at Ile Bizard is further illustrated by a significant 84 per cent correlation with trend obtained for generation survival when this and other age intervals were combined. Generally for all populations, it was observed that changes in numbers of ovipositing females resulted in sharp increases and decreases in the number of eggs laid per plot, which in turn had a significant effect on trend.

For the above age intervals the predator H. malus and the parasite A. mytilaspidis, combined, were determined to be the 'key' factor at Macdonald College and H. malus alone at Ile Bizard. The high levels at which these mortalities operated and their great variability explain for the most part their importance on trend index.

Flanders (1965) discusses the host-regulating capacity of parasite species, with specific reference to the black scale, Saissetia oleae (Bernard) and Andrewartha and Birch (1954), Thompson (1956), and Milne (1957), stress the importance of parasites and predators on population regulation. The above conclusions on the effect of predators and parasites on population trend of L. ulmi are based on the careful analysis of a vast amount of quantitative data for this species. On the basis of this evidence the conclusions reached by Smirnov and Polejaeff (1934), can only be accepted with reservation. The fact that populations at Macdonald College and Ile Bizard show a decrease in trend indicate that they are in phase, on apple in this area, and are likely to remain at endemic levels for some years to come.

Fig. 15. Percentage predation and parasitism in relation to host development, for all stages of *L. ulmi* developing on apple at Macdonald College and Ile Bizard, Quebec, experimental plots.

MAC. 1964



ÎLE BIZARD

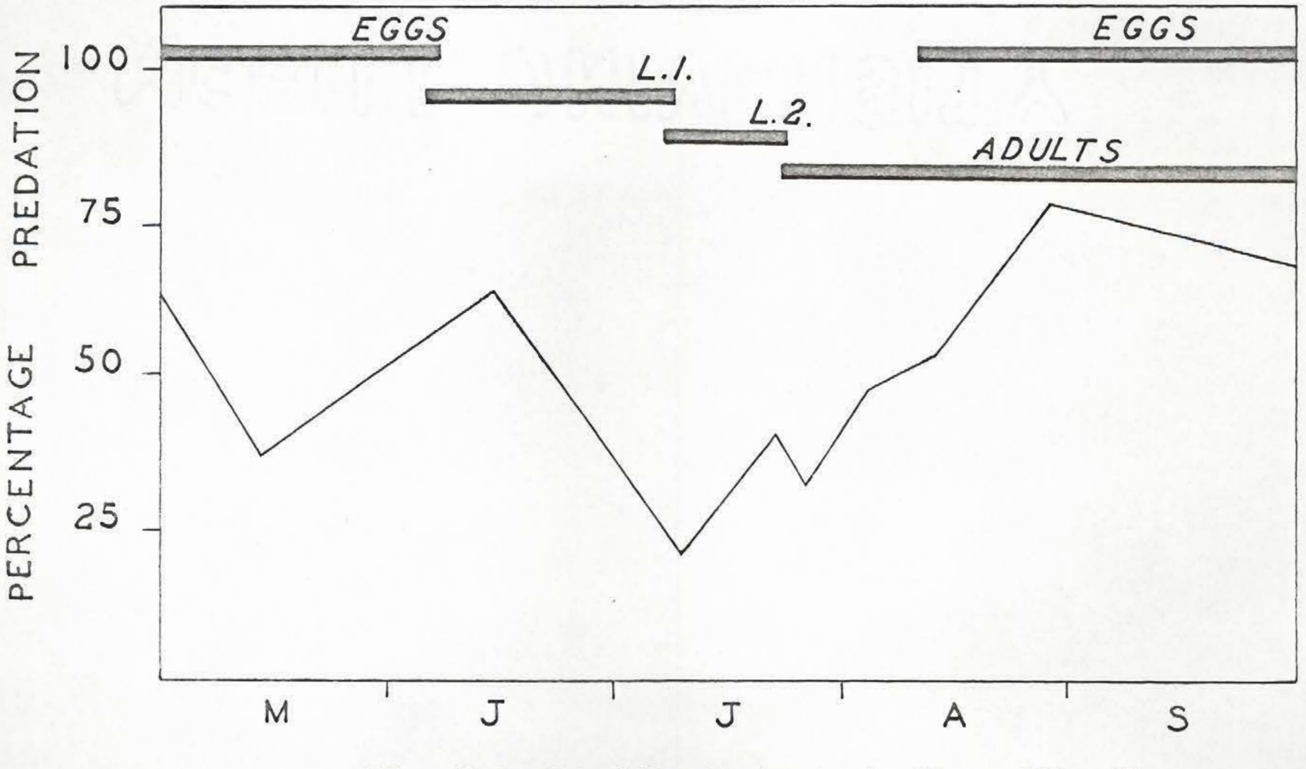


TABLE 24

Mean life table for the 1962-63 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in the Macdonald College Experimental plot.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	392.08	Predators	277.48	70.77	70.77	
		'Others'	-(-6.34)	-(-1.61)	-(-1.61)	0.308
Larvae 1	120.94	Predators	25.38	20.99	6.47	
		'Others'	29.97	24.78	7.64	0.542
Larvae 2	65.59	Predators	22.05	33.62	5.62	
		Parasites	1.50	2.29	0.38	0.651
		'Others'	-(-0.67)	-(-1.02)	-(-0.17)	
Adults (♀♀)	42.71	Predators	10.35	24.23	2.64	
		Parasites	1.10	2.58	0.28	
Females	31.26	Red. fec.	15.91	50.90	4.06	0.326
'Normal' ♀♀	15.35	♀♀ mortality	1.42	9.25	0.36	
Ovipositing ♀♀	13.93					
Generation			378.15	96.44	96.44	0.0355

Expected eggs		982.77
Actual eggs (N_2)		2386.31
Index of population trend:	Expected	250.65%
	Actual	608.62%
Constant mortality rate		98.44%

TABLE 25

Mean life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in the Macdonald College, Quebec Experimental plot.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	3065.25	Predators	2554.22	83.33	83.33	
		Parasites	43.16	1.41	1.41	
		'Others'	19.37	0.63	0.63	0.146
Larvae 1	448.50	Predators	164.52	36.68	5.37	
		Desiccation	81.12	18.09	2.64	
		'Others'	133.76	29.82	4.36	0.154
Larvae 2	69.10	Predators	46.15	66.79	1.51	
		Parasites	4.02	5.82	0.13	
		'Others'	0.88	1.27	0.03	0.261
Adults (♀♀)	18.05	Predators	5.33	29.36	0.17	
		Parasites	8.41	46.93	0.28	
Females	4.28	Red. fec.	2.97	69.39	0.10	0.045
'Normal' ♀♀	1.31	♀♀ mortality	0.49	37.40	0.01	
Ovipositing ♀♀	0.82					
Generation			3064.43	99.97	99.97	0.0003

Expected eggs	100.91
Actual eggs (N_2)	56.25
Index of population trend: Expected	3.29%
Actual	1.84%
Constant mortality rate	98.44%

TABLE 26

Mean life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in the Ile Bizard, Quebec Experimental plot.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	10102.73	Predators	8635.07	85.47	85.31	
		'Others'	31.18	0.31	0.31	0.142
Larvae 1	1436.48	Predators	911.29	63.44	9.02	
		Desiccation	245.17	17.07	2.43	
		'Others'	144.20	10.04	1.43	0.095
Larvae 2	135.82	Predators	44.71	32.92	0.44	
		'Others'	36.31	26.73	0.36	0.403
Adults (♀♀)	54.80	Predators	34.43	62.83	0.34	0.039
Females	20.37	Red. fec.	12.10	59.40	0.12	
'Normal' ♀♀	8.27	♀♀ mortality	6.12	74.00	0.06	
Ovipositing ♀♀	2.15					
Generation			10100.58	99.98	99.98	0.0002

Expected eggs	528.97
Actual eggs (N_2)	159.45
Index of population trend: Expected	5.24%
Actual	1.58%
Constant mortality rate	98.44%

TABLE 27

Range in L. ulmi (L.) mortalities, number and percentage per two-leaf clusters, due to different factors in each of four age intervals on apple, Macdonald College and Ile Bizard experimental plots, 1963-64.

		Macdonald 1963		Macdonald 1964		Ile Bizard 1964	
				Per 2-leaf Clusters			
Stages	Mortality factor MxF	Numbers	%	Numbers	%	Numbers	%
Eggs	Predators	13.25 - 1215.45	13 - 91	356 - 6288.50	50 - 98	311.11 - 26189.50	45 - 92
	Parasites	-	-	6 - 95	.51 - 3	-	-
Larvae 1	Predators	2.60 - 65.00	7 - 71	11 - 720	8 - 57	20 - 2496	20 - 72
	Desiccation	-	-	4 - 332	7 - 34	11 - 679	1 - 35
Larvae 2	Predators	5.33 - 61.64	9 - 63	5.50 - 154.75	35 - 85	2.75 - 131	3 - 40
	Parasites	0.16 - 4.58	.88 - 7	.20 - 17.50	.52 - 12	-	-
Adults	Predators	1 - 29.50	11 - 82	1.50 - 14.30	13 - 55	2.30 - 151.0	24 - 86
	Parasites	0 - 4.75	0 - 13	2.0 - 16.90	29 - 67	-	
	Red. Fecundity	1.61 - 53.80	20 - 80	0.10 - 10.43	23 - 93	1.54 - 25.25	28 - 86
	Female Mortality	-		.003 - 2.26	.71 - 98	2.10 - 22.10	35 - 96

VI SUMMARY AND CONCLUSIONS

Data on the life history of the Oyster shell scale on apple at Macdonald College and Ile Bizard, Quebec, showed that in this province L. ulmi has only one generation a year, consisting of four stages: the egg, two larval stages and the adult. The egg stage (overwintering stage) lasts from late August to May; first-stage larvae, the 'crawler' stage, from early May to mid June; second-stage larvae from mid June to late July and the adults from early August to late September. All stages except first-stage larvae are quiescent.

Males were not present in the populations studied, since, under Quebec conditions L. ulmi is exclusively parthenogenetic. Nor were males present on twigs and leaf clusters examined from other apple growing regions of Canada.

Morphological characters of each stage of L. ulmi, known to be typical for this species, were checked in the two populations studied and compared with those of respective stages obtained from other apple growing regions of Canada. To this end detailed descriptions and figures for each stage of the species, not previously given for apple are presented.

In the experimental orchards, population of the scale ranged from low (approximately 292 eggs per two leaf clusters) to medium (2394 to 4718 eggs per two leaf clusters) densities - the endemic to epidemic population levels, respectively, for L. ulmi in these plots.

The development of sampling techniques was greatly facilitated by the generally quiescent nature of L. ulmi, the uniform distribution of its stages within trees, and the confinement of the stages, at low to medium densities, to the wood of leaf clusters. Accordingly, the leaf cluster proved to be the most suitable sample unit for the study of this species.

Data revealed that for all stages of L. ulmi inter-tree variance was the major source of population variance, and generally there was no significance between Levels, Quadrants, and Levels X Quadrants. Based on the estimates of between-tree (S_s^2) and within-tree (S_t^2) variance, and because of the fairly low sampling costs, it was projected that populations of all stages of L. ulmi could be sampled, with a precision of 10 per cent standard error of the mean, by taking and examining for eggs, eight clusters from 89 trees; for first-stage larvae, four leaf clusters from 106 trees; for second-stage larvae, four leaf clusters from 108 trees; and for adults, 10 leaf clusters from 37 trees. The sampling plan outlined for these plots is expected to provide a reasonable degree of precision for basic studies of population dynamics of low to medium densities of L. ulmi on apple.

Eighty-one life tables were built for the three generations of L. ulmi studied, and from these tables mean life tables were prepared for each generation. Data revealed that generation mortalities for the Macdonald plot, 1963 and 1964, were respectively, 96.44 and 99.97 per cent and for the Ile Bizard plot, 1964, 99.98 per cent. For these populations, mortalities ranged from two per cent below (Macdonald '63) to one per cent above (Macdonald and Ile Bizard '64) the species constant mortality rate of 98.44 and these differences were reflected in population increases projected and obtained for the

Macdonald generation, 1964, and decreases projected and obtained for the Macdonald and Ile Bizard generations, 1965. Population changes in both plots are illustrated in histogram form.

For each generation, the mite predator H. malus and the chalcid parasite A. mytilaspidis, numerically, were the two most important mortality factors in the egg and adult stages of L. ulmi. At Ile Bizard (1964) A. mytilaspidis was present in low numbers. Low mortalities in all stages of the coccid also resulted from the mite predators Oppia nova (Oudemans), Lorryia sp., Chelytia sp., and from the chalcid parasite, Tetrastichus minutus (Howard), - all new records for L. ulmi in Canada - from coccinellid beetles and thrips larvae, and from overcrowding, desiccation, frost and physiological causes.

Correlation coefficient analyses of survival ratios revealed that eggs, first-stage larvae and ovipositing females (Tables 21 and 22) had the greatest effect on trend in the Macdonald, 1963-64, populations, and ovipositing adults and generation survival the greatest effect on trend in the Ile Bizard, 1964, population (Table 23). H. malus and A. mytilaspidis, acting mainly within these age intervals, were determined to be the mortality factors ('key' factors) that accounted for most of this effect (variance) on trend.

This report constitutes the first quantitative multifactor study of L. ulmi on apple, anywhere, and the first accurate pinpointing of H. malus and A. mytilaspidis as 'key' factors in the regulation of low to medium population densities of the Oystershell scale on apple. In the collection, analysis, and interpretation of the population data herein reported, the writer spent a total of 7085 hours and was assisted by a technician for an additional 535 hours. The total time worked is the equivalent of two men working a normal forty-hour week for a year and a half. To the writer's mind, this commitment in time is indicative of the painstaking care and attention that must be paid to detail in the accumulation today of scientifically acceptable population data.

LITERATURE CITED

Andrewartha, H. G. and L. C. Birch.

1954. The distribution and abundance of animals. Univ. of Chicago Press, Chicago. 1st edit. 782 pp.

Balachowsky, A.

1954. Les cochenilles palearctiques de la tribu des Diaspidini. Inst. Pasteur (Paris) Mem. Sci. 450 pp.

Bodenheimer, F. S.

1951. Citrus Entomology in the Middle East. The Hague.

Boranyovits, F.

1953. Some aspects of the biology of armoured scale insects. Endevour 12: 202-209.

Boratynski, K. L.

1952b. Sexual dimorphism in the second instar of some diaspididae. (Homoptera : Coccoidea) Roy. Ent. Soc. Lond. Trans. 104: 467-468.

Bouché, P. F.

1901. Life-history of the Oyster-shell Bark Louse of the apple (*Mytilaspis pomorum* Bouchè). The Insect Book by L. O. Howard. Manhattan Press, N. Y., U.S.A. 255-258.

Cameron, T. W. M.

1956. Parasites and Parasitism. Lond: Methuen and Co. Ltd. N. Y. 1-3.

Carnigie, A. J. M.

1957. Observations on the Behaviour of Crawlers of Lepidosaphes beckii Newm. (Hom. : Diaspidinae). Ent. Soc. South Africa Journ. Vol. 20: No. 1 164-169.

Ceasar, L.

1914. The San Jose Scale and Oystershell Scales. Ont. Dept. of Agr. Bull. 219: 1-30.

Chant, D. A.

1959. Phytoseiid mites (Acarina : Phytoseiidae) etc., Canad. Ent. 91: Supplement 12. 1-166.

Clausen, C. P.

1940. Entomophagous Insects 1st edit. McGraw-Hill Book Company, Inc. New York and London. 612 pp.

Comstock, J. H.

1881 Report on Scale Insects. Report of the Entomologist, part 2. U. S. Agric. Comm. Ann. Rept. 279-349.

Cooley, R. A., Parker, J. R. and W. S. Regan.

1924 Spraying for oystershell scale. Univ. Montana Agr. Exp. Sta. Circ. 124: 1-15.

Creelman, I. S.

1965. Distribution of the Oystershell scale, Lepidosaphes ulmi (L.) in Canada. Personal communication.

Danzig, E. M.

1959. On the biological forms of the Oystershell scale Lepidosaphes ulmi (L.) (Homoptera : Coccoidea), Zoologicheskii zhurnal 38: 879-886.

Dean, H. A.

1955. Factors affecting biological control of scale insects on Texas citrus. Journ. Econ. Ent. 48: 444-447.

De Bach, P.

1958. The role of weather and entomophagous species in the natural control of insect populations. Journ. Econ. Ent. 51: 474-484.

De Bach, P. and H. S. Smith.

1947. Effect of Parasite population density on the rate of change of host and parasite populations. Eco. Vol. 28: 290-298.

Deevy, E. S.

1947. Life tables for natural populations of animals. Quart. Rev. Bio. 22: 283-314.

Ebeling, W.

1950. Sub Tropical Entomology. Lithotype process Co., San Francisco.

Ewing, H. E.

1911. Predacious and parasitic acarina. Psyche Vol. 18: 37-43.

Ewing, H. E. and R. L. Webster.

1912. Mites associated with the Oystershell scale (*Lepidosaphes ulmi* L.) Psyche 19: 121-134.

Fernald, M. E.

1903. A Catalogue of the Coccidae of the world. Amherst, Mass., U.S.A. 304-317.

Ferris, G. F.

1928. The wax secreting organs of the Coccidae. Pan Pacific Ent. *5*: 67-70.

–

1934. Setae. Canad. Ent. *66*: 145-150.

–

1937. Atlas of Scale Insects of North America. Series 1. Stanford University Press, California. Serial nos. 70-76.

Fitch, A.

1856. The apple bark-louse, *Aspidiotus conchiformis*, Gmelin. In the first and second report on the noxious, beneficial and other insects of the state of New York, 31-38.

Flanders, S. E.

1965. Competition and Cooperation Among Parasitic Hymenoptera Related to Biological Control. Canad. Ent. *97*: 409-421.

Forbush, H. E.

1908. White breasted nuthatch (*Sitta carolinensis*) in Useful birds and their protection, 3rd edit. 171-175.

Frank, A. B. and F. Kruger.

1900. Schildlausbuch, 1-120 (Berlin).

French, C.

1891. The apple-bark scale. In A handbook of the destructive insects of Victoria, part 1. 76-80.

Ghauri, M. S. K.

1962. The Morphology and Taxonomy of male scale insects. British Museum (N.H.) London. Printed Hollard & Sons Ltd., Great Britain.

Girault, A. A.

1909. Standards of the number of eggs laid by insects. Ent. news *20*: 355-357.

Glen, P. A.

1920. Forms of Oystershell scale in Illinois. Journ. Econ. Ent. *13*: 173-177.

Glen, W. H.

1911. Some scale insects of Mississipi. Mississipi Agr. Exp. Sta. Tech. Bull. *2*: 41-42.

Griswold, G. H.

1922. Are there two species of Oystershell scale? Ann. Ent. Soc. Amer. *15*: 184-199.

—

1925. A study of the Oystershell scale *L. ulmi* (L.) and one of its parasites *Aphelinus mytilaspidis* (Le Baron) Corn. Uni. Agr. Exp. Sta. Mem. *93*: 3-67.

Harcourt, D. G.

1961. Design of a sampling plan for studies on the population dynamics of the diamondback moth, *Plutella maculipennis* (Curt.) (Lepidoptera : Plutellidae). Canad. Ent. *93*: 820-831.

—

1962. Design of a sampling plan for studies on the population dynamics of the imported cabbage worm, *Pieris raphee* (L.) (Lepidoptera : Pieridae). Canad. Ent. *94*: 849-859.

Harcourt, D. G.

1963. Major mortality factors in the population dynamics of the diamond-back moth, Plutella maculipennis (Curt.) (Lepidoptera : Plutellidae). Memoir Ent. Soc. Can. 32: 55-66.

Heriot, A. D.

1931. Some notes on the Oyster Shell Scale. Proc. Ent. Soc. B.C. 28: 6-15.

\-

1934. The renewal and replacement of the stylets of sucking insects during each stadium and the method of penetration. Canad. Journ. Res. 11: 602-612.

Holling, C. S.

1963. An experimental component analysis of population processes. Memoir Ent. Soc. Can. 32: 22-32.

\-

1964. The analysis of complex population processes. Canad. Ent. 96: 335-347.

Howard, L. O.

1881. Report on the parasites of the Coccidae in the collection of this department. Report of the Entomologist, part 3. U. S. Agr. Comm. Ann. rept. 350-373.

\-

1894. Geographical distribution of some common scale insects. Canad. Ent. 26: 353-356.

Howard, L. O. and C. L. Marlatt.

1896. The San Jose scale. U. S. Ent. Bur. Bull. 3 (n.s.): 1-80.

Hughes-Schrader, S.

1925. Cytology of hermaphroditism in *Icerya purchasi* (Coccidae). Zeit. f. Zellforsch. u. mik. Anat. 2.

–

1926. Spermatogenesis in *Icerya purchasi* - a correction. Science 63.

–

1927. Origin and differentiation of the male and female germ cells in the hermaphrodite of *Icerya purchasi* (Coccidae). Zeit. f. Zellforsch. u. mik. Anat. 6.

Hudon, M. and E. J. LeRoux.

1961. Variation between samples of immature stages, and of mortalities from some factors, of the European corn borer, *Ostrinia nubilalis* (Hubner) (Lepidoptera : Pyralidae), on Sweet Corn in Quebec. Canad. Ent. *93*: 867-888.

Hulley, P. E.

1962. On the Behaviour of Crawlers of Citrus Mussel Scale, *Lepidosaphes beckii* (Newm.) (Homoptera : Diaspididae) J. Ent. Soc. S. Africa: Vol *25*: No. 1. 56-72.

Imms, A. D.

1916. Observations on the insect parasites of some Coccidae. I. On *Aphelinus mytilaspidis* Le Baron, a chalcid parasite of the mussel scale (*Lepidosaphes ulmi* L.) Quart. J. Micros. Sci. *61*: (n.s.) 217-274.

–

1925. A General Textbook of Entomology (Revised by Richard, O. W. and Davies, R. G.) Methuen, London. 9th edit. 886 pp.

Jarvis, T. D.

1910. The Coccidae of Canada. Ent. Soc. Ont. Ann. Rpt. *41*: 64-77.

Kiritani, K. and N. Hokyo.

1962. Studies on the life table of the southern stink bug, *Nozara viridula*. Japanese Journ. Appl. Ent. Zool. *6*: 124-140.

Koronoes, J.

1934. Les coccidae de la Grece surtout du Pelion (Thessalie) I : Diaspinae par. 95 pp.

Kosztarab, M.

1959. Biological notes on the scale insects of Hungary. Ent. Soc. Amer. Ann. *52*: 2. 401-420.

—

1963. The armoured scale insects of Ohio (Homoptera : Coccoidea : Diaspididae) Bull. Ohio Biol. Surv. (N.S.) 1-120.

Kuwana, I.

1922a. Studies on Japanese Monophlebinae Contribution. 1. The Genus *Warajicoccus*. Dept. Agric. and Com. Imp. Plant Quar. Sta. Bull. 1.

Laffoon, J. L. (Chairman)

1960. Common names of insects. (Approved by the Entomological Society of America). Bull. Ent. Soc. Amer. *6*: 175-212.

Lajoie, P. and R. Baril.

1954. Soil survey of Montreal, Jesus and Bizard Islands in the province of Quebec. Queen's Printer and Controller of Stationery, Ottawa. 85 pp. 1 map.

Lathrop, F. H. and M. T. Hilborn.

1948. Recent advances in spray practices for Maine apple orchards. Maine Agr. Expt. Sta. Bull. 457: 325-353.

Le Baron, Wm.

1870. The Chalcideous parasite of the apple-tree bark louse (Chalcis Aphelinus mytilaspidis, n. sp.) Amer. ent. and bot. 2: 360-362.

-

1871. The Oystershell bark-louse (Mytilaspis conchiformis Gmelin). In the first annual report on the noxious insects of the State of Illinois. 24-46.

LeRoux, E. J.

1960. Effects of "modified" and "commercial" spray programs on the fauna of apple orchards in Quebec. Ann. Ent. Soc. Quebec. 6: 87-121.

-

1964a. The application of ecological principles to orchard entomology in Canada. Canad. Ent. 96: 348-355.

-

1964b. Ecological considerations in the utilization of chemical controls. Bull. Ent. Soc. Amer. 10: 70-74.

LeRoux, E. J. and C. Reimer.

1959. Variations between samples of immature stages and of mortalities from some factors of the Eye Spotted Bud Moth, Spilonota ocellana (D & S) Lepidoptera : Olethreutidae, and the Pistol Casebearer, Coleophora serratella (L.) (Lepidoptera : Coleophoridae). on apple in Quebec. Canad. Ent. 91: 7. 428-449.

LeRoux, E. J. and others.

1963. Population dynamics of Agricultural and Forest Insect Pests. Memoirs Ent. Soc. Canada. 32: 3-104.

Lignieres, J.

1893. Habits of *Monieziella entomophaga* and *Hemisarcoptes malus*. Mem. Soc. Zool. France. tome V. 5-25.

Linnaeus, C.

1758. Coccus. In Systema naturae, 10th edit. 1: 455-457.

Lord, F. T.

1947. The influence of spray programs on the fauna of apple orchards in Nova Scotia: II. Oystershell scale, *Lepidosaphes ulmi* (L.) Canadian Ent. 79: 196-209.

-

1949. The influence of spray programs on the fauna of apple orchards in Nova Scotia. III. Mites and their predators. Canad. Ent. 81: 202-214; 217-230.

Lord, F. T. and A. W. MacPhee.

1953. The influence of spray programs on the fauna of apple orchards in Nova Scotia. VI. Low temperatures and the natural control of the Oystershell scale, *Lepidosaphes ulmi* (L.) (Homoptera : Coccidae). Canad. Ent. 85: 282-291.

Lowe, V. H.

1899. How some birds help the farmer. N. Y. State Agr. Soc. Ann. Rpt. 58: 315-326.

Maerz, A. and M. R. Paul.

1930. A Dictionary of Colour. McGraw-Hill, New York. 1st edit. 207 pp.

MacGillivray, A. D.

1921. The Coccidae. Scrab Co. Urbana, Illinois. 474 pp.

MacPhee, A. W.

1953. The influence of spray programs on the fauna of apple orchards in Nova Scotia. V. The predacious thrips *Haplothrips faurei* Hood. Canad. Ent. 85: 33-40.

MacPhee, A. W. and K. H. Sanford.

1954. The influence of spray programs on the fauna of apple orchards in Nova Scotia. VII. Effect on some beneficial arthropods. Canad. Ent. 86: 128: -135.

Maskell, W. M.

1887. *Mytilaspis pomorum*, Bouche. In New Zealand Scale Insects. (Coccididae). p. 51-53.

McKenzie, H. L.

1956. The Armoured scale insects of California. Bull. California Insect Surv. 5: 209 pp.

Metcalf, C. L. and W. P. Flint.

1962. Destructive and Useful Insects 4th edit. McGraw Hill Book Co., Inc. New York. 1036 pp.

Milne, A.

1957a. The natural control of insect populations. Canad. Ent. 89: 193-213.

\-

1957b. Theories of natural control of insect populations. Cold Spring Harbour Symposia on Quant. Biol. 22: 253-271.

Morris, R. F.

1954. A sequential sampling technique for spruce budworm egg surveys. Canad. J. Zool. 32: 283-301.

-

1955. The development of sampling techniques with particular reference to the spruce budworm. Canad. J. Zool. 33: 225-294.

-

1957. The interpretation of mortality data in studies of population dynamics. Canad. Ent. 89: 49-69.

-

1959. Single-factor analysis in population dynamics. Ecol. 40: 580-588.

-

1960. Sampling insect populations. Ann. Rev. Ent. 5: 243-246.

-

1963. (Editor) The dynamics of epidemic Spruce budworm populations. Memoir Ent. Soc. Can. 31: 332 pp.

Morris, R. F. and C. A. Miller.

1954. The development of life tables for the spruce budworm. Canad. J. Zool. 32: 283-301.

Morris, R. F. and W. A. Reeks.

1954. A larval population technique for the winter moth, Operophtera brumata (Linn.) (Lepidoptera : Geometridae). Canad. Ent. 86: 433-438.

Morris, R. F., Miller, C. A., Greenbank, D. O. and D. G. Mott.

1958. The population dynamics of the spruce budworm in Eastern Canada. Proc. Tenth Int. Congr. Ent. 4: 137-149.

Muesebeck, C. F. W., Krombein, K. V., Townes, H. K. et al.

1951. Hymenoptera of America, North of Mexico. U. S. Dept. Agr., Agr. Monogr. No. 2. 1420 pp.

Newstead, R.

1900. Monograph of the Coccidae of the British Isles. London. Vol. 1. 220 pp.

-

1902. Monograph of the Coccidae of the British Isles. London. Vol. II. 193-206.

Nicholson, A. J.

1933. The balance of animal populations. J. Anim. Ecol. 2: 132-178.

Nicholson, A. J.

1954a. An outline of the dynamics of animal populations. Aust. J. Zool. 2: 9-65.

-

1958. Dynamics of insect populations. Ann. Rev. Ent. 3: 107-136.

Nicholson, A. J. and V. A. Bailey.

1935. The balance of animal populations. Proc. Zool. Soc. Lond., Part 3: 551-598.

Paradis, R. O.

1964. Recherches sur la biologie et la dynamique des populations naturelles d'Archips argyrospilus (Wlk.) (Lepidoptera : Tortricidae) dans le sud-ouest du Quebec. PhD. Thesis. McGill University.

Paradis, R. O. and E. J. LeRoux.

1962. A sampling technique for the population and mortality factors of the fruit tree leaf-roller, Archips argyrospilus (Wlk.) (Lepidoptera : Tortricidae), on apple in Quebec. Canad. Ent. 94: 561-573.

Paradis, R. O. and E. J. LeRoux.

1965. Recherches sur la biologie et la dynamique des populations naturelles d'Archips argyrospilus (Wlk.) (Lepidopteres : Tortricidae) dans le sud-ouest du Quebec. In Press.

Perley, E.

1796. (Letter) Massachussetts Soc. Prom. Agr., Rules and Regulations. 32-33.

Peterson, A.

1934. A manual of Entomological equipment and methods. Part one. 2nd edit. Edwards Brother, Inc. Ann Arbor, Michigan. 138 pp.

Pickett, A. D.

1949. A critique on chemical control methods. Canad. Ent. 81: 67-76.

Pickett, A. D., Patterson, N. A., Stultz, H. T. and F. T. Lord.

1946. The influence of spray programs on the fauna of apple orchards in Nova Scotia. Scientific Agr. 26: II. 590-600.

Pickett, A. D. and N. A. Patterson.

1953. The influence of spray programs on the fauna of apple orchards in Nova Scotia. IV. A Review. Canad. Ent. 85: 472-478.

Pierantoni, U.

1910. La symbiosi ereditaria e la biologia sessuale d'Icerya. Monit. Zool. Ital. anno 21.

\-

1914a. Studio sulla sviluppo d'Icerya purchasi Mask. Parte II. Arch. di Zool. Ital. 7.

Pottinger, R. P.

1964. The Biology and Dynamics of <u>Lithocolletis</u> <u>Blancardella</u> (Fabr.) on apple in Quebec. PhD. Thesis. McGill University.

Quaintance, A. L. and E. R. Sasscer.

1910. The Oystershell scale and Scurfy scale. U. S. D. A. Circ. <u>121</u>: 1-15.

Quayle, H. J.

1911. Locomotion of young scale insects. Journ. Econ. Ent <u>4</u>: 301-306.

\-

1916. Dispersion of scale insects by wind. Journ. Econ. Ent. <u>9</u>: 486-492.

\-

1938. Insects of citrus and other subtropical fruits. Comstock Publishing Co., New York.

Reaumur, Rene Antoine Ferchault De.

1738. Memoires pour servir a l'histoire des insectes. <u>4</u>: 69-70.

Richards, A. M.

1961. The Oystershell scale, Quadraspidiotus ostreaeformis (Curtis) in the Christchurch district of New Zealand. N. Z. J. Agr. Res. 5: 95-100.

Riley, C. V.

1869. The bark lice of the apple tree (Homoptera Coccidae). In the first annual report on the noxious, beneficial and other insects of the State of Missouri. 7-18.

1873. The oystershell bark louse of the apple (Mytilaspidis pomicortis, n. sp.) 5th Ann. Rpt. noxious, beneficial and other insects of the State of Missouri. 73-96.

Schrader, H. S.

1930. Contribution to the life history of Iceryine Coccids, with special reference to parthenogenesis and hermaphroditism. Ann. Ent. Soc. Amer. 23: 359-380.

Sherman, F.

1913. The Oystershell scale. Bull. North Caroline Dept. Agr. 34: 6. 4-24.

Shimer, H.

1868. Notes on the apple bark louse Lepidosaphes conchiformis Gmelin. sp. with a description of a supposed new Acarus. Amer. Ent. Soc. Trans. 1: 361-373.

Shotwell, R. L.

1923. On the Oystershell scale found on willows at Boulder, Colorado. J. Econ. Ent. 16: 392-393.

Smirnov, E. and W. Polejaeff.

1934. Density of population and sterility of the females in the coccid Lepidosaphes ulmi L. J. Anim. Eco. vol. 3: 29-40.

-

1935. Kampf um den Raum bei der schildlaus Lepidosaphes ulmi (L.) Zeitschrifft Fur Angewandte Entomologie. Einundzwanzigster Band Berlin.

Smith, H. S.

1916. An attempt to redefine the host relationships exhibited by Entomological Insects. J. Eco. Ent. Vol. 9. 477-486.

-

1935. The Role of biotic factors in the determination of population densities. J. Eco. Ent. 28: 873-898.

Solomon, M. E.

1949. The natural control of animal populations. J. Anim. Ecol. 18: 1-35.

Stammer, H. J.

1959. Beitrage, Zur Systematik und Okologie mitteleuropaischer Acarina. Academische Verlagsgeselleschaft Geest und Portig K. G. Leipzig : 145-146.

Stark, R. W.

1958. Life table for the Lodgepole needle miner Recuvaria starki Freeman. (Lepidoptera Gelechiidae). Proc. Tenth Int. Congr. Ent., 1956. 4: 151-162.

Stark, R. W.

1959. Population dynamics of the Lodgepole needle miner Recuvaria starki Freeman in Canadian Rocky Mountain Parks. Canad. J. Zool. 37: 917-943.

Steal, R. C. D. and J. A. Torrie.

1960. Principles and procedures of Statistics. McGraw-Hill, New York. 1st edit. 481 pp.

Stofberg, F. J.

1937. The biology of the citrus mussel scale Lepidosaphes pinnaeformis (Bouchè) Kirk, Sci. Bull. Dep. Agri. S. Africa 165.

Stultz, H. T.

1955. The influence of spray programs on the fauna of apple orchards in Nova Scotia. Canad. Ent. 87: 79-85.

Suter, P.

1932. Untersuchungen uber Korperbau Entwicklungsgang und Rassendifferen zierung der Kommaschildlaus, Lepidosaphes ulmi (L.) Mitteil Schweizer Ent. Ges. 15: 347-420.

Sweetman, H. L.

1958. The Principles of Biological Control. Wm. C. Brown Co. Dubuque, Iowa. 4-8.

Thiem, H.

1931. Kommas schildlaus der deutschen cocci den fauna (Lepidosaphes rubri n. sp.) Gartenbauwiss 5: (6) 557-567.

Thompson. W. R.

1939. Biological control and the theories and interactions of populations. Parasitology 31: 299-388.

Thompson, W. R.

1953. A Catalogue of predators and parasites of insect pests. Section 2. Part 2, 1-8. (Commonwealth Inst. Biol. Control).

Tothill, J. D.

1919. Some notes on the natural control of the Oystershell scale. Bull. Ent. Res. 9: 183-196.

Varley, C. C. and C. R. Gradwell.

1960. Key factors in population studies. J. Anim. Ecol. 29: 399-401.

Walsh, B. D.

1867. The Oystershell bark louse (Aspidiotus conchiformis Gmelin). First Ann. Rpt. on noxious insects of the State of Illinois. 43-70.

Watt, K. E. F.

1959. A mathematical model for the effect of densities of attacked and attacking species on the number attacked. Canad. Ent. 91: 129-144.

-

1961. Mathematical models for use in insect pest control. Canad. Ent. 93 Suppl. 19: 62 pp.

-

1963. Mathematical models for five agricultural crop pests. Memoirs Ent. Soc. Can. 32: 103 pp.

Webster, R. L.

1915. Effect of low temperatures on the Oystershell scale L. ulmi (L.). J. Econ. Ent. 8: 371-375.

Wigglesworth, V. B.

1950. The Principles of Insect Physiology. 5th edit. London: Methuen & Co. Ltd. 486-489.

Yakubova, F.

1935. Korpergrosse und Fruchtbarkeit der Schildlaus *Lepidosaphes ulmi* L. Zool. J. Moskau, *14*: 719-721.

Plate I - A. Experimental apple orchard, Ile Bizard, Que.

B and C. Distribution of *L. ulmi* adult scales (X0.3) on wood near leaf clusters; B. leaf cluster removed; C. leaf cluster *in situ*.

Plate I

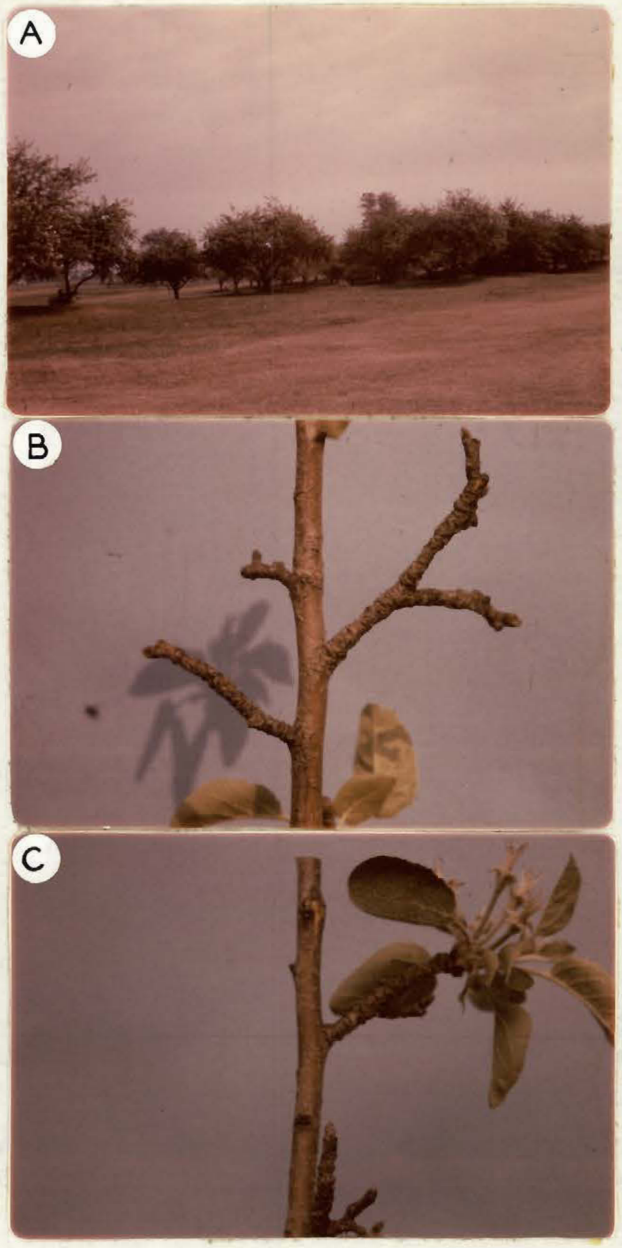

A
B
C

Plate II - A. L. ulmi adult scales (X40), at high densities, concentrated near leaf clusters.

B. Enlarged view of L. ulmi adult scales (X48).

C. View of size differences between male (in centre of photo) and female (located at top and bottom of photo) L. ulmi adult scales (X48) on Quercus sp. from Warsaw, Poland.

D. View of parasitized L. ulmi adult scales (X48) showing circular parasite exit holes.

Plate II

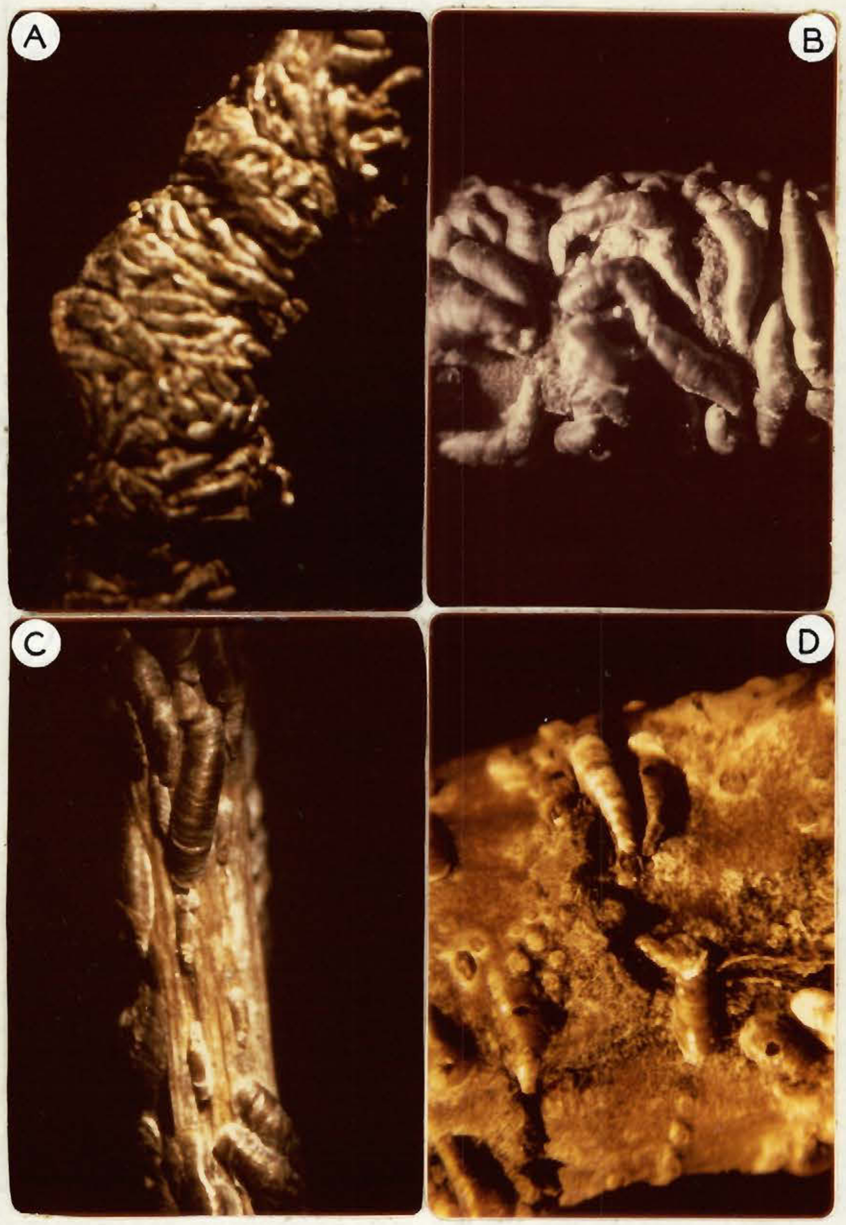

A
B
C
D

Plate III - A. Ventral view of L. ulmi adult scale (X48) showing incomplete ventral covering.

B. Ventral view of L. ulmi adult scale (X48) with numerous eggs.

C. View of immature (ordinarily creamish-white) overwintered L. ulmi eggs (X100).

D. View of mature (yellowish-brown) overwintered L. ulmi eggs (X100).

Plate III

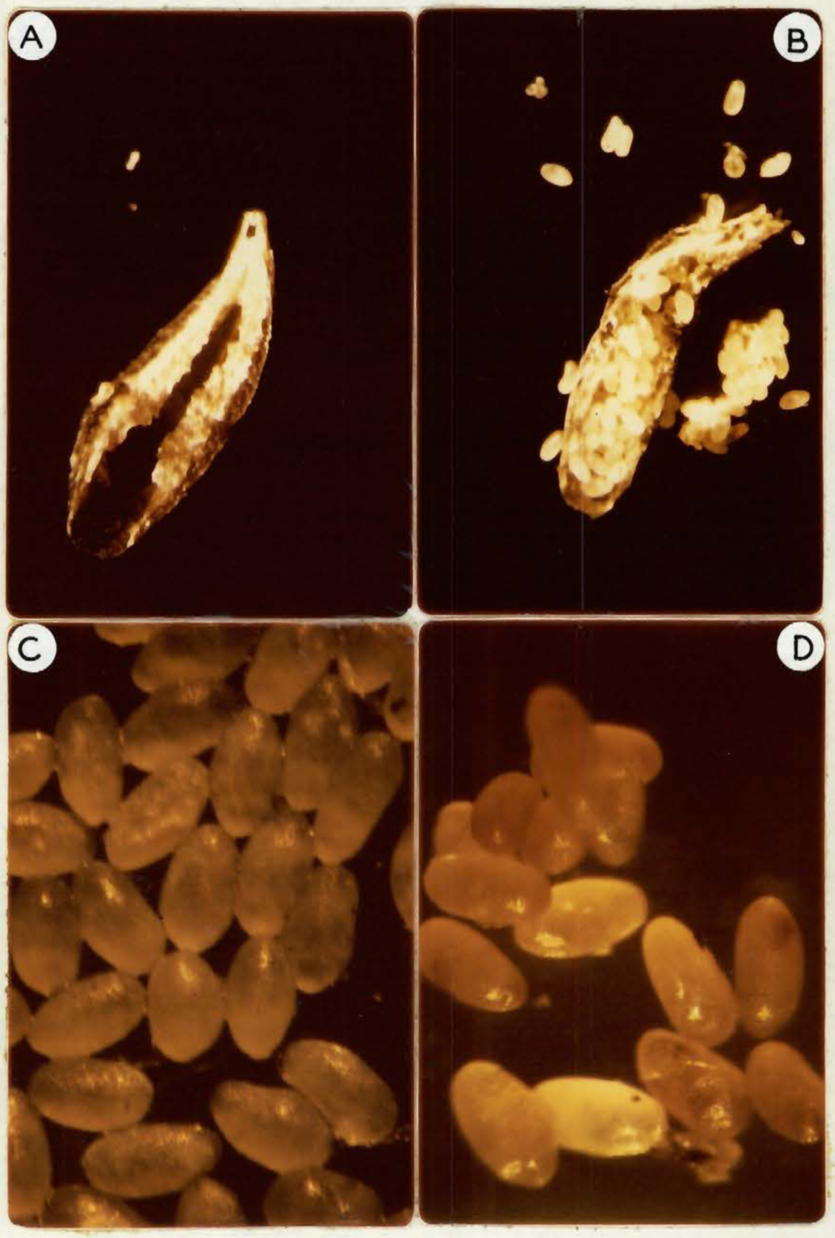

A
B
C
D

Plate IV - A. View of first-stage L. ulmi larvae (X100) immediately following emergence.

B. Dorsal view of first-stage L. ulmi larvae (X75) with secretions of waxy thread-like cottony fluff.

C. Same as B, enlarged (X100).

D. L. ulmi scale size difference between adults and first-stage larvae (X48).

Plate IV


A
B
C
D

Plate V - A. Dorsal view of early first-stage L. ulmi larvae (X48) on apple host showing newly secreted first scale covering.

B. Dorsal view of L. ulmi early second stage larvae (X48) showing newly secreted second scale covering.

C. Ventral view of fully developed L. ulmi second stage larvae (X48) within scales.

D. Dorsal view of four well developed second stage L. ulmi larvae (X48) removed from scales.

Plate V

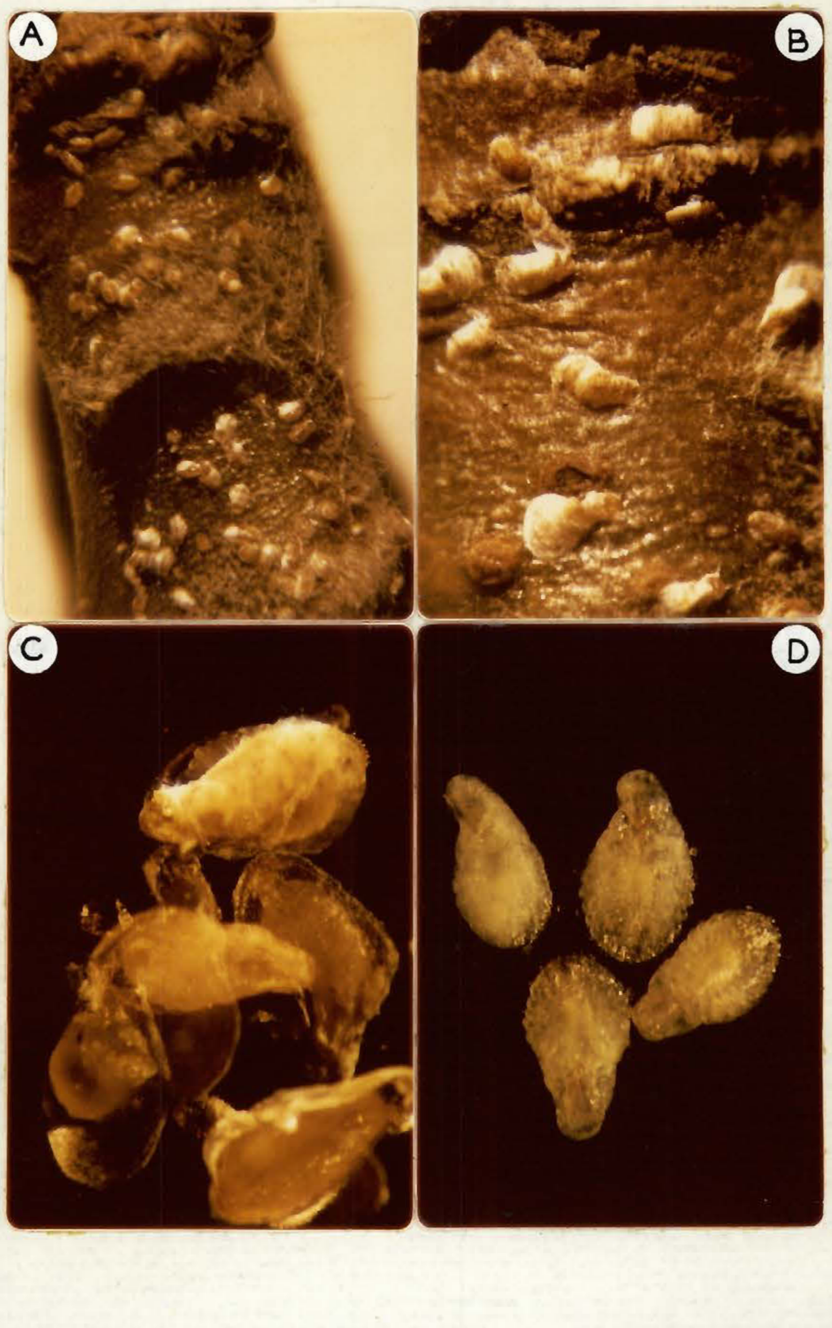

A
B
C
D

Plate VI - A. Ventral view of adult *L. ulmi* overwintered scale showing well developed larva (X100) of the parasite *A. mytilaspidis* within.

B. Two mature *A. mytilaspidis* larvae (X48) in second stage *L. ulmi* scales (bottom of photo) and one (top of photo) *A. mytilaspidis* pupa (X48).

C. View of mature larva (X100) of *A. mytilaspidis* feeding externally on adult *L. ulmi* female scale.

D. Contents of a mite-infested (*H. malus*) overwintered *L. ulmi* scale (X48).

Plate VI

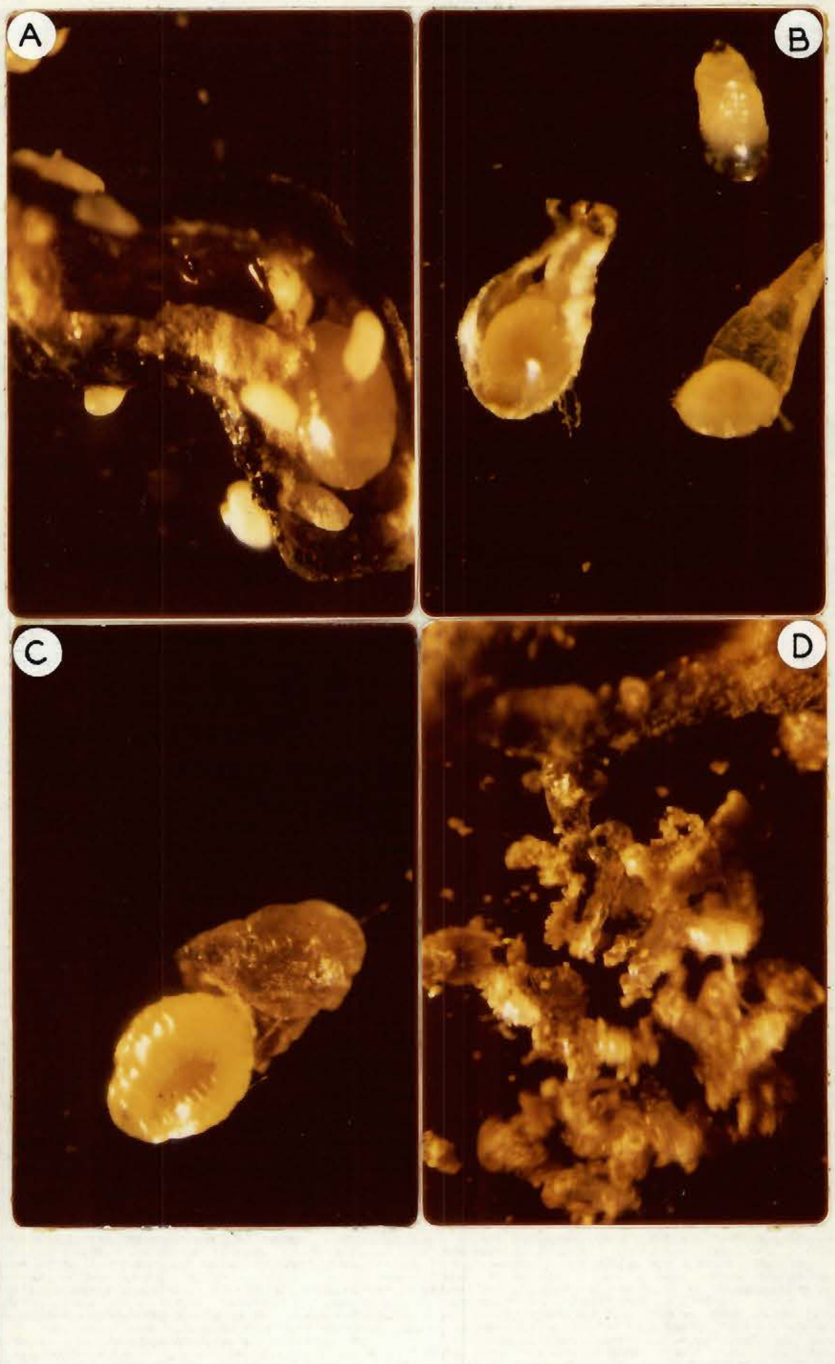

A
B
C
D

Plate VII - A. Dorsal view of the pupa (X100) of the parasite *A. mytilaspidis*.

B. Dorsal view of adult (X100) (sex not known) *A. mytilaspidis* with wings extended.

C. Ventral view of three mature adult *L. ulmi* females (X48) with centre female being fed upon by the mite predator *H. malus*.

Plate VII

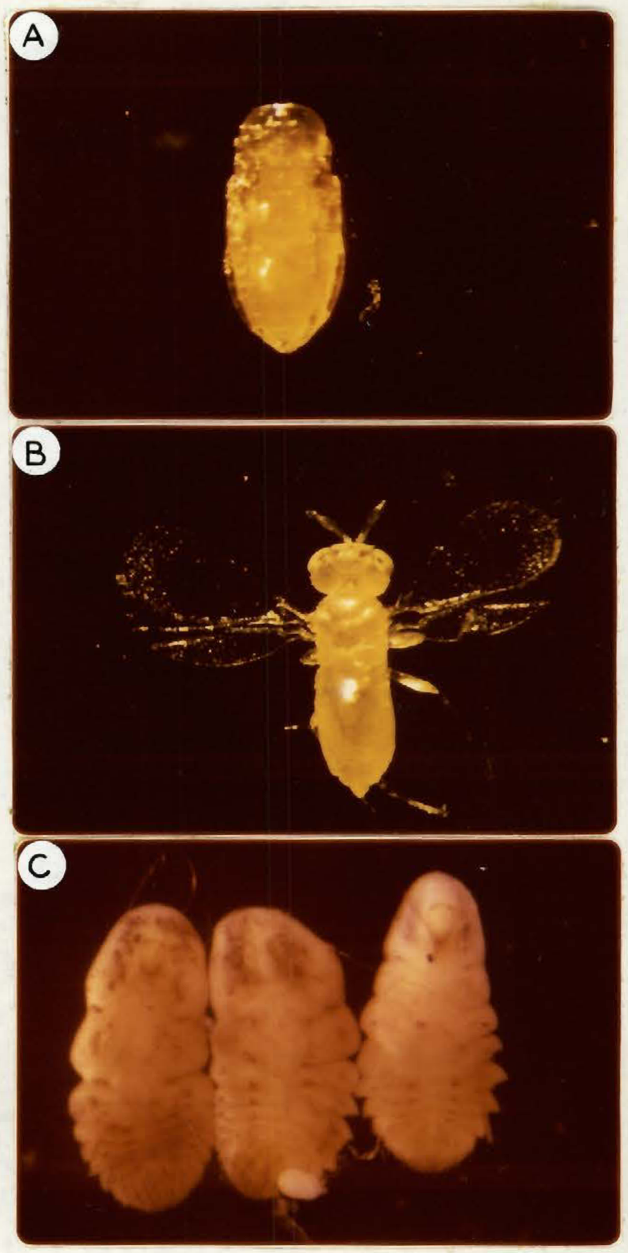
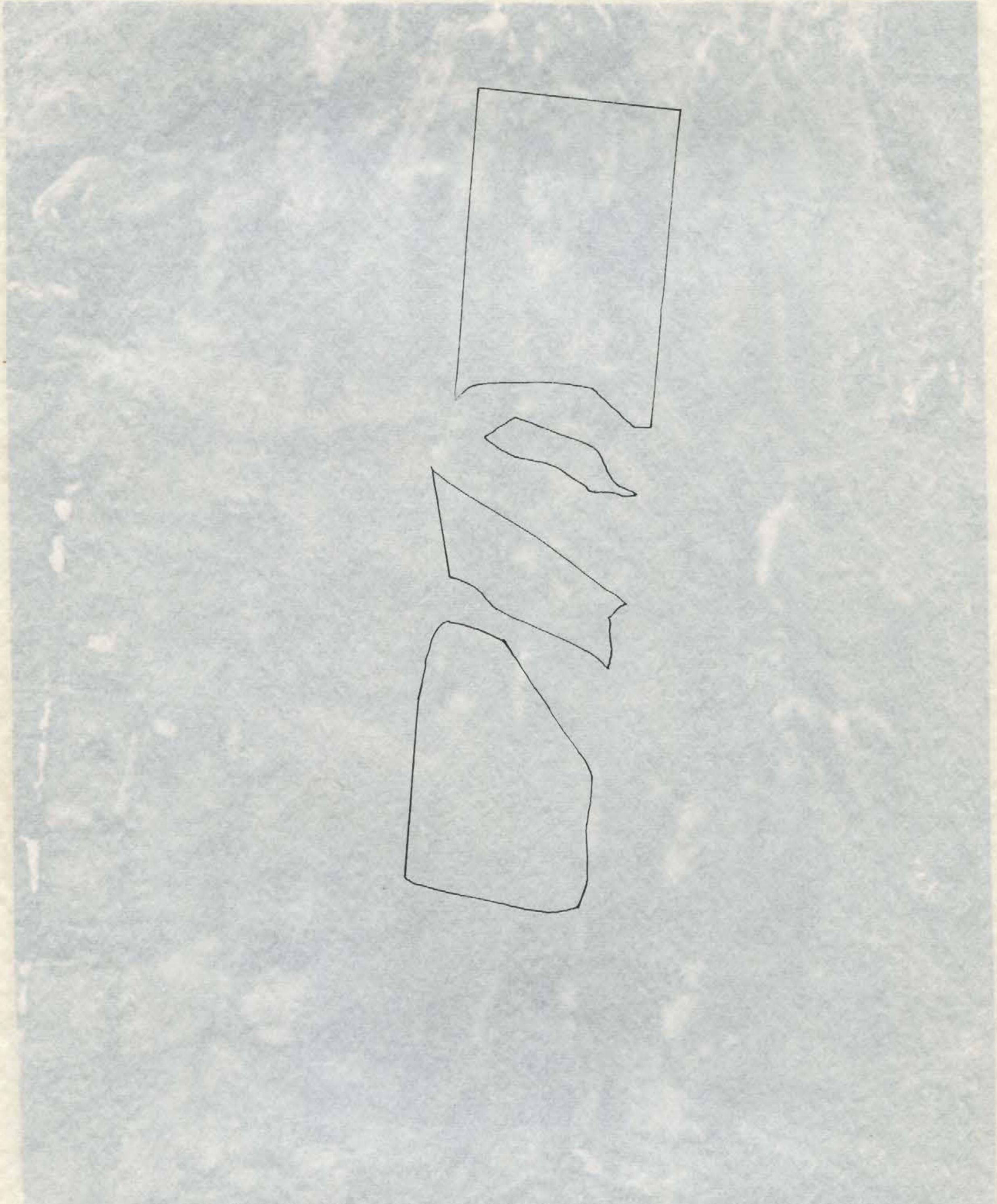

A
B
C

Plate VIII Aerial view of the Ile Bizard, Quebec, Experimental orchard and surrounding country side.

Scale 1" : 500 feet.

Plate VIII



Orchard area delimited by black border on photograph.

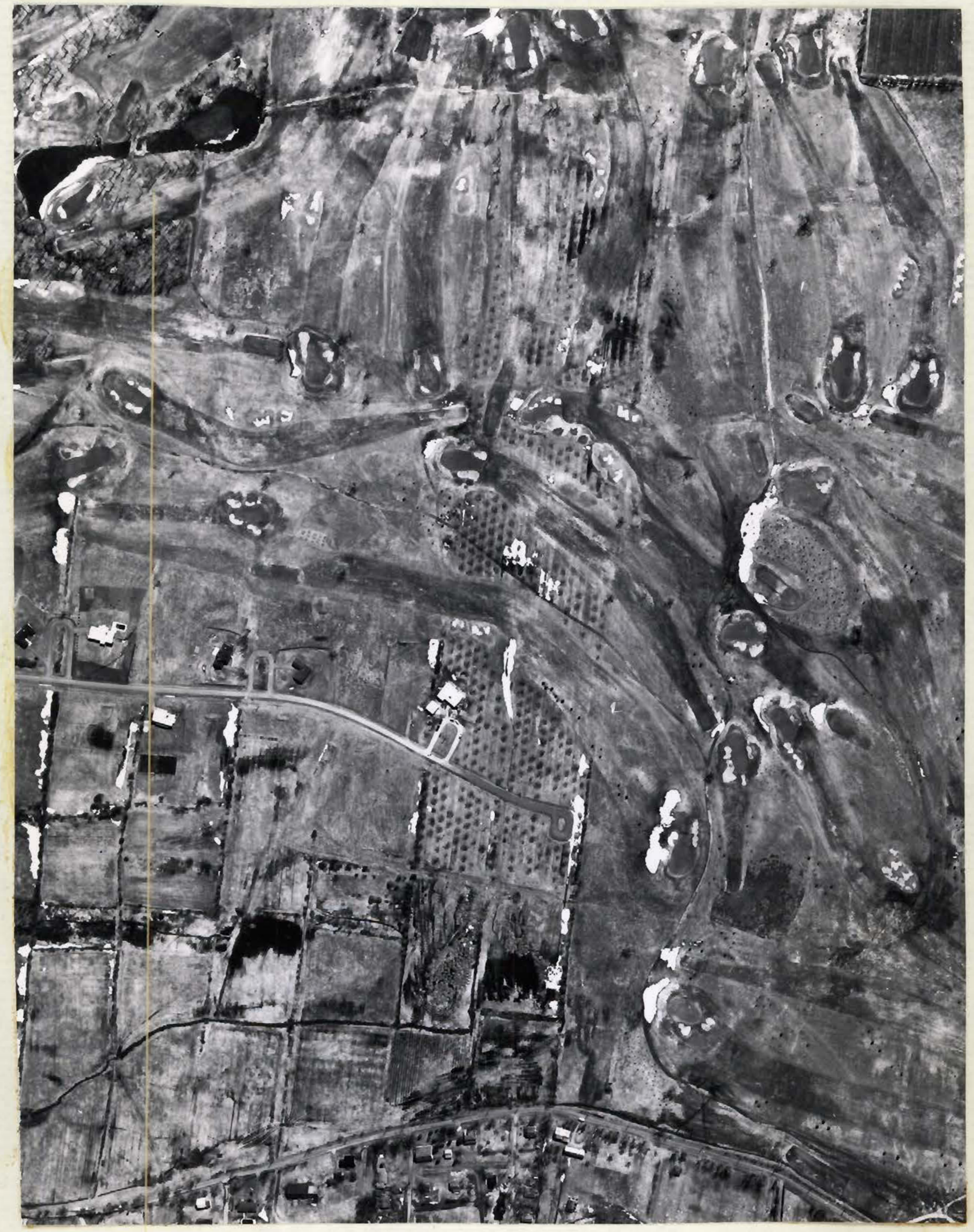


Plate IX Aerial view of the Macdonald College, Quebec, Experimental orchard.

Scale 1" : 500 feet.

Plate IX

Orchard area delimited by black border on photograph.

APPENDIX

PART I

LIFE TABLES

Life table for the 1962-63 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number I, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	311.56	Predators	177.77	57.06	57.06	
		'Others'	6.67	2.14	2.14	0.451
Larvae 1	140.46	Predators	41.45	29.51	13.30	
		'Others'	34.45	24.53	11.06	0.460
Larvae 2	64.56	Predators	32.97	51.07	10.58	
		Parasites	3.02	4.68	0.97	0.598
		'Others'	-(-10.06)	-(-15.58)	-(-3.23)	
Adults (♀♀)	38.63	Predators	20.75	53.71	6.66	
		Parasites	1.25	3.24	0.40	0.301
Females	16.63	Red. fec.	4.97	29.89	1.59	
'Normal' ♀♀	11.66					
Ovipositing ♀♀	11.66					
Generation			299.90	96.25	96.25	0.0374

Expected eggs		746.24
Actual eggs (N_2)		2972.63
Index of population trend:	Expected	239.51%
	Actual	954.11%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number II, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	290.94	Predators	184.25	63.33	63.33	
		'Others'	-(-3.21)	-(-1.10)	-(-1.10)	0.378
Larvae 1	109.90	Predators	14.40	13.10	4.95	
		'Others'	16.19	14.73	5.56	0.722
Larvae 2	79.31	Predators	14.46	18.23	4.97	
		Parasites	1.21	1.53	0.42	
		'Others'	-(-4.04)	-(-5.09)	-(-1.39)	0.853
Adults (♀♀)	67.69	Predators	6.38	9.43	2.19	
		Parasites	1.50	2.22	0.52	0.427
Females	59.81	Red. fec.	30.94	51.73	10.63	
'Normal' ♀♀	28.87					
Ovipositing ♀♀	28.87					
Generation			262.07	90.08	90.08	0.0992

Expected eggs		1847.52
Actual eggs (N_2)		1746.75
Index of population trend:	Expected	635.02%
	Actual	600.38%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number III, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	480.00	Predators	310.94	64.78	64.78	0.352
Larvae 1	169.06	Predators	30.83	18.24	6.42	
		'Others'	29.34	17.35	6.11	0.644
Larvae 2	108.89	Predators	23.26	21.36	4.85	
		Parasites	2.42	2.22	0.50	
		'Others'	29.52	26.94	6.15	0.493
Adults (♀♀)	53.69	Predators	7.75	14.43	1.61	
		Parasites	2.88	5.36	0.60	0.210
Females	43.06	Red. fec.	23.30	54.11	4.86	
'Normal' ♀♀	19.76	♀♀ mortality	8.49	42.97	1.77	
Ovipositing ♀♀	11.27					
Generation				97.65	97.65	0.0235

Expected eggs		1264.80
Actual eggs (N_2)		1610.75
Index of population trend:	Expected	263.50%
	Actual	335.57%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number IV, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	711.20	Predators	547.10	76.93	76.93	0.231
Larvae 1	164.10	Predators	41.05	25.02	5.77	
		'Others'	38.92	23.72	5.47	0.513
Larvae 2	84.13	Predators	35.60	42.33	5.01	
		Parasites	1.16	1.37	0.16	
		'Others'	-(-5.94)	-(-7.06)	-(-0.84)	0.634
Adults (♀♀)	53.31	Predators	15.87	29.77	2.23	
		Parasites	0.50	0.94	0.07	0.306
Females	36.94	Red. fec.	20.64	55.87	2.90	
'Normal' ♀♀	16.30					
Ovipositing ♀♀	16.30					
Generation			694.90	97.70	97.70	0.0229

Expected eggs		1043.04
Actual eggs (N_2)		3066.25
Index of population trend:	Expected	146.66%
	Actual	431.14%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number V, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	442.20	Predators 'Others'	351.04 -(-26.94)	79.38 -(-6.09)	79.38 -(-6.09)	0.267
Larvae 1	118.10	Predators 'Others'	17.90 60.35	15.16 51.10	4.05 13.65	0.338
Larvae 2	39.86	Predators Parasites 'Others'	17.44 0.83 -(-7.41)	43.75 2.08 -(-18.59)	3.94 0.18 -(-1.67)	0.728
Adults (♀♀)	29.00	Predators Parasites	6.81 0.31	20.89 1.66	1.54 0.07	0.433
Females	21.88	Red. fec.	9.33	47.51	2.11	
'Normal' ♀♀	12.55					
Ovipositing ♀♀	12.55					
Generation			429.65	97.16	97.16	0.284

Expected eggs		803.20
Actual eggs (N2)		3185.88
Index of population trend:	Expected	181.64%
	Actual	720.46%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number VI, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	166.56	Predators	93.79	56.31	56.31	
		'Others'	48.74	29.26	29.26	0.206
Larvae 1	24.03	Predators	6.63	2.76	3.98	
		'Others'	0.59	2.45	0.35	0.699
Larvae 2	16.81	Predators	8.54	50.80	5.13	
		Parasites	0.40	2.38	0.24	
		'Others'	-(-6.10)	-(-36.29)	-(-3.66)	0.831
Adults (♀♀)	13.97	Predators	4.63	33.14	2.78	
		Parasites	0.19	1.36	0.11	0.211
Females	9.15	Red. fec.	6.20	67.76	3.72	
'Normal' ♀♀	2.95					
Ovipositing ♀♀	2.95					
Generation			163.61	98.22	98.22	0.0253

Expected eggs		191.84
Actual eggs (N2)		1606.38
Index of population trend:	Expected	115.18%
	Actual	964.45%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number I, 'N' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N)	462.75	Predators	242.67	52.44	52.44	0.476
Larvae 1	220.08	Predators	65.00	29.53	14.05	
		'Others'	57.17	25.98	12.35	0.445
Larvae 2	97.91	Predators	61.64	62.96	13.32	
		Parasites	3.83	3.91	0.83	
		'Others'	-(-3.56)	-(-0.36)	-(-0.77)	0.368
Adults (♀♀)	36.0	Predators	29.50	81.94	6.37	
		Parasites	2.75	7.64	0.59	0.059
Females	3.75	Red. fec.	1.61	42.93	0.35	
'Normal' ♀♀	2.14	♀♀ mortality	0.00	0.00	0.00	
Ovipositing ♀♀	2.14					
Generation			460.61	99.53	99.53	0.0046

Expected eggs		136.96
Actual eggs (N_2)		3115.00
Index of population trend:	Expected	29.60%
	Actual	673.14%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number I, 'S' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	67.25	Predators	44.25	65.79	65.79	
		'Others'	-(-26.67)	-(-39.66)	-(-39.66)	0.739
Larvae 1	49.67	Predators	7.00	14.09	10.41	
		'Others'	14.99	30.18	22.29	0.557
Larvae 2	27.68	Predators	13.83	49.96	20.57	
		Parasites	1.33	4.80	1.98	
		'Others'	1.27	4.58	1.89	0.406
Adults (♀♀)	11.25	Predators	3.5	31.11	5.20	
		Parasites	0.75	6.66	1.12	0.367
Females	7.00	Red. fec.	2.87	42.68	4.27	
'Normal' ♀♀	4.13					
Ovipositing ♀♀	4.13					
Generation			63.12	93.86	93.86	0.0614

Expected eggs		264.32
Actual eggs (N_2)		4273.50
Index of population trend:	Expected	393.04%
	Actual	6354.64%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number I, 'E' quadrant, at Macdonald College, Quebec.

Eggs (N)	575.25	Predators	398.92	69.35	69.35	0.307
Larvae 1	176.33	Predators	47.60	26.99	8.27	
		'Others'	61.10	34.65	10.62	0.384
Larvae 2	67.73	Predators	31.92	47.20	5.55	
		Parasites	2.33	3.44	0.41	
		'Others'	-(-43.37)	-(-64.13)	-(-7.54)	1.133
Adults (♀♀)	76.75	Predators	26.00	33.88	4.52	
		Parasites	0.75	0.97	0.13	0.489
Females	50.50	Red. fec.	12.50	25.00	2.17	
'Normal' ♀♀	37.50					
Ovipositing ♀♀	37.50					
Generation			537.75	93.48	93.48	0.0651

Expected eggs		2400.0
Actual eggs (N_2)		2759.50
Index of population trend:	Expected	417.21%
	Actual	479.70%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number I, 'W' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	141.00	Predators	25.25	17.90	17.90	0.821
Larvae 1	115.75	Predators	46.20	39.91	32.77	
		'Others'	4.55	3.93	3.23	0.562
Larvae 2	65.00	Predators	24.50	37.69	17.38	
		Parasites	4.58	7.05	3.25	
		'Others'	5.42	8.34	3.84	0.469
Adults (♀♀)	30.5	Predators	24.0	78.68	17.02	
		Parasites	0.75	2.46	0.53	0.094
Females	5.75	Red. fec.	2.88	50.09	2.04	
'Normal' ♀♀	2.87					
Ovipositing ♀♀	2.87					
Generation			138.13	97.96	97.96	0.0203

Expected eggs		183.68
Actual eggs (N_2)		1742.50
Index of population trend:	Expected	130.27%
	Actual	1235.82%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number II, 'N' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	105.00	Predators	13.25	12.62	12.62	
		'Others'	-(-12.83)	-(-12.22)	-(-12.22)	0.996
Larvae 1	104.58	Predators	13.00	12.43	12.38	
		'Others'	-(-23.34)	-(-22.32)	-(-22.23)	1.099
Larvae 2	114.92	Predators	16.00	13.92	15.24	
		Parasites	1.17	1.01	1.11	
		'Others'	3.50	3.05	3.33	0.820
Adults (♀♀)	94.25	Predators	8.5	9.02	8.10	
		Parasites	1.25	1.33	1.19	0.439
Females	84.50	Red. fec.	43.09	50.99	41.04	
'Normal' ♀♀	41.41					
Ovipositing ♀♀	41.41					
Generation			63.59	60.56	60.56	0.3943

Expected eggs	2650.24
Actual eggs (N_2)	2912.50
Index of population trend: Expected	2524.04%
Actual	2773.81%
Constant mortality rate	98.44%

Life table for the 1962-63 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number II, 'S' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	127.50	Predators	46.83	36.73	36.73	0.633
Larvae 1	80.67	Predators	7.90	9.79	6.20	
		'Others'	5.61	6.95	4.40	0.833
Larvae 2	67.16	Predators	6.33	9.43	4.96	
		Parasites	0.67	0.99	0.53	
		'Others'	-(-12.59)	-(-18.75)	-(-9.87)	1.083
Adults (♀♀)	72.75	Predators	4.25	5.84	3.33	
		Parasites	1.75	2.41	1.37	0.440
Females	66.75	Red. fec.	34.71	52.00	27.22	
'Normal' ♀♀	32.04					
Ovipositing ♀♀	32.04					
Generation			95.46	74.87	74.87	0.2512

Expected eggs		2050.56
Actual eggs (N_2)		457.00
Index of population trend:	Expected	1608.28%
	Actual	358.43%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number II, 'E' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	282.50	Predators	143.75	50.88	50.88	0.491
Larvae 1	138.75	Predators	23.40	16.86	8.28	
		'Others'	47.35	34.13	16.76	0.490
Larvae 2	68.00	Predators	19.42	28.56	6.87	
		Parasites	0.92	1.35	0.33	
		'Others'	-(-1.34)	-(-1.97)	-(-0.47)	0.721
Adults (♀♀)	49.00	Predators	6.50	13.27	2.30	
		Parasites	1.00	2.04	0.35	0.364
Females	41.50	Red. fec.	23.66	57.01	8.38	
'Normal' ♀♀	17.84					
Ovipositing ♀♀	17.84					
Generation			264.66	93.68	93.68	0.0631

Expected eggs		1141.76
Actual eggs (N_2)		1782.00
Index of population trend:	Expected	404.16%
	Actual	630.80%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number II, 'W' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	648.75	Predators	533.17	82.18	82.18	0.178
Larvae 1	115.58	Predators	13.30	11.51	2.05	
		'Others'	35.11	30.38	5.41	0.581
Larvae 2	67.17	Predators	16.08	23.94	2.48	
		Parasites	2.08	3.10	0.32	
		'Others'	-(-5.74)	-(-8.55)	-(-0.88)	0.815
Adults (♀♀)	54.75	Predators	6.25	11.42	0.96	
		Parasites	2.00	3.65	0.31	0.442
Females	46.50	Red. fec.	22.32	48.00	3.44	
'Normal' ♀♀	24.18					
Ovipositing ♀♀	24.18					
Generation			624.54	96.27	96.27	0.0372

Expected eggs		1547.52
Actual eggs (N_2)		2292.50
Index of population trend:	Expected	238.54%
	Actual	353.37%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number III, 'N' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	382.00	Predators	147.08	38.50	38.50	0.615
Larvae 1	234.92	Predators	37.40	15.92	9.80	
		'Others'	65.52	27.89	17.15	0.562
Larvae 2	132.00	Predators	26.83	20.32	7.02	
		Parasites	3.67	2.78	0.96	
		'Others'	19.25	14.58	5.04	0.623
Adults (♀♀)	82.25	Predators	12.50	15.20	3.27	
		Parasites	2.50	3.04	0.66	0.055
Females	67.25	Red. fec.	53.80	80.00	14.08	
'Normal' ♀♀	13.45	♀♀ mortality	8.95	66.54	2.34	
Ovipositing ♀♀	4.50					
Generation			377.50	98.82	98.82	0.0117

Expected eggs		860.80
Actual eggs (N_2)		803.50
Index of population trend:	Expected	225.34%
	Actual	210.34%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number III, 'S' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	625.50	Predators	471.34	75.35	75.35	0.246
Larvae 1	154.16	Predators	29.10	18.88	4.65	
		'Others'	11.23	7.28	1.80	0.738
Larvae 2	113.83	Predators	26.92	23.65	4.30	
		Parasites	1.75	1.54	0.28	
		'Others'	34.66	30.45	5.54	0.444
Adults (♀♀)	50.50	Predators	4.50	8.91	0.72	
		Parasites	1.75	3.47	0.28	0.153
Females	44.25	Red. fec.	11.49	26.08	1.84	
'Normal' ♀♀	32.76	♀♀ mortality	25.02	76.37	4.00	
Ovipositing ♀♀	7.74					
Generation			617.76	98.76	98.76	0.0123

Expected eggs	2096.64
Actual eggs (N_2)	495.50
Index of population trend: Expected	3.35%
Actual	0.79%
Constant mortality rate	98.44%

Life table for the 1962-63 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number III, 'E' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	724.75	Predators	498.17	68.74	68.74	0.313
Larvae 1	226.58	Predators	13.71	60.50	1.89	
		'Others'	77.21	34.07	10.65	0.599
Larvae 2	135.66	Predators	23.83	17.56	3.29	
		Parasites	2.83	4.79	0.39	
		'Others'	65.00	47.91	8.97	0.324
Adults (♀♀)	44.00	Predators	4.00	9.09	0.55	
		Parasites	2.50	5.68	0.34	0.437
Females	37.50	Red. fec.	18.38	49.01	2.54	
'Normal' ♀♀	19.21					
Ovipositing ♀♀	19.21					
Generation			705.63	97.36	97.36	0.0263

Expected eggs	1223.68
Actual eggs (N_2)	1776.50
Index of population trend: Expected	168.84%
Actual	245.12%
Constant mortality rate	98.44%

Life table for the 1962-63 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number III, 'W' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N)	187.75	Predators	127.17	67.73	67.73	0.323
Larvae 1	60.58	Predators	43.10	71.15	22.96	
		'Others'	-(-36.60)	-(-60.42)	-(-19.49)	0.893
Larvae 2	54.08	Predators	15.50	28.66	8.26	
		Parasites	1.42	2.63	0.76	
		'Others'	-(- 0.84)	-(- 1.55)	-(- 0.45)	0.703
Adults (♀♀)	38.00	Predators	10.00	26.32	5.33	
		Parasites	4.75	12.50	2.52	0.361
Females	23.25	Red. fec.	9.53	40.99	5.07	
'Normal' ♀♀	13.72					
Ovipositing ♀♀	13.72					
Generation			174.03	92.69	92.69	0.0730

Expected eggs	878.08
Actual eggs (N_2)	3607.50
Index of population trend: Expected	467.68%
Actual	1921.44%
Constant mortality rate	98.44%

Life table for the 1962-63 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number IV, 'N' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N)	864.5	Predators	621.50	71.89	71.89	0.281
Larvae 1	243.00	Predators	56.20	23.13	6.50	
		'Others'	83.80	34.48	9.69	0.424
Larvae 2	103.00	Predators	40.25	39.08	4.66	
		Parasites	1.58	1.53	0.18	
		'Others'	-(-29.83)	-(-28.96)	-(-3.45)	0.883
Adults (♀♀)	91.00	Predators	19.00	20.88	2.20	
		Parasites	0.75	0.82	0.09	0.399
Females	71.25	Red. fec.	34.91	49.00	4.04	
'Normal' ♀♀	36.34					
Ovipositing ♀♀	36.34					
Generation			828.16	95.80	95.80	0.0420

Expected eggs		2325.76
Actual eggs (N_2)		6110.50
Index of population trend:	Expected	269.03%
	Actual	706.82%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number IV, 'S' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	243.75	Predators	144.17	59.14	59.14	0.409
Larvae 1	99.58	Predators	16.40	16.47	6.72	
		'Others'	35.01	35.16	14.36	0.484
Larvae 2	48.17	Predators	22.75	47.23	9.33	
		Parasites	0.50	1.04	0.21	
		'Others'	-(-7.58)	-(-15.73)	-(-3.10)	0.675
Adults (♀♀)	32.50	Predators	16.25	50.00	6.67	
		Parasites	0.75	2.31	0.31	0.148
Females	15.50	Red. fec.	10.70	69.03	4.39	
'Normal' ♀♀	4.80					
Ovipositing ♀♀	4.80					
Generation			238.95	98.03	98.03	0.0196

Expected eggs		307.20
Actual eggs (N_2)		2130.50
Index of population trend:	Expected	126.03%
	Actual	874.05%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of <u>L</u>. <u>ulmi</u> (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number IV, 'E' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	313.25	Predators	207.25	66.16	66.16	0.338
Larvae 1	106.00	Predators	29.80	28.11	9.51	
		'Others'	-(-2.63)	-(-2.48)	-(-0.84)	0.744
Larvae 2	78.83	Predators	30.75	39.01	9.82	
		Parasites	1.17	1.48	0.37	
		'Others'	18.66	23.67	5.96	0.358
Adults (♀♀)	28.25	Predators	8.75	30.97	2.79	
		Parasites	0.50	1.77	0.16	0.316
Females	19.00	Red. fec.	10.07	53.00	3.21	
'Normal' ♀♀	8.93					
Ovipositing ♀♀	8.93					
Generation			304.32	97.14	97.14	0.0285

Expected eggs		571.52
Actual eggs (N_2)		2340.00
Index of population trend:	Expected	182.45%
	Actual	747.17%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number IV, 'W' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	1423.28	Predators	1215.45	85.40	85.40	0.146
Larvae 1	207.83	Predators	61.80	29.74	4.34	
		'Others'	39.53	19.02	2.78	0.512
Larvae 2	106.50	Predators	48.67	45.70	3.42	
		Parasites	1.33	1.24	0.09	
		'Others'	-(-5.00)	-(-4.69)	-(-0.35)	0.577
Adults (♀♀)	61.50	Predators	19.50	31.70	1.37	0.246
Females	42.00	Red. fec.	26.88	64.00	1.89	
'Normal' ♀♀	15.12					
Ovipositing ♀♀	15.12					
Generation			1408.16	98.94	98.94	0.0106

Expected eggs 967.68
Actual eggs (N_2) 1683.50
Index of population trend: Expected 67.99%
Actual 118.28%
Constant mortality rate 98.44%

Life table for the 1962-63 generation of <u>L. ulmi</u> (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number V, 'N' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	1014.75	Predators	918.58	90.52	90.52	0.095
Larvae 1	96.17	Predators	25.80	26.83	2.54	
		'Others'	15.12	15.72	1.49	0.575
Larvae 2	55.25	Predators	28.50	51.58	2.81	
		Parasites	1.25	2.26	0.12	
		'Others'	-(-18.75)	-(-33.94)	-(-1.84)	0.801
Adults (♀♀)	44.25	Predators	11.25	25.42	1.11	
		Parasites	0.50	1.13	0.05	0.588
Females	32.50	Red. fec.	6.50	20.00	0.64	
'Normal' ♀♀	26.00					
Ovipositing ♀♀	26.00					
Generation			988.75	97.44	97.44	0.0256

Expected eggs	1664.00
Actual eggs (N_2)	2549.50
Index of population trend: Expected	163.98%
Actual	251.24%
Constant mortality rate	98.44%

Life table for the 1962-63 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number V, 'S' quadrant, at Macdonald College, Que.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	316.00	Predators	253.09	80.09	80.09	0.199
Larvae 1	62.91	Predators	18.00	28.61	5.70	
		'Others'	16.49	26.21	5.22	0.452
Larvae 2	28.42	Predators	12.58	44.26	3.98	
		Parasites	0.25	0.88	0.08	
		'Others'	7.84	27.59	2.47	0.273
Adults (♀♀)	7.75	Predators	1.00	12.90	0.32	
		Parasites	0.00	0.00	0.00	0.374
Females	6.75	Red. fec.	3.85	57.04	1.22	
'Normal' ♀♀	2.90					
Ovipositing ♀♀	2.90					
Generation			313.10	99.08	99.08	0.0091

Expected eggs		185.60
Actual eggs (N_2)		2005.60
Index of population trend:	Expected	58.73%
	Actual	634.49%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number V, 'E' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	179.25	Predators	43.75	24.41	24.41	
		'Others'	-(-107.75)	-(-60.11)	-(-60.11)	1.357
Larvae 1	243.25	Predators	17.6	7.24	9.82	
		'Others'	201.73	82.93	112.54	0.098
Larvae 2	23.92	Predators	12.75	53.30	7.11	
		Parasites	1.0	4.18	0.56	1.244
		'Others'	-(-19.58)	-(-81.85)	-(-10.92)	
Adults (♀♀)	29.75	Predators	3.25	10.92	1.81	
		Parasites	0.00	0.00	0.00	0.445
Females	26.50	Red. fec.	13.25	50.00	7.39	
'Normal' ♀♀	13.25					
Ovipositing ♀♀	13.25					
Generation			166.00	92.61	92.61	0.0739

Expected eggs		848.00
Actual eggs (N_2)		4869.50
Index of population trend:	Expected	473.08%
	Actual	2716.60%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number V, 'W' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	258.8	Predators	188.72	72.92	72.92	0.271
Larvae 1	70.08	Predators	10.2	14.55	3.94	
		'Others'	8.05	11.48	3.11	0.740
Larvae 2	51.83	Predators	15.92	30.72	6.15	
		Parasites	0.83	1.60	0.32	
		'Others'	0.83	1.60	0.32	0.661
Adults (♀♀)	34.25	Predators	11.75	34.30	4.54	
		Parasites	0.75	2.19	0.29	0.235
Females	21.75	Red. fec.	13.70	62.99	5.29	
'Normal' ♀♀	8.05					
Ovipositing ♀♀	8.05					
Generation			250.75	96.88	96.88	0.0311

Expected eggs	515.20
Actual eggs (N_2)	3319.50
Index of population trend: Expected	199.07%
Actual	1282.65%
Constant mortality rate	98.44%

Life table for the 1962-63 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number VI, 'N' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	$100M/N$	$100M/N_1$	S_x
Eggs (N_1)	218.50	Predators	197.83	90.54	90.54	0.095
Larvae 1	20.67	Predators	6.30	30.48	2.88	
		'Others'	-(-2.89)	-(-13.98)	-(-1.32)	0.835
Larvae 2	17.26	Predators	10.83	62.75	4.96	
		Parasites	0.16	0.93	0.07	0.506
		'Others'	-(-2.48)	-(-14.36)	-(-1.13)	
Adults (♀♀)	8.75	Predators	3.00	34.28	1.37	
		Parasites	0.25	2.86	0.11	0.264
Females	5.50	Red. fec.	3.19	58.00	1.46	
'Normal' ♀♀	2.31					
Ovipositing ♀♀	2.31					
Generation			216.19	98.94	98.94	0.0105

Expected eggs		147.84
Actual eggs (N_2)		2249.50
Index of population trend:	Expected	67.66%
	Actual	1029.52%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number VI, 'S' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	$100M/N$	$100M/N_1$	S_x
Eggs (N_1)	41.00	Predators	22.17	54.07	54.07	0.459
Larvae 1	18.83	Predators	2.60	13.81	6.34	
		'Others'	3.90	20.71	9.51	0.655
Larvae 2	12.33	Predators	6.07	49.23	14.81	
		Parasites	0.45	3.65	1.10	1.342
		'Others'	-(-10.74)	-(-87.10)	-(-36.20)	
Adults (♀♀)	16.55	Predators	4.75	28.70	11.59	
		Parasites	0.25	1.51	0.61	0.181
Females	11.55	Red. fec.	8.55	74.03	20.85	
'Normal' ♀♀	3.00					
Ovipositing ♀♀	3.00					
Generation			38.00	92.68	92.68	0.0731

Expected eggs		192.00
Actual eggs (N_2)		1298.50
Index of population trend:	Expected	468.29%
	Actual	3167.07%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number VI, 'E' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	126.00	Predators	86.67	68.79	68.79	0.312
Larvae 1	39.33	Predators	14.50	36.89	11.51	0.600
		'Others'	1.25	3.17	0.99	
Larvae 2	23.58	Predators	11.92	50.55	9.46	
		Parasites	0.58	2.46	0.46	0.869
		'Others'	-(-9.42)	-(-39.95)	-(-7.48)	
Adults (♀♀)	20.50	Predators	8.75	42.68	6.94	
		Parasites	0.25	1.22	0.20	0.196
Females	11.50	Red. fec.	7.48	65.04	5.94	
'Normal' ♀♀	4.02					
Ovipositing ♀♀	4.02					
Generation			121.98	96.81	96.81	0.0319

Expected eggs		268.80
Actual eggs (N_2)		1915.50
Index of population trend:	Expected	213.33%
	Actual	1520.24%
Constant mortality rate		98.44%

Life table for the 1962-63 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number VI, 'W' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	80.75	Predators	68.50	84.83	84.83	0.214
		'Others'	-(-5.05)	-(-6.25)	-(-6.25)	
Larvae 1	17.30	Predators	3.10	17.92	3.83	
		'Others'	0.12	0.69	0.15	0.814
Larvae 2	14.08	Predators	5.33	37.86	6.60	
		Parasites	0.42	2.98	0.52	0.716
		'Others'	-(-1.75)	-(-12.43)	-(-2.17)	
Adults (♀♀)	10.08	Predators	2.00	20.00	2.48	
		Parasites	0.00	0.00	0.00	0.248
Females	8.08	Red. fec.	5.58	69.06	6.91	
'Normal'♀♀	2.50					
Ovipositing ♀♀	2.50					
Generation			78.25	96.90	96.90	0.0309

Expected eggs		158.72
Actual eggs (N$_2$		962.00
Index of population trend:	Expected	196.56%
	Actual	1191.33%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number I, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	3908.63	Predators	3022.97	77.34	77.34	
		Parasites	62.66	1.60	1.60	
		'Others'	87.75	2.25	2.25	0.188
Larvae 1	735.25	Predators	205.75	27.98	5.26	
		Desiccation	165.88	22.56	4.24	
		'Others'	261.31	35.54	6.68	0.139
Larvae 2	102.31	Predators	63.94	62.50	1.77	
		Parasites	8.63	8.44	0.22	
		'Others'	8.85	8.64	0.23	0.204
Adults (♀♀)	20.90	Predators	7.03	33.64	0.18	
		Parasites	8.77	41.96	0.23	0.574
Females	5.10	Red. fec.	3.70	51.62	0.09	
'Normal' ♀♀	1.40	♀♀ mortality	0.20	15.16	0.01	
Ovipositing ♀♀	1.20					
Generation			3907.43	99.95	99.95	0.0003

Expected eggs		89.60
Actual eggs (N_2)		78.54
Index of population trend:	Expected	2.29%
	Actual	2.01%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number II, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	2227.13	Predators	1749.25	78.54	78.54	
		Parasites	40.75	1.83	1.83	
		'Others'	-(-57.25)	-(-2.57)	-(-2.57)	0.222
Larvae 1	494.38	Predators	148.63	30.06	6.67	
		Desiccation	95.25	19.27	4.28	
		'Others'	205.56	41.58	9.23	0.091
Larvae 2	44.94	Predators	26.69	59.39	1.20	
		Parasites	2.25	5.01	0.10	
		'Others'	3.60	8.01	0.16	0.276
Adults (♀♀)	12.40	Predators	3.45	27.82	0.16	
		Parasites	5.85	47.18	0.26	0.049
Females	3.10	Red. fec.	1.97	63.55	0.09	
'Normal' ♀♀	1.13	♀♀ mortality	0.52	46.02	0.02	
Ovipositing ♀♀	0.61					
Generation			2226.52	99.97	99.97	0.0003

Expected eggs	72.16
Actual eggs (N_2)	40.84
Index of population trend: Expected	3.24%
Actual	1.83%
Constant mortality rate	98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number III, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	1825.50	Predators	1578.38	86.46	86.46	
		Parasites	17.00	0.93	0.93	
		'Others'	9.62	0.53	0.53	0.121
Larvae 1	220.50	Predators	57.37	26.02	3.14	
		Desiccation	51.25	23.24	2.81	
		'Others'	81.44	36.94	4.46	0.138
Larvae 2	30.44	Predators	23.56	77.40	1.29	
		Parasites	0.44	1.44	0.02	
		'Others'	-(-9.09)	-(-29.86)	-(-0.49)	0.510
Adults (♀♀)	15.53	Predators	2.70	17.39	0.15	
		Parasites	5.23	33.68	0.29	0.119
Females	7.60	Red. fec.	5.00	65.79	0.27	
'Normal' ♀♀	2.60	♀♀ mortality	0.75	28.84	0.04	
Ovipositing ♀♀	1.85					
Generation			1823.65	99.90	99.90	0.0010

Expected eggs		166.40
Actual eggs (N_2)		129.46
Index of population trend:	Expected	9.12%
	Actual	7.09%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number IV, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	3608.63	Predators	3291.00	91.20	91.20	
		Parasites	38.63	1.07	1.07	
		'Others'	16.12	0.45	0.45	0.073
Larvae 1	262.88	Predators	117.50	44.70	3.26	
		Desiccation	32.63	12.41	0.90	
		'Others'	70.82	26.94	1.96	0.160
Larvae 2	41.93	Predators	27.19	66.04	0.77	
		Parasites	1.81	4.32	0.05	
		'Others'	-(-3.12)	-(-7.44)	-(-0.08)	0.371
Adults (♀♀)	15.55	Predators	4.05	26.05	0.08	
		Parasites	8.10	52.09	0.11	0.022
Females	3.40	Red. fec.	2.68	78.82	0.07	
'Normal' ♀♀	0.72	♀♀ mortality	0.38	52.78	0.01	
Ovipositing ♀♀	0.34					
Generation			3608.29	99.99	99.99	0.0001

Expected eggs		46.24
Actual eggs (N_2)		19.04
Index of population trend:	Expected	1.28%
	Actual	0.53%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number V, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	4339.00	Predators	3528.97	81.33	81.33	
		Parasites	47.53	1.10	1.10	
		'Others'	41.62	0.96	0.96	0.166
Larvae 1	720.88	Predators	366.13	50.79	8.44	
		Desiccation	93.12	12.92	2.15	
		'Others'	102.00	23.51	2.35	0.152
Larvae 2	159.63	Predators	112.25	70.32	2.59	
		Parasites	10.11	6.38	0.23	
		'Others'	14.44	9.05	0.33	0.143
Adults (♀♀)	22.75	Predators	9.75	42.86	0.22	
		Parasites	10.38	45.62	0.24	0.019
Females	2.62	Red. fec.	1.36	51.91	0.03	
'Normal' ♀♀	1.26	♀♀ mortality	0.82	65.08	0.02	
Ovipositing ♀♀	0.44					
Generation			4338.56	99.99	99.99	0.0001

Expected eggs		80.80
Actual eggs (N_2)		30.01
Index of population trend:	Expected	1.86%
	Actual	0.69%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number VI, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	2482.62	Predators	2155.00	86.80	86.80	
		Parasites	52.37	2.11	2.11	
		'Others'	18.12	0.73	0.73	0.104
Larvae 1	257.13	Predators	94.25	36.65	3.80	
		Desiccation	48.63	18.91	1.96	
		'Others'	78.87	30.67	3.18	0.138
Larvae 2	35.38	Predators	22.75	64.30	0.92	
		Parasites	0.80	2.26	0.02	
		'Others'	-(-9.35)	-(-2.64)	-(-0.37)	0.599
Adults (♀♀)	21.18	Predators	4.83	22.80	0.19	
		Parasites	12.45	58.78	0.50	0.023
Females	3.90	Red. fec.	3.13	80.26	0.13	
'Normal' ♀♀	0.77	♀♀ mortality	0.28	36.36	0.01	
Ovipositing ♀♀	0.49					
Generation			2482.13	99.98	99.98	0.0002

Expected eggs		49.28
Actual eggs (N_2)		39.61
Index of population trend:	Expected	1.98%
	Actual	1.60%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number I, 'N' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	3993.0	Predators	2889.38	72.36	72.36	
		Parasites	52.12	1.31	1.31	
		'Others'	82.00	2.05	2.05	0.243
Larvae 1	969.50	Predators	273.50	28.21	6.85	
		Desiccation	332.00	34.24	8.32	
		'Others'	302.25	31.18	7.57	0.063
Larvae 2	61.75	Predators	47.75	77.32	1.20	
		Parasites	0.50	0.81	0.01	
		'Others'	2.50	4.05	0.06	0.178
Adults (♀♀)	11.00	Predators	4.50	40.90	0.11	0.045
		Parasites	4.20	38.18	0.10	
Females	2.30	Red. fec.	1.22	53.04	0.03	
'Normal' ♀♀	1.80	♀♀ mortality	0.59	54.09	0.01	
Ovipositing ♀♀	0.49					
Generation			3992.51	99.98	99.98	0.0001

Expected eggs		69.12
Actual eggs (N_2)		31.33
Index of population trend:	Expected	1.73%
	Actual	0.78%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number I, 'S' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	5930.50	Predators	4305.00	72.59	72.59	
		Parasites	95.00	1.60	1.60	
		'Others'	216.50	3.65	3.65	0.022
Larvae 1	1314.00	Predators	241.50	18.37	4.07	
		Desiccation	229.00	17.42	3.86	
		'Others'	737.00	56.09	12.43	0.081
Larvae 2	106.50	Predators	68.00	63.84	1.15	
		Parasites	10.25	9.62	0.17	
		'Others'	15.45	14.51	0.26	0.120
Adults (♀♀)	12.80	Predators	4.80	37.50	0.08	
		Parasites	4.60	35.94	0.07	0.059
Females	3.40	Red. fec.	2.65	77.94	0.05	
'Normal' ♀♀	0.75					
Ovipositing ♀♀	0.75					
Generation			5929.75	99.98	99.98	0.0001

Expected eggs		48.00
Actual eggs (N_2)		49.00
Index of population trend:	Expected	0.81%
	Actual	0.83%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number I, 'E' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N)	3244.50	Predators	2855.00	88.00	88.00	
		Parasites	52.00	1.60	1.60	
		'Others'	9.50	0.29	0.29	0.101
Larvae 1	328.00	Predators	168.50	51.37	5.19	
		Desiccation	60.50	18.46	1.86	
		'Others'	-(-37.00)	-(-11.28)	-(-1.14)	0.415
Larvae 2	136.00	Predators	96.75	71.14	2.98	
		Parasites	16.25	11.95	0.50	
		'Others'	5.70	3.53	0.18	0.127
Adults (♀♀)	17.30	Predators	9.30	53.76	0.29	
		Parasites	7.40	43.53	0.23	0.006
Females	0.60	Red. fec.	0.50	83.33	0.01	
'Normal' ♀♀	0.10					
Ovipositing ♀♀	0.10					
Generation			3244.40	99.99	99.99	0.00003

Expected eggs	6.40
Actual eggs (N_2)	13.17
Index of polulation trend: Exptected	0.20%
Actual	0.41%
Constant mortality rate	98.44%

Life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number I, 'W' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	2466.50	Predators	2042.50	82.81	82.81	
		Parasites	51.50	2.09	2.09	
		'Others'	43.00	1.74	1.74	0.159
Larvae 1	392.50	Predators	139.50	42.34	5.66	
		Desiccation	42.00	12.75	1.70	
		'Others'	43.00	13.05	1.74	0.268
Larvae 2	105.00	Predators	43.25	41.19	1.75	
		Parasites	7.50	7.14	0.30	
		'Others'	11.75	11.19	0.48	0.405
Adults (♀♀)	42.50	Predators	9.50	22.35	0.39	
		Parasites	18.90	44.47	0.77	0.081
Females	14.10	Red. fec.	10.43	73.97	0.42	
'Normal' ♀♀	3.67	♀♀ mortality	0.22	5.99	0.01	
Ovipositing ♀♀	3.45					
Generation			2463.05	99.86	99.86	0.001

Expected eggs 234.88
Actual eggs (N_2) 220.33
Index of population trend: Expected 9.52%
Actual 8.93%
Constant mortality rate 98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number II, 'N' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	$100M/N$	$100M/N_1$	S_x
Eggs (N_1)	3306.50	Predators	2885.50	87.27	87.27	
		Parasites	56.50	1.71	1.71	
		'Others'	29.00	0.88	0.88	0.101
Larvae 1	335.50	Predators	163.50	48.73	4.94	
		Desiccation	90.00	26.83	2.72	
		'Others'	62.00	18.48	1.88	0.060
Larvae 2	20.00	Predators	9.50	47.50	0.29	
		Parasites	1.00	5.00	0.03	
		'Others'	-(-7.80)	-(-39.00)	-(-0.24)	0.865
Adults (♀♀)	17.30	Predators	3.60	20.81	0.11	
		Parasites	8.00	46.24	0.24	0.053
Females	5.70	Red. fec.	4.79	84.03	0.14	
'Normal' ♀♀	0.91					
Ovipositing ♀♀	0.91					
Generation			3305.59	99.97	99.97	0.0002

Expected eggs		58.24
Actual eggs (N_2)		65.50
Index of population trend:	Expected	1.76%
	Actual	1.98%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number II, 'S' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	707.00	Predators	356.00	50.35	50.35	
		Parasites	24.50	3.47	3.47	
		'Others'	-(-316.00)	44.07	44.07	0.908
Larvae 1	642.00	Predators	104.50	16.27	14.78	
		Desiccation	111.50	17.38	15.77	
		'Others'	357.00	55.61	50.50	0.107
Larvae 2	69.00	Predators	51.25	74.28	7.24	
		Parasites	3.75	5.43	0.53	
		'Others'	2.90	4.20	0.41	0.161
Adults (♀♀)	11.10	Predators	3.00	27.03	0.42	
		Parasites	5.90	53.15	0.83	0.068
Females	2.20	Red. fec.	0.50	22.73	0.07	
'Normal' ♀♀	1.70	♀♀ mortality	0.94	55.29	0.13	
Ovipositing ♀♀	0.76					
Generation			706.24	99.89	99.89	0.0010

Expected eggs		108.80
Actual eggs (N_2)		48.67
Index of population trend:	Expected	15.38%
	Actual	6.88%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number II, 'E' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	2073.00	Predators	1441.00	69.51	69.51	
		Parasites	32.0	1.54	1.54	
		'Others'	40.50	1.95	1.95	0.270
Larvae 1	559.50	Predators	199.00	35.57	9.60	
		Desiccation	85.00	15.19	4.10	
		'Others'	295.75	46.43	12.53	0.028
Larvae 2	15.75	Predators	5.50	34.92	0.27	
		Parasites	0.50	3.17	0.02	
		'Others'	4.35	27.62	0.21	0.343
Adults (♀♀)	5.40	Predators	1.50	27.78	0.07	
		Parasites	2.60	48.15	0.13	0.089
Females	1.30	Red. fec.	0.68	52.31	0.03	
'Normal' ♀♀	0.62	♀♀ mortality	0.14	22.58	0.01	
Ovipositing ♀♀	0.48					
Generation			2072.52	99.97	99.97	0.0002

Expected eggs		39.68
Actual eggs (N_2)		30.50
Index of population trend:	Expected	1.91%
	Actual	1.47%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number II, 'W' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	$100M/N$	$100M/N_1$	S_x
Eggs (N_1)	2822.0	Predators	2314.00	82.00	82.00	
		Parasites	50.00	1.77	1.77	
		'Others'	17.50	0.62	0.62	0.156
Larvae 1	440.50	Predators	127.50	28.94	4.52	
		Desiccation	94.50	21.45	3.35	
		'Others'	143.50	32.58	5.09	0.170
Larvae 2	75.00	Predators	40.50	54.00	1.44	
		Parasites	3.75	5.00	0.13	
		'Others'	14.95	19.93	0.53	0.211
Adults (♀♀)	15.80	Predators	5.70	36.08	0.20	
		Parasites	6.90	43.69	0.24	0.018
Females	3.20	Red. fec.	1.92	60.00	0.07	
'Normal' ♀♀	1.28	♀♀ mortality	0.99	77.34	0.03	
Ovipositing ♀♀	0.29					
Generation			2821.71	99.99	99.99	0.0001

Expected eggs		81.92
Actual eggs (N_2)		18.67
Index of population trend:	Expected	2.90%
	Actual	0.66%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number III, 'N' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	$100M/N$	$100M/N_1$	S_x
Eggs (N_1)	878.00	Predators	631.00	71.87	71.87	
		Parasites	25.50	2.90	2.90	
		'Others'	4.00	0.46	0.46	0.248
Larvae 1	217.50	Predators	77.50	35.63	8.83	
		Desiccation	43.50	20.00	4.95	
		'Others'	77.00	34.40	8.77	0.090
Larvae 2	19.50	Predators	15.75	80.76	1.79	
		Parasites	0.50	2.56	0.06	
		'Others'	-(-3.75)	-(-19.23)	-(-0.43)	0.359
Adults ♀♀	7.00	Predators	2.30	32.86	0.26	
		Parasites	2.00	28.57	0.23	0.030
Females	2.70	Red. fec.	2.27	84.07	0.26	
'Normal' ♀♀	0.43	♀♀ mortality	0.22	51.16	0.02	
Ovipositing ♀♀	0.21					
Generation			877.79	99.97	99.97	0.0002

Expected eggs		27.52
Actual eggs (N_2)		13.65
Index of population trend:	Expected	3.13%
	Actual	1.55%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number III, 'S' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	622.50	Predators	419.00	67.31	67.31	
		Parasites	6.00	0.96	0.96	
		'Others'	5.00	0.80	0.80	0.309
Larvae 1	192.50	Predators	15.00	7.79	2.41	
		Desiccation	36.00	18.70	5.78	
		'Others'	105.75	54.94	16.98	0.186
Larvae 2	35.75	Predators	30.25	84.61	4.86	
		Parasites	0.25	0.69	0.04	
		'Others'	-(-27.35)	-(-43.94)	-(-4.39)	0.912
Adults (♀♀)	32.60	Predators	4.10	12.58	0.66	
		Parasites	11.20	34.35	1.79	0.191
Females	17.30	Red. fec.	11.07	63.99	1.78	
'Normal' ♀♀	6.23					
Ovipositing ♀♀	6.23					
Generation			616.27	98.99	98.99	0.0100

Expected eggs		398.72
Actual eggs (N_2)		441.67
Index of population trend:	Expected	64.05%
	Actual	70.95%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number III, 'E' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	2140.00	Predators	1692.00	79.07	79.07	
		Parasites	16.00	0.75	0.75	
		'Others'	25.50	1.19	1.19	0.190
Larvae 1	406.50	Predators	126.00	30.99	5.89	
		Desiccation	108.00	26.56	5.04	
		'Others'	124.75	30.68	5.83	0.117
Larvae 2	47.75	Predators	36.00	75.39	1.68	
		Parasites	0.25	0.52	0.01	
		'Others'	-(-0.70)	-(-1.47)	-(-0.03)	0.255
Adults (♀♀)	12.20	Predators	2.40	19.67	0.11	
		Parasites	4.50	36.80	0.21	0.003
Females	5.30	Red. fec.	3.66	69.06	0.17	
'Normal' ♀♀	1.64	♀♀ mortality	1.60	97.56	0.07	
Ovipositing ♀♀	0.04					
Generation			2139.96	99.99	99.99	0.00001

Expected eggs		104.96
Actual eggs (N_2)		2.50
Index of population trend:	Expected	4.90%
	Actual	1.17%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number III, 'W' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	3661.50	Predators	3571.50	97.54	97.54	
		Parasites	20.50	0.56	0.56	
		'Others'	4.00	0.11	0.11	0.018
Larvae 1	65.50	Predators	11.00	16.79	0.30	
		Desiccation	17.50	26.72	0.49	
		'Others'	18.25	27.86	0.50	0.286
Larvae 2	18.75	Predators	12.25	65.33	0.33	
		Parasites	0.75	4.00	0.02	
		'Others'	-(-4.55)	-(-24.26)	-(-0.12)	0.549
Adults ♀♀	10.30	Predators	2.00	19.42	0.05	
		Parasites	3.20	31.07	0.08	0.091
Females	5.10	Red. fec.	3.00	58.82	0.08	
'Normal' ♀♀	2.10	♀♀ mortality	1.16	55.24	0.03	
Ovipositing ♀♀	0.94					
Generation			3660.56	99.97	99.97	0.0003

Expected eggs		134.40
Actual eggs (N_2)		60.00
Index of population trend:	Expected	3.67%
	Actual	1.64%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number IV, 'N' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	6390.50	Predators	6288.50	98.40	98.40	
		Parasites	48.50	0.76	0.76	0.008
Larvae 1	53.50	Predators	15.00	28.03	0.24	
		Desiccation	4.00	7.48	0.06	
		'Others'	4.25	7.94	0.07	0.565
Larvae 2	30.25	Predators	19.75	58.68	0.31	
		Parasites	0.25	0.82	0.004	
		'Others'	-(-9.65)	-(-31.90)	-(-0.15)	0.658
Adults (♀♀)	19.90	Predators	3.00	15.07	0.05	
		Parasites	10.40	52.26	0.16	0.021
Females	6.50	Red. fec.	5.20	80.00	0.08	
'Normal' ♀♀	1.30	♀♀ mortality	0.88	67.69	0.01	
Ovipositing ♀♀	0.42					
Generation			6390.08	99.99	99.99	0.00007

Expected eggs		83.20
Actual eggs (N_2)		15.50
Index of population trend:	Expected	1.30%
	Actual	0.24%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number IV, 'S' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	$100M/N$	$100M/N_1$	S_x
Eggs (N_1)	3156.00	Predators	2636.00	83.52	83.52	
		Parasites	52.50	1.66	1.66	
		'Others'	41.50	1.32	1.32	0.135
Larvae 1	426.0	Predators	241.50	56.69	7.65	
		Desiccation	52.50	12.32	1.66	
		'Others'	115.00	26.99	3.64	0.040
Larvae 2	17.00	Predators	12.50	73.52	0.40	
		Parasites	1.00	5.88	0.03	
		'Others'	-(-10.70)	-(-62.94)	-(-0.34)	0.835
Adults ♀♀	14.20	Predators	5.20	36.62	0.17	
		Parasites	7.50	51.82	0.24	0.020
Females	1.50	Red. fec.	1.20	80.00	0.04	
'Normal' ♀♀	0.30	♀♀ mortality	0.02	6.66		
Ovipositing ♀♀	0.28					
Generation			3155.72	99.99	99.99	0.00018

Expected eggs		19.20
Actual eggs (N_2)		18.50
Index of population trend:	Expected	0.60%
	Actual	0.59%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number IV, 'E' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	2437.50	Predators	2211.00	90.71	90.71	
		Parasites	18.00	0.74	0.74	
		'Others'	2.00	0.08	0.08	0.085
Larvae 1	206.50	Predators	52.00	25.18	2.13	
		Desiccation	31.00	15.01	1.27	
		'Others'	78.75	38.14	3.23	0.217
Larvae 2	44.75	Predators	23.00	51.39	0.94	
		Parasites	1.25	2.79	0.05	
		'Others'	5.30	11.84	0.22	0.340
Adults (♀♀)	15.20	Predators	4.60	30.30	0.20	
		Parasites	6.40	42.01	0.26	0.031
Females	4.20	Red. fec.	3.20	76.19	0.13	
'Normal' ♀♀	1.00	♀♀ mortality	0.53	53.00	0.02	
Ovipositing ♀♀	0.47					
Generation			2437.03	99.98	99.98	0.0002

Expected eggs	64.00
Actual eggs (N_2)	29.83
Index of population trend: Expected	2.63%
Actual	1.22%
Constant mortality rate	98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number IV, 'W' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	2450.50	Predators	2028.50	82.79	82.79	
		Parasites	35.50	1.45	1.45	
		'Others'	21.00	0.86	0.08	0.149
Larvae 1	365.50	Predators	161.50	44.19	6.60	
		Desiccation	43.00	11.76	1.75	
		'Others'	85.30	23.39	3.48	0.207
Larvae 2	75.70	Predators	55.50	73.51	2.26	
		Parasites	4.75	8.29	0.19	
		'Others'	2.55	3.37	0.10	0.170
Adults (♀♀)	12.90	Predators	3.40	26.35	0.14	
		Parasites	8.10	62.79	0.33	0.015
Females	1.40	Red. fec.	1.11	79.28	0.04	
'Normal' ♀♀	0.29	♀♀ mortality	0.10	34.48	0.00	
Ovipositing ♀♀	0.19					
Generation			2450.31	99.99	99.99	0.00008

Expected eggs		18.56
Actual eggs (N_2)		12.33
Index of population trend:	Expected	0.76%
	Actual	0.50%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number V, 'N' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	2743.50	Predators	2494.50	90.92	90.92	
		Parasites	14.00	0.51	0.51	
		'Others'	33.50	1.22	1.22	0.073
Larvae 1	201.50	Predators	87.50	43.42	3.19	
		Desiccation	64.50	32.00	2.35	
		'Others'	18.75	9.30	0.68	0.153
Larvae 2	30.75	Predators	20.00	64.04	0.73	
		Parasites	1.00	3.25	0.04	
		'Others'	2.95	9.59	0.11	0.221
Adults (♀♀)	6.80	Predators	3.30	48.52	0.12	
		Parasites	3.20	47.05	0.12	0.006
Females	0.30	Red. fec.	0.23	76.67	0.01	
'Normal' ♀♀	0.07	♀♀ mortality	0.03	42.85	0.001	
Ovipositing ♀♀	0.04					
Generation			2743.46	99.99	99.99	0.00001

Expected eggs	4.48
Actual eggs (N_2)	9.50
Index of population trend: Expected	0.16%
Actual	0.35%
Constant mortality rate	98.44%

Life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number V, 'S' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	4962.00	Predators	3572.20	71.99	71.99	
		Parasites	59.80	1.21	1.21	
		'Others'	17.00	0.34	0.34	0.265
Larvae 1	1313.00	Predators	720.00	54.84	14.51	
		Desiccation	178.50	13.59	3.59	
		'Others'	196.75	14.98	3.96	0.166
Larvae 2	217.75	Predators	154.75	71.06	3.12	
		Parasites	13.75	6.31	0.28	
		'Others'	14.35	6.59	0.29	0.160
Adults (♀♀)	34.90	Predators	14.30	40.97	0.29	
		Parasites	16.90	48.42	0.34	0.019
Females	3.70	Red. fec.	2.48	67.03	0.05	
'Normal' ♀♀	1.22	♀♀ mortality	0.54	44.26	0.01	
Ovipositing ♀♀	0.68					
Generation			4961.32	99.98	99.98	0.0001

Expected eggs		78.08
Actual eggs (N_2)		42.67
Index of population trend:	Expected	1.57%
	Actual	0.86%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number V, 'E' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N1)	5248.50	Predators	4466.70	85.10	85.10	
		Parasites	53.30	1.02	1.02	
		'Others'	24.00	0.46	0.46	0.134
Larvae 1	704.50	Predators	299.50	42.51	5.71	
		Desiccation	50.50	7.17	0.96	
		'Others'	142.75	20.26	2.72	0.301
Larvae 2	211.75	Predators	151.00	71.31	2.88	
		Parasites	17.50	8.26	0.33	
		'Others'	28.35	13.39	0.54	0.070
Adults (♀♀)	14.90	Predators	8.20	55.03	0.16	
		Parasites	4.50	30.20	0.09	0.032
Females	2.20	Red. fec.	1.28	58.18	0.02	
'Normal' ♀♀	0.92	♀♀ mortality	0.44	47.83	0.008	
Ovipositing ♀♀	0.48					
Generation			5248.02	99.99	99.99	0.00009

Expected eggs		58.88
Actual eggs (N_2)		30.67
Index of population trend:	Expected	1.12%
	Actual	0.58%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number V, 'W' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	4402.00	Predators	3582.50	81.38	81.38	
		Parasites	63.00	1.43	1.43	
		'Others'	92.00	2.10	2.10	0.151
Larvae 1	664.50	Predators	357.50	55.79	8.12	
		Desiccation	79.00	11.89	1.79	
		'Others'	49.75	7.49	1.13	0.268
Larvae 2	178.25	Predators	123.25	69.14	2.81	
		Parasites	8.50	4.79	0.19	
		'Others'	12.10	6.73	0.27	0.193
Adults (♀♀)	34.40	Predators	13.20	38.37	0.30	
		Parasites	16.90	49.13	0.38	0.017
Females	4.30	Red. fec.	1.46	33.95	0.03	
'Normal' ♀♀	2.84	♀♀ mortality	2.26	79.58	0.05	
Ovipositing ♀♀	0.58					
Generation			4401.42	99.98	99.98	0.0001

Expected eggs		181.76
Actual eggs (N_2)		37.18
Index of population trend:	Expected	4.13%
	Actual	0.84%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number VI, 'N' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N)	3158.00	Predators	2772.50	87.79	87.79	
		Parasites	58.00	1.84	1.84	
		'Others'	22.00	0.69	0.69	0.097
Larvae 1	305.50	Predators	158.50	51.88	5.02	
		Desiccation	35.50	11.62	1.12	
		'Others'	54.50	17.84	1.73	0.187
Larvae 2	57.00	Predators	34.25	60.09	1.08	
		Parasites	1.50	2.63	0.05	
		'Others'	5.65	9.91	0.18	0.274
Adults (♀♀)	15.60	Predators	3.40	21.79	0.12	
		Parasites	10.40	66.66	0.33	0.049
Females	1.80	Red. fec.	1.00	55.55	0.03	
'Normal' ♀♀	0.80	♀♀ mortality	0.03	3.32	0.00	
Ovipositing ♀♀	0.77					
Generation			3157.23	99.98	99.98	0.0002

Expected eggs		51.20
Actual eggs (N_2)		49.50
Index of population trend:	Expected	1.62%
	Actual	1.57%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number VI, 'S' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	2117.00	Predators	1874.50	88.55	88.55	
		Parasites	53.50	2.53	2.53	
		'Others'	4.00	0.19	0.19	0.087
Larvae 1	185.00	Predators	28.00	15.14	1.32	
		Parasites	53.00	28.65	2.50	
		'Others'	92.00	49.73	4.35	0.065
Larvae 2	12.00	Predators	7.25	60.41	0.34	
		Parasites	0.25	2.08	0.01	
		'Others'	-(-16.10)	-(-1.34)	-(-0.76)	1.717
Adults (♀♀)	20.60	Predators	5.70	27.66	0.27	
		Parasites	12.10	58.74	0.57	0.020
Females	2.80	Red. fec.	2.38	85.00	0.11	
'Normal' ♀♀	0.42	♀♀ mortality	0.003	0.71	0.0001	
Ovipositing ♀♀	0.417					
Generation			2116.583	99.98	99.98	0.0002

Expected eggs		26.88
Actual eggs (N_2)		26.67
Index of population trend:	Expected	1.27%
	Actual	1.26%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number VI, 'E' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	2063.00	Predators	1877.00	90.98	90.98	
		Parasites	69.00	3.34	3.34	
		'Others'	2.00	0.10	0.10	0.056
Larvae 1	115.00	Predators	32.50	28.26	1.58	
		Desiccation	12.00	10.43	0.58	
		'Others'	20.25	17.61	0.98	0.437
Larvae 2	50.25	Predators	31.25	62.19	1.51	
		Parasites	1.25	2.49	0.06	
		'Others'	0.85	1.69	0.04	0.336
Adults (♀♀)	16.90	Predators	3.90	23.08	0.19	
		Parasites	8.80	52.07	0.43	0.044
Females	4.20	Red. fec.	2.81	66.90	0.14	
'Normal' ♀♀	1.39	♀♀ mortality	0.64	46.04	0.03	
Ovipositing ♀♀	0.75					
Generation			2062.25	99.96	99.96	0.0004

Expected eggs		88.96
Actual eggs (N_2)		48.00
Index of population trend:	Expected	4.31%
	Actual	2.33%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number VI, 'W' quadrant, at Macdonald College, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	2592.50	Predators	2096.00	80.85	80.85	
		Parasites	29.00	1.12	1.12	
		'Others'	44.50	1.72	1.72	0.163
Larvae 1	423.00	Predators	158.00	37.35	6.09	
		Desiccation	94.00	22.22	3.63	
		'Others'	148.75	35.17	5.74	0.053
Larvae 2	22.25	Predators	18.25	82.02	0.70	
		Parasites	0.20	0.90	0.01	
		'Others'	-(-27.80)	-(-124.49)	-(-1.07)	1.420
Adults (♀♀)	31.60	Predators	6.32	19.94	0.24	
		Parasites	18.50	58.54	0.71	0.001
Females	6.78	Red. fec.	6.31	93.08	0.24	
'Normal' ♀♀	0.47	♀♀ mortality	0.43	91.49	0.01	
Ovipositing ♀♀	0.04					
Generation			2592.46	99.99	99.99	0.00002

Expected eggs		30.08
Actual eggs (N_2)		34.25
Index of population trend:	Expected	1.16%
	Actual	1.32%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number I, at Ile Bizard, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	23488.75	Predators	20944.60	89.17	89.17	
		'Others'	222.28	0.95	0.95	0.099
Larvae 1	2321.88	Predators	1593.25	68.62	6.78	
		Desiccation	503.25	21.67	2.14	
		'Others'	114.00	4.91	0.49	0.048
Larvae 2	111.38	Predators	40.94	36.76	0.17	
		'Others'	34.44	30.72	0.15	0.323
Adults (♀♀)	36.00	Predators	15.93	44.25	0.07	0.059
Females	20.08	Red. fec.	12.53	62.40	0.05	
'Normal' ♀♀	7.55	♀♀ mortality	5.43	71.92	0.02	
Ovipositing ♀♀	2.12					
Generation			23486.63	99.99	99.99	0.0001

Expected eggs		483.04
Actual eggs (N_2)		243.13
Index of population trend:	Expected	2.05%
	Actual	1.03%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number II, at Ile Bizard, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	8643.75	Predators	6742.0	78.00	78.00	
		'Others'	104.0	1.20	1.20	0.208
Larvae 1	1797.75	Predators	1047.00	58.24	12.11	
		Desiccation	211.75	11.79	2.45	
		'Others'	282.81	15.73	3.27	0.143
Larvae 2	256.19	Predators	84.25	32.89	0.98	
		'Others'	65.11	25.41	0.75	0.417
Adults (♀♀)	106.83	Predators	83.05	77.74	0.96	0.017
Females	23.78	Red. fec.	12.08	50.80	0.14	
'Normal' ♀♀	11.70	♀♀ mortality	9.84	84.17	0.11	
Ovipositing ♀♀	1.86					
Generation			8641.89	99.97	99.97	0.0002

Expected eggs	748.32
Actual eggs (N_2)	88.38
Index of population trend: Expected	8.66%
Actual	1.02%
Constant mortality rate	98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number III, at Ile Bizard, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	2971.13	Predators	2341.00	78.79	78.79	
		'Others'	-(-218.76)	-(-7.36)	-(-7.36)	0.286
Larvae 1	848.89	Predators	524.13	60.67	17.64	
		Desiccation	129.75	15.27	4.37	
		'Others'	107.26	12.62	3.61	0.103
Larvae 2	87.75	Predators	26.06	33.12	0.97	
		'Others'	27.66	31.52	0.93	0.354
Adults (♀♀)	31.03	Predators	15.75	50.76	0.53	0.030
Females	15.28	Red. fec.	10.10	66.10	0.34	
'Normal' ♀♀	5.18	♀♀ mortality	4.26	82.24	0.14	
Ovipositing ♀♀	0.92					
Generation			2970.21	99.96	99.96	0.0003

Expected eggs	331.36
Actual eggs (N_2)	58.87
Index of population trend: Expected	11.15%
Actual	1.98%
Constant mortality rate	98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number VI, at Ile Bizard, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	2370.00	Predators	1880.00	79.33	79.33	
		'Others'	10.00	0.42	0.42	0.203
Larvae 1	480.00	Predators	216.00	45.00	9.11	
		Desiccation	166.00	34.58	7.00	0.319
		'Others'	-(-55.50)	-(-11.56)	-(-2.34)	
Larvae 2	153.50	Predators	19.50	12.70	0.82	1.30
		'Others'	-(-65.20)	42.48	-(-2.75)	
Adults (♀♀)	199.20	Predators	74.40	37.35	3.14	0.147
Females	124.80	Red. fec.	79.87	64.00	3.37	
'Normal' ♀♀	44.93	♀♀ mortality	15.61	34.74	0.66	
Ovipositing ♀♀	29.32					
Generation			2340.68	98.76	98.76	0.0123

Expected eggs		2875.52
Actual eggs (N_2)		1876.50
Index of population trend:	Expected	121.33%
	Actual	79.18%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number I, 'N' quadrant, at Ile Bizard, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	29962.00	Predators	26182.5	87.39	87.39	
		'Others'	308.50	1.03	1.03	0.116
Larvae 1	3471.00	Predators	2496.00	71.91	8.33	
		Desiccation	679.00	19.56	2.27	
		'Others'	65.25	2.18	0.21	0.066
Larvae 2	230.75	Predators	80.75	34.84	0.27	
		'Others'	109.60	47.49	0.36	0.175
Adults (♀♀)	40.40	Predators	14.8	36.63	0.05	0.058
Females	25.60	Red. fec.	15.87	61.99	0.05	
'Normal' ♀♀	9.73	♀♀ mortality	7.39	75.95	0.03	
Ovipositing ♀♀	2.34					
Generation			29959.66	99.99	99.99	0.00008

Expected eggs		622.72
Actual eggs (N_2)		123.75
Index of population trend:	Expected	2.07%
	Actual	0.41%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number I, 'E' quadrant, at Ile Bizard, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	20601.00	Predators	18924.00	91.86	91.86	
		'Others'	45.50	0.22	0.22	0.079
Larvae 1	1631.50	Predators	904.50	55.44	4.39	
		Desiccation	498.50	30.55	2.42	
		'Others'	183.25	11.23	0.89	0.027
Larvae 2	45.25	Predators	16.00	35.36	0.08	
		'Others'	-(-5.75)	-(-12.71)	-(-0.03)	0.773
Adults (♀♀)	35.00	Predators	15.40	44.00	0.08	0.126
Females	19.60	Red. fec.	12.54	63.98	0.06	
'Normal' ♀♀	7.06	♀♀ mortality	2.65	37.54	0.01	
Ovipositing ♀♀	4.41					
Generation			20596.59	99.98	99.98	0.0002

Expected eggs		451.84
Actual eggs (N_2)		282.50
Index of population trend:	Expected	2.19%
	Actual	1.37%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number I, 'S' quadrant, at Ile Bizard, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	18455.00	Predators	16958.40	91.90	91.90	
		'Others'	116.10	0.63	0.63	0.074
Larvae 1	1380.50	Predators	674.00	48.82	3.65	
		Desiccation	515.50	37.34	2.79	
		'Others'	111.50	8.08	0.60	0.058
Larvae 2	79.50	Predators	28.25	35.53	0.15	
		'Others'	15.15	19.06	0.08	0.454
Adults (♀♀)	36.1	Predators	15.30	42.38	0.08	0.006
Females	20.80	Red. fec.	12.69	61.01	0.07	
'Normal' ♀♀	8.11	♀♀ mortality	7.90	97.41	0.04	
Ovipositing ♀♀	0.21					
Generation			18454.79	99.99	99.99	0.00001

Expected eggs		519.04
Actual eggs (N_2)		468.50
Index of population trend:	Expected	2.81%
	Actual	2.53%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number I, 'W' quadrant, at Ile Bizard, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	24937.00	Predators	21713.50	87.07	87.07	
		'Others'	419.00	1.68	1.68	0.112
Larvae 1	2804.50	Predators	2298.50	81.96	9.22	
		Desiccation	320.00	11.41	1.28	
		'Others'	96.00	3.42	0.38	0.032
Larvae 2	90.00	Predators	38.75	43.06	0.16	
		'Others'	18.75	20.83	0.08	0.361
Adults (♀♀)	32.50	Predators	18.20	56.00	0.07	0.046
Females	14.30	Red. fec.	9.01	63.00	0.04	
'Normal' ♀♀	5.29	♀♀ mortality	3.77	71.27	0.01	
Ovipositing ♀♀	1.52					
Generation			24935.48	99.99	99.99	0.00006

Expected eggs		338.56
Actual eggs (N_2)		97.75
Index of population trend:	Expected	1.36%
	Actual	0.39%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number II, 'N' quadrant, at Ile Bizard, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	13821.00	Predators	10644.00	77.01	77.01	
		'Others'	140.50	1.02	1.02	0.220
Larvae 1	3036.50	Predators	2123.00	69.92	15.36	
		Desiccation	500.50	16.48	3.62	
		'Others'	344.75	11.35	2.49	0.022
Larvae 2	68.25	Predators	17.50	25.64	0.13	
		'Others'	15.05	22.05	0.11	0.523
Adults (♀♀)	35.70	Predators	25.50	71.34	0.18	0.014
Females	10.2	Red. fec.	6.22	60.98	0.05	
'Normal' ♀♀	3.98	♀♀ mortality	3.48	87.44	0.02	
Ovipositing ♀♀	0.50					
Generation			13820.50	99.99	99.99	0.00004

Expected eggs		254.72
Actual eggs (N_2)		31.50
Index of population trend:	Expected	1.84%
	Actual	0.23%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number II, 'S' quadrant, at Ile Bizard, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	2871.00	Predators	1293.50	45.05	45.05	
		'Others'	106.00	3.70	3.70	0.513
Larvae 1	1471.50	Predators	648.00	44.04	22.57	
		Desiccation	97.00	6.59	3.38	
		'Others'	477.75	32.47	16.64	0.169
Larvae 2	248.75	Predators	83.75	33.68	2.92	
		'Others'	-(-38.70)	-(-15.56)	-(-1.35)	0.819
Adults (♀♀)	203.70	Predators	151.10	74.18	5.26	0.026
Females	52.60	Red. fec.	25.25	48.00	0.88	
'Normal' ♀♀	27.35	♀♀ mortality	22.10	80.80	0.77	
Ovipositing ♀♀	5.25					
Generation			2865.75	99.82	99.82	0.0018

Expected eggs	1750.40
Actual eggs (N_2)	214.75
Index of population trend: Expected	60.96%
Actual	7.48%
Constant mortality rate	98.44%

Life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number II, 'E' quadrant, at Ile Bizard, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	7481.50	Predators	6156.50	82.29	82.29	
		'Others'	48.50	0.65	0.65	0.171
Larvae 1	1276.50	Predators	766.50	60.05	10.25	
		Desiccation	141.50	11.08	1.89	
		'Others'	107.00	8.38	1.43	0.205
Larvae 2	261.50	Predators	104.75	40.05	1.40	
		'Others'	120.85	46.21	1.62	0.137
Adults (♀♀)	35.90	Predators	24.90	69.35	0.33	0.033
Females	11.00	Red. fec.	7.70	70.00	0.10	
'Normal' ♀♀	3.30	♀♀ mortality	2.10	63.64	0.02	
Ovipositing ♀♀	1.20					
Generation			7480.30	99.98	99.98	0.0002

Expected eggs		211.20
Actual eggs (N_2)		76.50
Index of population trend:	Expected	2.82%
	Actual	1.02%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number II, 'W' quadrant, at Ile Bizard, Quebec.

x	N_x	M_xF	M_x	100M/N	100M/N_1	S_x
Eggs (N_1)	10401.5	Predators	8874.00	85.31	85.31	
		'Others'	121.00	1.16	1.16	0.135
Larvae 1	1406.50	Predators	650.50	46.25	6.25	
		Desiccation	108.00	7.68	1.04	
		'Others'	201.75	14.34	1.94	0.317
Larvae 2	446.25	Predators	131.00	29.36	1.26	
		'Others'	163.25	36.58	1.57	0.341
Adults (♀♀)	152.00	Predators	130.70	85.99	1.27	0.003
Females	21.30	Red. fec.	9.16	43.00	0.08	
'Normal' ♀♀	12.14	♀♀ mortality	11.66	96.05	0.11	
Ovipositing ♀♀	0.48					
Generation			10401.02	99.99	99.99	0.00005

Expected eggs	776.96
Actual eggs (N_2)	30.75
Index of population trend: Expected	7.47%
Actual	0.30%
Constant mortality rate	98.44%

Life table for the 1963-64 generation of <u>L. ulmi</u> (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number III, 'N' quadrant, at Ile Bizard, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	2330.50	Predators	1856.00	79.64	79.64	
		'Others'	24.00	1.03	1.03	0.193
Larvae 1	450.50	Predators	192.00	42.62	8.24	
		Desiccation	39.00	8.65	1.67	
		'Others'	-(-17.50)	-(-3.88)	-(-0.75)	0.526
Larvae 2	237.00	Predators	95.75	40.40	4.10	
		'Others'	105.35	44.45	4.52	0.151
Adults (♀♀)	35.90	Predators	13.80	38.44	0.59	0.003
Females	22.10	Red. fec.	19.00	85.97	0.82	
'Normal' ♀♀	3.10	♀♀ mortality	2.98	96.13	0.13	
Ovipositing ♀♀	0.12					
Generation			2330.38	99.99	99.99	0.00005

Expected eggs		198.40
Actual eggs (N_2)		8.00
Index of population trend:	Expected	8.51%
	Actual	0.34%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number III, 'S' quadrant, at Ile Bizard, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	1558.00	Predators	893.00	57.32	57.32	1.048
		'Others'	-(-967.50)	-(-62.10)	-(-62.10)	
Larvae 1	1632.50	Predators	1201.00	73.57	77.09	
		Desiccation	318.50	19.51	20.44	
		'Others'	67.75	4.15	4.35	0.028
Larvae 2	45.25	Predators	7.25	16.02	0.47	
		'Others'	-(-2.20)	-(-4.86)	-(-0.14)	0.888
Adults (♀♀)	40.20	Predators	27.20	67.66	1.74	0.019
Females	13.00	Red. fec.	6.11	47.00	0.39	
'Normal' ♀♀	6.89	♀♀ mortality	6.10	88.53	0.39	
Ovipositing ♀♀	0.79					
Generation			1557.21	99.95	99.95	0.0005

Expected eggs		440.96
Actual eggs (N_2)		50.50
Index of population trend:	Expected	28.30%
	Actual	3.24%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number III, 'E' quadrant, at Ile Bizard, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	6227.50	Predators	4945.50	79.41	79.41	
		'Others'	68.00	1.09	1.09	0.195
Larvae 1	1214.00	Predators	683.50	56.30	10.98	
		Desiccation	129.50	10.68	2.08	
		'Others'	350.00	28.83	5.62	0.042
Larvae 2	51.00	Predators	10.50	20.59	0.17	
		'Others'	32.70	64.12	0.53	0.153
Adults (♀♀)	7.80	Predators	2.30	29.48	0.04	0.138
Females	5.50	Red. fec.	1.54	28.00	0.02	
'Normal' ♀♀	3.96	♀♀ mortality	2.88	72.73	0.04	
Ovipositing ♀♀	1.08					
Generation			6226.42	99.98	99.98	0.0002

Expected eggs		253.44
Actual eggs (N_2)		69.00
Index of population trend:	Expected	4.06%
	Actual	1.12%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of *L. ulmi* (L.) on apple, based on numbers per 2 leaf clusters obtained in tree number III, 'W' quadrant, at Ile Bizard, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	1768.50	Predators	1669.00	94.37	94.37	
		'Others'	1.00	0.05	0.05	0.056
Larvae 1	98.50	Predators	20.00	20.30	1.13	
		'Others'	28.75	28.19	1.63	0.180
		Desiccation	32.00	32.49	1.84	
Larvae 2	17.75	Predators	2.75	15.49	0.16	
		'Others'	-(-25.20)	-(-141.97)	-(-1.42)	2.265
Adults (♀♀)	40.20	Predators	19.70	49.00	1.11	0.042
Females	20.50	Red. fec.	13.74	77.69	0.78	
'Normal' ♀♀	6.76	♀♀ mortality	5.07	75.00	0.29	
Ovipositing ♀♀	1.69					
Generation			1766.81	99.90	99.90	0.0009

Expected eggs		432.64
Actual eggs (N_2)		108.00
Index of population trend:	Expected	24.46%
	Actual	6.12%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained per quadrant in tree numbers IV and V, at Ile Bizard, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	431.19	Predators	311.12	72.15	72.15	
		'Others'	3.38	0.78	0.78	0.271
Larvae 1	116.69	Predators	46.50	39.85	10.78	
		Desiccation	11.94	1.02	2.78	
		'Others'	16.44	1.41	3.81	0.358
Larvae 2	41.81	Predators	4.12	9.85	0.96	
		'Others'	15.75	37.67	3.65	0.525
Adults (♀♀)	21.94	Predators	4.48	20.41	1.04	0.144
Females	17.46	Red. fec.	10.65	60.99	2.47	
'Normal' ♀♀	6.81	♀♀ mortality	3.64	53.45	0.84	
Ovipositing ♀♀	3.17					
Generation			428.02	99.26	99.26	0.0073

Expected eggs		435.84
Actual eggs (N_2)		200.72
Index of population trend:	Expected	101.08%
	Actual	46.55%
Constant mortality rate		98.44%

Life table for the 1963-64 generation of L. ulmi (L.) on apple, based on numbers per 2 leaf clusters obtained per quadrant in tree number VI, at Ile Bizard, Quebec.

x	N_x	M_xF	M_x	100M/N	$100M/N_1$	S_x
Eggs (N_1)	592.50	Predators	470.00	79.32	79.32	
		'Others'	2.50	0.42	0.42	0.203
Larvae 1	120.00	Predators	54.00	45.00	9.11	
		Desiccation	41.50	34.58	7.00	
		'Others'	-(-13.88)	-(-11.57)	-(-2.34)	0.320
Larvae 2	38.38	Predators	4.88	12.71	0.82	
		'Others'	-(-16.30)	-(-42.47)	-(-2.74)	1.298
Adults (♀♀)	49.80	Predators	18.60	37.35	3.14	0.147
Females	31.20	Red. fec.	19.97	64.01	3.37	
'Normal' ♀♀	11.23	♀♀ mortality	3.90	34.73	0.66	
Ovipositing ♀♀	7.33					
Generation			585.17	98.76	98.76	0.0124

Expected eggs		718.88
Actual eggs (N_2)		469.12
Index of population trend:	Expected	121.33%
	Actual	79.18%
Constant mortality rate		98.44%

APPENDIX

PART II

COUNTS & ANALYSIS OF VARIANCE

Species: Lepidosaphes ulmi (L.)
Stage sampled: Eggs
Sample: 2 leaf clusters

Date of sampling: May 12, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	174	46	178	330	728	528	20	990	117	1655	2383
2	0	46	279	84	409	155	130	407	539	1231	1640
3	102	178	828	474	1582	176	236	78	127	617	2199
4	1347	246	191	1476	3260	775	204	473	698	2150	5410
5	133	86	15	135	369	129	357	209	131	826	1195
6	626	36	164	304	1130	40	0	37	0	77	1207
Total	2382	638	1655	2803	7478	1803	947	2194	1612	6556	14034

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	1566417.4	5	(MST)313283.5	3.62	2.48	3.58
Within trees						
Levels	17710.0	1	17710.0	0.20	4.11	7.39
Quadrants	424599.6	3	141533.0	1.63	2.86	4.38
Levels x Quadrants	161292.9	3	53764.0	0.62	2.86	4.38
Error	3025155.5	35	(MSR) 86433.0	0	0	0

$\bar{x}$ = 292.37

% S.E. = 27.67

S.E. ($S_{\bar{x}}$) = 80.8

C.V.$_{\underline{n}}$ = 162.86

Term "predated" used in this and other tables of Part II of the Appendix means "killed by predators".

Species: _Lepidosaphes ulmi_ (L.)
Stage sampled: Predated eggs
Sample: 2 leaf clusters

Date of sampling: May 12, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	27	4	8	10	49	0	5	202	29	236	285
2	0	5	14	22	41	18	16	23	28	85	126
3	3	6	47	25	81	22	55	0	0	77	158
4	158	14	0	113	285	402	15	12	0	429	714
5	0	2	4	0	6	0	16	3	257	276	282
6	82	0	2	84	168	40	0	37	0	77	245
Total	270	31	75	254	630	482	107	277	314	1180	1810

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	28174.0	5	(MST)5634.0	0.92	2.48	3.58
Within trees						
Levels	6302.0	1	6302.0	1.03	4.11	7.39
Quadrants	17671.0	3	5890.0	0.97	2.86	4.38
Levels x Quadrants	1625.0	3	541.0	0.08	2.86	4.38
Error	212530.0	35	(MSR)6072.0	0	0	0

$\bar{x}$ = 37.70

% S.E. = 28.64

S.E. ($S_{\bar{x}}$) = 10.8

C.V.$_{\underline{n}}$ = 70.25

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *H. malus* and others
Sample: 2 leaf clusters

Date of sampling: May 12, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	2	0	1	0	3	0	0	22	0	22	25
2	1	0	0	6	7	3	0	0	0	3	10
3	0	6	1	1	8	1	0	0	0	1	9
4	57	1	0	40	98	5	0	0	22	27	125
5	0	0	1	3	4	0	1	0	0	1	5
6	0	0	1	1	2	0	1	2	8	11	13
Total	60	7	7	51	122	9	2	24	30	65	187

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	1350.0	5	(MST)	270.0	2.81	2.48	3.58
Within trees							
Levels	68.0	1		68.0	.70	4.11	7.39
Quadrants	302.0	3		100.0	1.04	2.86	4.38
Levels x Quadrants	212.0	3		70.0	.72	2.86	4.38
Error	3355.0	35	(MSR)	96.0	0	0	0

$\bar{x}$ = 3.89

% S.E. = 60.92

S.E. ($S_{\bar{x}}$) = 2.37

$C.V._{n}$ = 268.63

Species: <u>Lepidosaphes ulmi</u> (L.)
Stage sampled: Eggs
Sample: 2 leaf clusters

Date of sampling: May 24, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	251	35	446	95	827	625	0	573	17	1215	2042
2	0	301	270	330	901	244	0	156	1591	1991	2892
3	562	389	1527	116	2594	185	1451	165	0	1801	4395
4	727	72	479	1898	3176	283	410	42	0	735	3911
5	400	218	335	633	1586	3288	552	42	122	4004	5590
6	138	75	179	0	392	56	38	82	0	176	568
Total	2078	1090	3236	3072	9476	4681	2451	1060	1730	9922	19398

Analysis of Variance

SOURCES OF VARIANCE	<u>S.S.</u>	<u>d.f.</u>	<u>M.S.</u>	<u>F</u>	<u>F_{05}</u>	<u>F_{01}</u>
Between trees	2000296.0	5	(MST)400059.2	1.01	2.48	3.58
Within trees						
Levels	4144.0	1	4144.0	0.01	4.11	7.39
Quadrants	472249.0	3	157416.3	0.39	2.86	4.38
Levels x Quadrants	1259512.0	3	419837.0	1.06	2.86	4.38
Error	13819007.0	35	(MSR)394829.0	0	0	0

$\bar{x}$ = 404.12

% S.E. = 22.5

S.E. ($S_{\bar{x}}$) = 91.2

C.V.$_{\underline{n}}$ = 61.68

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Predated eggs
Sample: 2 leaf clusters

Date of sampling: May 24, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	35	0	9	8	52	73	0	146	6	225	277
2	0	12	0	29	41	14	0	9	128	151	192
3	23	9	83	22	137	22	181	37	0	240	377
4	199	0	9	330	538	88	140	7	7	242	780
5	47	21	51	63	182	201	16	0	10	227	409
6	32	0	7	0	39	5	5	0	0	10	49
Total	336	42	159	452	989	403	342	199	151	1095	2084

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	38745.0	5	(MST) 7749.0	1.67	2.48	3.58
Within trees						
Levels	234.0	1	234.0	0.05	4.11	7.39
Quadrants	8299.0	3	2766.0	0.59	2.86	4.38
Levels x Quadrants	15323.0	3	5107.0	1.10	2.86	4.38
Error	162337.0	35	(MSR) 4638.0	0	0	0

$\bar{x}$ = 43.41

% S.E. = 29.25

S.E. ($S_{\bar{x}}$) = 12.7

C.V.$_{\underline{n}}$ = 174.8

Species: Lepidosaphes ulmi (L.)
Stage sampled: A. mytilaspidis
Sample: 2 leaf clusters

Date of sampling: May 24, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	4	0	0	0	4	0	0	0	0	0	4
2	1	0	0	1	2	1	1	1	2	5	7
3	2	0	1	2	5	5	0	3	3	11	16
4	11	0	0	0	11	1	0	1	2	4	15
5	1	0	0	6	7	4	1	0	0	5	12
6	1	0	0	0	1	0	0	0	0	0	1
Total	20	0	1	9	30	11	2	5	7	25	55

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	23.0	5	(MST)	4.6	1.32	2.48	3.58
Within trees							
Levels	0.52	1		0.52	0.14	4.11	7.39
Quadrants	41.0	3		13.6	3.88	2.86	4.38
Levels x Quadrants	8.48	3		2.82	0.80	2.86	4.38
Error	123.0	35	(MSR)	3.5	0	0	0

$\bar{x}$ = 1.14

% S.E. = 26.3

S.E. ($S_{\bar{x}}$) = 0.30

C.V.$_{\underline{n}}$ = 132.5

Species: Lepidosaphes ulmi (L.)
Stage sampled: H. malus and others
Sample: 2 leaf clusters

Date of sampling: May 24, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	4	1	0	0	5	0	0	17	0	17	22
2	4	0	0	12	16	8	0	3	1	12	28
3	3	4	5	0	12	1	16	3	0	20	32
4	31	0	2	34	67	0	2	0	0	2	69
5	0	0	6	27	33	25	4	0	1	30	63
6	1	1	4	0	6	0	3	1	0	4	10
Total	43	6	17	73	139	34	25	24	2	85	224

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	345.0	5	(MST) 69.0	0.99	2.48	3.58
Within trees						
Levels	61.0	1	61.0	0.88	4.11	7.39
Quadrants	138.0	3	46.0	0.66	2.86	4.38
Levels x Quadrants	400.0	3	133.0	1.92	2.86	4.38
Error	2427.0	35	(MSR) 69.34	0	0	0

$\bar{x}$ = 4.67

% S.E. = 25.69

S.E. ($S_{\bar{x}}$) = 1.2

C.V.$_{\underline{n}}$ = 124.17

Species: Lepidosaphes ulmi (L.)
Stage sampled: Larvae 1
Sample: 2 leaf clusters

Date of sampling: June 9, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	300	48	223	81	652	140	117	211	10	478	1130
2	47	141	65	173	426	200	94	151	218	663	1089
3	841	126	374	101	1442	246	151	249	60	706	2148
4	217	149	115	747	1228	389	62	84	152	687	1915
5	81	15	18	171	285	90	76	256	26	448	733
6	45	23	158	45	271	25	20	51	27	123	394
Total	1531	502	953	1318	4304	1090	520	1002	493	3105	7409

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	285947.0	5	(MST)	57189.5	2.53	2.48	3.58
Within trees							
Levels	29950.0	1		29950.0	1.33	4.11	7.39
Quadrants	107710.0	3		35903.0	1.59	2.86	4.38
Levels x Quadrants	43203.0	3		14401.0	0.64	2.86	4.38
Error	789825.0	35	(MSR)	22566.0	0	0	0

$\bar{x}$ = 154.35

% S.E. = 22.50

S.E. ($S_{\bar{x}}$) = 34.51

C.V.$_{\underline{n}}$ = 126.72

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Unhatched eggs
Sample: 2 leaf clusters

Date of sampling: June 9, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	72	52	24	1	149	44	5	23	1	73	222
2	0	0	0	0	0	0	0	0	0	0	0
3	37	32	71	26	166	11	36	84	3	134	300
4	45	15	22	905	987	48	4	1	4	57	1044
5	3	0	0	11	14	4	15	32	0	51	65
6	4	2	19	2	27	5	0	21	0	26	53
Total	161	101	136	945	1343	112	60	161	8	341	1684

Analysis of Variance

SOURCES OF VARIANCE	<u>S.S.</u>	<u>d.f.</u>	<u>M.S.</u>	<u>F</u>	<u>F_{05}</u>	<u>F_{01}</u>
Between trees	95451.0	5	(MST)19090.0	1.12	2.48	3.58
Within trees						
Levels	20916.0	1	20916.0	1.23	4.11	7.39
Quadrants	32325.0	3	10775.0	0.63	2.86	4.38
Levels x Quadrants	52641.0	3	17547.0	1.03	2.86	4.38
Error	593477.0	35	(MSR)16956.0	0	0	0

$\bar{x}$ = 35.08

% S.E. = 56.4

S.E. ($S_{\bar{x}}$) = 19.8

C.V.$_{\underline{n}}$ = 245.5

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *A. mytilaspidis*
Sample: 2 leaf clusters

Date of sampling: June 9, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	3	0	1	1	5	1	2	0	1	4	9
2	0	0	0	1	1	0	0	0	0	0	1
3	0	1	1	1	3	0	0	0	0	0	3
4	1	0	0	1	2	0	2	0	0	2	4
5	0	0	0	0	0	0	1	0	0	1	1
6	0	0	1	0	1	0	0	2	0	2	3
Total	4	1	3	4	12	1	5	2	1	9	21

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	5.44	5	(MST) 1.08	2.45	2.48	3.58
Within trees						
Levels	0.18	1	0.18	0.40	4.11	7.39
Quadrants	0.07	3	0.02	0.04	2.86	4.38
Levels x Quadrants	2.73	3	0.91	2.06	2.86	4.38
Error	15.40	35	(MSR) 0.44	0	0	0

$\bar{x}$ = 0.43

% S.E. = 32.55

S.E. ($S_{\bar{x}}$) = 0.14

C.V.$_{n}$ = 185.6

Species: Lepidosaphes ulmi (L.)
Stage sampled: H. malus and others
Sample: 2 leaf clusters

Date of sampling: June 9, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	5	0	2	3	10	3	0	8	4	15	25
2	4	0	0	3	7	2	0	3	10	15	22
3	7	5	1	2	15	0	6	4	0	10	25
4	8	8	1	76	93	4	1	0	0	5	98
5	1	0	0	1	2	1	0	0	0	1	3
6	2	3	0	1	6	1	0	0	0	1	7
Total	27	16	4	86	133	11	7	15	14	47	180

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	675.0	5	(MST)135.0	1.15	2.48	3.58
Within trees						
Levels	154.0	1	154.0	1.31	4.11	7.39
Quadrants	352.0	3	117.0	1.00	2.86	4.38
Levels x Quadrants	317.0	3	105.0	0.89	2.86	4.38
Error	4098.0	35	(MSR)117.0	0	0	0

$\bar{x}$ = 3.75

% S.E. = 44.80

S.E. ($S_{\bar{x}}$) = 1.68

C.V.$_{\underline{n}}$ = 204.82

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Larvae 1
Sample: 2 leaf clusters

Date of sampling: June 17, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	183	120	109	101	513	244	8	353	1	606	1119
2	154	3	17	217	391	174	151	205	127	657	1048
3	299	312	405	87	1103	168	221	282	67	738	1841
4	396	198	116	666	1376	368	22	139	119	648	2024
5	196	40	15	71	322	230	177	348	25	780	1102
6	61	20	27	20	128	11	43	18	10	82	210
Total	1289	693	689	1162	3833	1195	622	1345	349	3511	7344

Analysis of Variance

SOURCES OF VARIANCE	<u>S.S.</u>	<u>d.f.</u>	<u>M.S.</u>	<u>F</u>	F_{05}	F_{01}
Between trees	263221.0	5	(MST)52644.2	3.77	2.48	3.58
Within trees						
Levels	2160.0	1	2160.0	0.15	4.11	7.39
Quadrants	69681.0	3	23227.0	1.66	2.86	4.38
Levels x Quadrants	89938.0	3	29979.0	2.14	2.86	4.38
Error	488606.0	35	(MSR)13960.0	0	0	0

$\bar{x}$ = 153.0

% S.E. = 21.56

S.E. ($S_{\bar{x}}$) = 33.0

C.V.$_{\underline{n}}$ = 111.80

Species: <u>Lepidosaphes ulmi</u> (L.)
Stage sampled: Predated larvae 1
Sample: 2 leaf clusters

Date of sampling: June 17, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	39	10	0	10	59	19	0	48	0	67	126
2	44	0	6	47	97	2	18	31	1	52	149
3	80	117	74	1	272	145	29	47	377	598	870
4	145	29	47	377	598	93	0	39	3	135	733
5	91	4	0	9	104	36	19	50	4	109	213
6	0	7	10	8	25	0	0	0	0	0	25
Total	399	167	137	452	1155	295	66	215	385	961	2116

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	79002.0	5	(MST)	15800.0	2.82	2.48	3.58
Within trees							
Levels	784.0	1		784.0	0.14	4.11	7.39
Quadrants	20086.0	3		6695.0	1.19	2.86	4.38
Levels x Quadrants	1849.0	3		616.0	0.11	2.86	4.38
Error	195773.0	35	(MSR)	5593.0	0	0	0

$\bar{x}$ = 44.08

% S.E. = 43.10

S.E. ($S_{\bar{x}}$) = 18.0

$C.V._{\underline{n}}$ = 217.92

Species: Lepidosaphes ulmi (L.)
Stage sampled: Unhatched eggs
Sample: 2 leaf clusters

Date of samplings: June 17, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	106	27	12	3	148	47	0	55	0	102	250
2	9	0	0	41	50	2	33	18	15	68	118
3	394	277	103	9	782	23	11	43	5	82	864
4	179	26	11	702	918	54	0	34	10	98	1016
5	2	21	0	0	23	100	17	84	0	201	224
6	0	10	2	0	12	3	1	0	17	21	33
Total	690	340	128	755	1933	229	62	234	47	572	2505

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	107576.0	5	(MST)21515.0	1.53	2.48	3.58
Within trees						
Levels	38590.0	1	38590.0	2.75	4.11	7.39
Quadrants	17638.0	3	5879.0	0.41	2.86	4.38
Levels x Quadrants	28269.0	3	9423.0	0.67	2.86	4.38
Error	491140.0	35	(MSR)14032.0	0	0	0

$\bar{x}$ = 52.18

% S.E. = 40.24

S.E. ($S_{\bar{x}}$) = 21.0

C.V.$_{\underline{n}}$ = 208.0

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *A. mytilaspidis*
Sample: 2 leaf clusters

Date of sampling: June 17, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS					QUADRANTS					
	N	S	E	W	Total "A"	N	S	E	W	Total "B"	Total (A+B)
1	1	0	0	0	1	0	0	0	0	0	1
2	0	0	0	0	0	0	0	0	0	0	0
3	1	0	3	1	5	3	1	2	4	10	15
4	0	0	0	5	5	0	1	0	2	3	8
5	3	1	3	0	7	0	2	2	1	5	12
6	0	1	0	0	1	0	0	0	1	1	2
Total	5	2	6	6	19	3	4	4	8	19	38

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	24.75	5	(MST) 4.95	4.05	2.48	3.58
Within trees						
Levels	0	1	0	0	4.11	7.39
Quadrants	3.00	3	1.00	0.81	2.86	4.38
Levels x Quadrants	1.33	3	0.44	0.36	2.86	4.38
Error	42.92	35	(MSR) 1.22	0	0	0

$\bar{x}$ = 0.79

% S.E. = 39.24

S.E. ($S_{\bar{x}}$) = 0.31

C.V.$_{\underline{n}}$ = 201.6

Species: Lepidosaphes ulmi (L.)
Stage sampled: H. malus and others
Sample: 2 leaf clusters

Date of sampling: June 17, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	3	2	1	0	6	1	0	1	0	2	8
2	9	2	3	3	17	0	0	0	0	0	17
3	24	4	6	0	34	0	0	2	0	2	36
4	9	0	3	52	64	8	0	1	1	10	74
5	0	0	1	1	2	4	0	6	0	10	12
6	0	1	0	0	1	0	0	1	0	1	2
Total	45	9	14	56	124	13	0	11	1	25	149

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	447.0	5	(MST) 89.0	1.39	2.48	3.58
Within trees						
Levels	204.0	1	204.0	3.18	4.11	7.39
Quadrants	147.0	3	49.0	0.76	2.86	4.38
Levels x Quadrants	141.0	3	47.0	0.73	2.86	4.38
Error	2266.0	35	(MSR) 64.0	0	0	0

$\bar{x}$ = 3.1

% S.E. = 59.67

S.E. ($S_{\bar{x}}$) = 1.85

C.V.$_{\underline{n}}$ = 216.75

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Larvae 1
Sample: 2 leaf clusters

Date of sampling: June 24, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	385	11	178	165	739	271	81	319	62	733	1472
2	11	40	77	97	225	157	61	157	88	463	688
3	212	126	249	34	621	255	194	84	63	596	1217
4	241	55	45	109	450	309	85	123	122	639	1089
5	33	9	30	74	146	153	39	98	68	358	504
6	20	11	11	46	88	13	47	50	10	120	208
Total	902	252	590	525	2269	1158	507	831	413	2909	5178

Analysis of Variance

SOURCES OF VARIANCE	<u>S.S.</u>	<u>d.f.</u>	<u>M.S.</u>	<u>F</u>	F_{05}	F_{01}
Between trees	141776.0	5	(MST)28355.0	5.88	2.48	3.58
Within trees						
Levels	8533.0	1	8533.0	1.76	4.11	7.39
Quadrants	84454.0	3	28151.0	5.83	2.86	4.38
Levels x Quadrants	8233.0	3	2744.0	0.56	2.86	4.38
Error	168746.0	35	(MSR) 4821.0	0	0	0

$\bar{x}$ = 107.87

% S.E. = 22.29

S.E. ($S_{\bar{x}}$) = 24.3

C.V.$_{n}$ = 102.12

Species: Lepidosaphes ulmi (L.)
Stage sampled: Predated larvae 1
Sample: 2 leaf clusters

Date of sampling: June 24, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	3	0	5	92	100	42	2	5	0	49	149
2	2	0	3	0	5	11	0	0	1	12	17
3	10	6	4	0	20	21	8	5	0	34	54
4	0	3	2	24	29	0	5	1	0	6	35
5	0	5	8	0	13	9	10	0	2	21	34
6	13	0	0	0	13	0	4	0	0	4	17
Total	28	14	22	116	180	83	29	11	3	126	306

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	1559.0	5	(MST)311.0	1.59	2.48	3.58
Within trees						
Levels	607.0	1	607.0	3.11	4.11	7.39
Quadrants	501.0	3	167.0	0.85	2.86	4.38
Levels x Quadrants	738.0	3	246.0	1.26	2.86	4.38
Error	6827.0	35	(MSR)195.0	0	0	0

$\bar{x}$ = 6.37

% S.E. = 39.87

S.E. ($S_{\bar{x}}$) = 2.54

C.V.$_{\underline{n}}$ = 188.28

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *A. mytilaspidis*
Sample: 2 leaf clusters

Date of sampling: June 24, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	3	0	1	0	4	0	0	3	0	3	7
2	0	0	0	0	0	3	0	0	0	3	3
3	1	3	4	0	8	2	0	0	2	4	12
4	7	11	0	5	23	0	0	1	0	1	24
5	2	0	0	0	2	0	0	1	2	3	5
6	0	0	0	2	2	2	0	0	0	2	4
Total	13	14	5	7	39	7	0	5	4	16	55

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	39.0	5	(MST) 7.8	1.85	2.48	3.58
Within trees						
Levels	11.0	1	11.0	2.61	4.11	7.39
Quadrants	5.0	3	1.6	0.38	2.86	4.38
Levels x Quadrants	9.0	3	3.0	0.71	2.86	4.38
Error	148.0	35	(MSR) 4.2	0	0	0

$\bar{x}$ = 1.14

% S.E. = 35.08

S.E. ($S_{\bar{x}}$) = 0.4

C.V.$_n$ = 173.64

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *H. malus* and others
Sample: 2 leaf clusters

Date of sampling: June 24, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	0	0	3	10	13	0	0	1	0	1	14
2	0	0	0	0	0	1	0	0	1	2	2
3	0	1	0	0	1	4	3	1	1	9	10
4	7	4	0	1	12	1	2	0	0	3	15
5	1	1	0	0	2	0	0	0	1	1	3
6	0	0	0	0	0	0	0	0	0	0	0
Total	8	6	3	11	28	6	5	2	3	16	44

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	26.0	5	(MST)5.0	1.28	2.48	3.58
Within trees						
Levels	3.0	1	3.0	0.76	4.11	7.39
Quadrants	4.0	3	1.0	0.25	2.86	4.38
Levels x Quadrants	3.0	3	1.0	0.25	2.86	4.38
Error	138.0	35	(MSR)3.9	0	0	0

$\bar{x}$ = 0.91

% S.E. = 35.16

S.E. ($S_{\bar{x}}$) = 0.32

C.V.$_{\underline{n}}$ = 142.7

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *A. mytilaspidis*
Sample: 2 leaf clusters

Date of sampling: June 24, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS N	S	E	W	Total "A"	QUADRANTS N	S	E	W	Total "B"	Total (A+B)
1	3	0	0	3	6	3	2	2	0	7	13
2	0	1	0	1	2	0	0	0	0	0	2
3	1	0	0	0	1	0	2	0	3	5	6
4	0	0	0	2	2	0	1	2	0	3	5
5	0	0	0	0	0	1	0	0	0	1	1
6	0	1	0	0	1	0	0	0	0	0	1
Total	4	2	0	6	12	4	5	4	3	16	28

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	13.5	5	(MST)2.7	3.91	2.48	3.58
Within trees						
Levels	0.33	1	0.33	0.47	4.11	7.39
Quadrants	1.5	3	0.5	0.72	2.86	4.38
Levels x Quadrants	2.5	3	0.8	1.15	2.86	4.38
Error	24.17	35	(MSR)0.69	0	0	0

$\bar{x}$ = 0.58   % S.E. = 39.65

S.E. ($S_{\bar{x}}$) = 0.23   C.V.$_{\underline{n}}$ = 194.36

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: Larvae 1
Sample: 2 leaf clusters

Date of sampling: June 24, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	198	28	209	168	603	365	21	101	54	541	1144
2	2	54	65	17	138	202	126	124	142	594	732
3	152	182	275	58	667	258	165	183	68	674	1341
4	143	216	65	63	487	318	153	205	142	818	1305
5	57	11	22	64	154	92	47	60	96	295	449
6	8	10	22	12	52	14	26	35	9	84	136
Total	560	501	658	382	2101	1249	538	708	511	3006	5107

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	152382.0	5	(MST)30476.0	7.42	2.48	3.58
Within trees						
Levels	17063.0	1	17063.0	4.15	4.11	7.39
Quadrants	41254.0	3	13751.0	3.35	2.86	4.38
Levels x Quadrants	24206.0	3	8068.6	1.96	2.86	4.38
Error	143611.0	35	(MSR) 4103.0	0	0	0

$\bar{x}$ = 106.39

% S.E. = 23.50

S.E. ($S_{\bar{x}}$) = 25.0

C.V.$_{\underline{n}}$ = 105.28

Species: _Lepidosaphes_ _ulmi_ (L.)
Stage sampled: Predated larvae 1
Sample: 2 leaf clusters

Date of sampling: June 24, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	116	15	116	74	321	72	9	6	44	131	452
2	6	6	33	10	55	10	17	5	16	48	103
3	40	24	30	13	107	1	19	5	7	32	139
4	66	3	13	29	111	17	2	59	0	78	189
5	38	27	24	13	102	9	15	10	8	42	144
6	5	0	16	0	21	10	7	33	6	56	77
Total	271	75	232	139	717	119	69	118	81	387	1104

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	11685.0	5	(MST)2337.0	5.13	2.48	3.58
Within trees						
Levels	2268.0	1	2268.0	4.98	4.11	7.39
Quadrants	3252.0	3	1084.0	2.38	2.86	4.38
Levels x Quadrants	1024.0	3	341.0	0.74	2.86	4.38
Error	15933.0	35	(MSR) 455.0	0	0	0

$\bar{x}$ = 23.0

% S.E. = 30.0

S.E. ($S_{\bar{x}}$) = 6.9

C.V.$_{\underline{n}}$ = 138.88

Species: Lepidosaphes ulmi (L.)
Stage sampled: H. malus and others
Sample: 2 leaf clusters

Date of sampling: June 24, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS					QUADRANTS					
	N	S	E	W	Total "A"	N	S	E	W	Total "A"	Total (A+B)
1	0	0	0	0	0	0	0	0	0	0	0
2	2	0	4	0	6	0	0	1	1	2	8
3	0	5	1	0	6	5	0	1	0	6	12
4	1	0	0	12	13	5	0	0	3	8	21
5	1	2	1	1	5	0	0	2	0	2	7
6	0	1	0	2	3	2	0	0	0	2	5
Total	4	8	6	15	33	12	0	4	4	20	53

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	32.0	5	(MST)6.0	2.00	2.48	3.58
Within trees						
Levels	3.0	1	3.0	1.00	4.11	7.39
Quadrants	7.0	3	2.0	.66	2.86	4.38
Levels x Quadrants	18.0	3	6.0	2.00	2.86	4.38
Error	115.0	35	(MSR)3.0	0	0	0

$\bar{x}$ = 1.10

% S.E. = 31.81

S.E. ($S_{\bar{x}}$) = 0.35

C.V.$_{\underline{n}}$ = 159.98

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Larvae 1
Sample: 2 leaf clusters

Date of sampling: July 2, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS N	S	E	W	Total "A"	QUADRANTS N	S	E	W	Total "B"	Total (A+B)
1	143	23	175	141	482	112	57	40	35	244	726
2	26	8	179	44	257	149	133	218	135	635	892
3	47	57	132	39	275	129	87	223	33	472	747
4	116	63	58	85	322	173	119	115	142	549	871
5	49	27	24	72	172	57	176	64	94	391	563
6	19	1	13	15	48	5	9	30	3	47	95
Total	400	179	581	396	1556	625	581	690	442	2338	3894

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	54773.0	5	(MST) 10954.0	4.22	2.48	3.58
Within trees						
Levels	12740.0	1	12740.0	4.91	4.11	7.39
Quadrants	12925.0	3	4308.0	1.66	2.86	4.38
Levels x Quadrants	6113.0	3	2037.0	0.78	2.86	4.38
Error	90749.0	35	(MSR) 2592.0	0	0	0

$\bar{x}$ = 81.12 % S.E. = 18.5

S.E. ($S_{\bar{x}}$) = 15.0 C.V.$_{n}$ = 83.64

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Predated larvae 1
Sample: 2 leaf clusters

Date of sampling: July 2, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	114	6	158	114	392	52	4	19	8	83	475
2	22	6	96	28	152	17	7	22	4	50	202
3	18	35	42	10	105	3	10	4	3	20	125
4	85	16	25	49	175	73	101	40	69	283	458
5	5	13	14	32	64	33	45	36	13	127	191
6	16	0	10	5	31	4	1	27	3	35	66
Total	260	76	345	238	919	182	168	148	100	598	1517

Analysis of Variance

SOURCES OF VARIANCE	<u>S.S.</u>	<u>d.f.</u>	<u>M.S.</u>	<u>F</u>	F_{05}	F_{01}
Between trees	18638.0	5	(MST)3727.0	3.96	2.48	3.58
Within trees						
Levels	2146.0	1	2146.0	2.28	4.11	7.39
Quadrants	3073.0	3	1024.0	1.09	2.86	4.38
Levels x Quadrants	3887.0	3	1295.0	1.37	2.86	4.38
Error	32882.0	35	(MSR) 939.0	0	0	0

$\bar{\bar{x}}$ = 31.6

% S.E. = 27.84

S.E. ($S_{\bar{x}}$) = 8.8

C.V.$_{\underline{n}}$ = 126.40

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *A. mytilaspidis*
Sample: 2 leaf clusters

Date of sampling: July 2, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS N	S	E	W		QUADRANTS N	S	E	W		
1	2	0	0	5	7	3	0	0	2	5	12
2	0	0	0	0	0	0	0	0	5	5	5
3	1	0	2	0	3	4	0	5	1	10	13
4	6	0	0	1	7	1	0	1	1	3	10
5	2	1	0	0	3	0	0	0	1	1	3
6	0	0	0	0	0	0	0	0	0	0	0
Total	11	1	2	6	20	8	0	6	10	24	44

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	15.47	5	(MST)	3.09	1.28	2.48	3.58
Within trees							
Levels	0.33	1		0.33	0.13	4.11	7.39
Quadrants	16.50	3		5.50	2.29	2.86	4.38
Levels x Quadrants	3.17	3		1.05	0.43	2.86	4.38
Error	84.1	35	(MSR)	2.4	0	0	0

$\bar{x}$ = 0.91

% S.E. = 26.3

S.E. ($S_{\bar{x}}$) = 0.24

C.V.$_{\underline{n}}$ = 110.09

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *H. malus* and others
Sample: 2 leaf clusters

Date of sampling: July 2, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	6	1	5	11	23	7	0	8	9	24	47
2	8	0	0	1	9	1	1	5	1	8	17
3	1	0	2	0	3	17	0	0	0	17	20
4	5	0	0	2	7	0	1	4	0	5	12
5	0	1	0	0	1	0	0	0	0	0	1
6	2	0	0	0	2	1	0	0	0	1	3
Total	22	2	7	14	45	26	2	17	10	55	100

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	173.0	5	(MST)	34.0	3.70	2.48	3.58
Within trees							
Levels	2.0	1		2.0	0.22	4.11	7.39
Quadrants	81.0	3		27.0	3.0	2.86	4.38
Levels x Quadrants	9.0	3		3.0	0.33	2.86	4.38
Error	333.0	35	(MSR)	9.0	0	0	0

$\bar{x}$ = 2.08

% S.E. = 41.34

S.E. ($S_{\bar{x}}$) = 0.86

C.V.$_{\underline{n}}$ = 182.6

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Larvae 1
Sample: 2 leaf clusters

Date of sampling: July 2, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	193	17	152	115	477	131	65	46	56	298	775
2	9	10	76	15	110	124	147	331	114	716	826
3	98	37	140	52	327	114	122	123	65	424	751
4	90	35	52	43	220	156	38	155	104	453	673
5	104	33	24	29	190	12	105	14	51	182	372
6	10	2	21	3	36	17	14	36	8	75	111
Total	504	134	465	257	1360	554	491	705	398	2148	3508

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	49941.0	5	(MST)	9988.0	3.23	2.48	3.58
Within trees							
Levels	12936.0	1		12936.0	4.19	4.11	7.39
Quadrants	19283.0	3		6427.0	2.08	2.86	4.38
Levels x Quadrants	4350.0	3		1450.0	0.46	2.86	4.38
Error	108040.0	35	(MSR)	3086.0	0	0	0

$\bar{x}$ = 73.08

% S.E. = 19.72

S.E. ($S_{\bar{x}}$) = 14.4

C.V.$_{\underline{n}}$ = 95.20

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: Predated larvae 1
Sample: 2 leaf clusters

Date of sampling: July 2, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS N	S	E	W	Total "A"	QUADRANTS N	S	E	W	Total "B"	Total (A+B)
1	116	15	115	74	320	72	9	6	44	131	451
2	6	6	33	10	55	10	19	5	16	50	105
3	40	24	30	13	107	16	19	5	7	47	154
4	66	3	13	29	111	17	2	59	38	116	227
5	28	27	24	13	92	9	15	10	8	42	134
6	5	0	16	3	24	10	7	33	6	56	80
Total	261	75	231	142	709	134	71	118	119	442	1151

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	11653.0	5	(MST)2330.0	8.41	2.48	3.58
Within trees						
Levels	1485.0	1	1485.0	5.36	4.11	7.39
Quadrants	3005.0	3	1001.0	3.61	2.86	4.38
Levels x Quadrants	6978.0	3	2326.0	8.39	2.86	4.38
Error	9722.0	35	(MSR) 277.0	0	0	0

$\bar{x}$ = 23.97

% S.E. = 28.78

S.E. ($S_{\bar{x}}$) = 6.9

C.V.$_{n}$ = 127.18

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *A. mytilaspidis*
Sample: 2 leaf clusters

Date of sampling: July 2, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	1	0	0	0	1	0	1	1	3	5	6
2	1	0	1	0	2	0	0	7	0	7	9
3	0	0	1	0	1	1	1	6	6	14	15
4	0	0	0	1	1	3	0	2	1	6	7
5	2	0	0	0	2	6	0	1	3	10	12
6	0	0	0	0	0	0	0	0	0	0	0
Total	4	0	2	1	7	10	2	17	13	42	49

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	16.8	5	(MST)	3.36	1.32	2.48	3.58
Within trees							
Levels	25.52	1		25.52	10.04	4.11	7.39
Quadrants	13.0	3		4.3	1.69	2.86	4.38
Levels x Quadrants	8.64	3		2.88	1.13	2.86	4.38
Error	89.04	35	(MSR)	2.54	0	0	0

$\bar{x}$ = 1.02

% S.E. = 2.35

S.E. ($S_{\bar{x}}$) = 0.24

C.V.$_{\underline{n}}$ = 113.68

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *H. malus* and others
Sample: 2 leaf clusters

Date of sampling: July 2, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	14	0	3	11	28	0	0	4	3	7	35
2	2	0	1	1	4	3	2	5	2	12	16
3	0	0	0	0	0	3	0	0	0	3	3
4	0	1	0	1	2	0	0	2	0	2	4
5	0	0	0	0	0	1	0	0	0	1	1
6	2	0	0	1	3	1	1	0	0	2	5
Total	18	1	4	14	37	8	3	11	5	27	64

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	106.0	5	(MST)	21.0	4.2	2.48	3.58
Within trees							
Levels	2.0	1		2.0	0.40	4.11	7.39
Quadrants	21.0	3		7.0	1.40	2.86	4.38
Levels x Quadrants	18.0	3		6.0	1.20	2.86	4.38
Error	190.0	35	(MSR)	5.0	0	0	0

$\bar{x}$ = 1.33   % S.E. = 49.62

S.E. ($S_{\bar{x}}$) = 0.66   C.V.$_{n}$ = 236.0

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Larvae 2
Sample: 2 leaf clusters

Date of sampling: July 10, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	93	94	57	53	297	125	23	18	52	218	515
2	8	6	54	47	115	204	89	68	134	495	610
3	146	110	69	76	401	64	94	148	69	375	776
4	90	47	107	65	309	126	57	139	71	393	702
5	86	5	10	51	152	61	96	59	33	249	401
6	5	16	3	36	60	12	28	26	17	83	143
Total	428	278	300	328	1334	592	387	458	376	1813	3147

Analysis of Variance

SOURCES OF VARIANCE	<u>S.S.</u>	<u>d.f.</u>	<u>M.S.</u>	<u>F</u>	F_{05}	F_{01}
Between trees	32869.0	5	(MST)6573.0	4.33	2.48	3.58
Within trees						
Levels	4780.0	1	4780.0	3.15	4.11	7.39
Quadrants	6408.0	3	2136.0	1.40	2.86	4.38
Levels x Quadrants	724.0	3	241.0	0.15	2.86	4.38
Error	53089.0	35	(MSR)1516.0	0	0	0

$\bar{x}$ = 65.56

% S.E. = 16.66

S.E. ($S_{\bar{x}}$) = 11.7

C.V.$_{\underline{n}}$ = 78.52

Species: _Lepidosaphes_ _ulmi_ (L.)
Stage sampled: Predated larvae 2
Sample: 2 leaf clusters

Date of sampling: July 10, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	86	72	30	33	221	53	3	7	8	71	292
2	5	2	22	16	45	17	4	7	9	37	82
3	31	59	24	9	123	2	10	30	26	68	191
4	61	29	45	60	195	16	13	26	24	79	274
5	64	2	8	35	109	36	23	25	22	106	215
6	2	12	0	7	21	5	16	13	10	44	65
Total	249	176	129	160	714	129	69	108	99	405	1119

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	5663.0	5	(MST)1132.0	3.58	2.48	3.58
Within trees						
Levels	1989.0	1	1989.0	6.2	4.11	7.39
Quadrants	1093.0	3	364.0	1.15	2.86	4.38
Levels x Quadrants	512.0	3	170.0	0.53	2.86	4.38
Error	11074.0	35	(MSR) 316.0	0	0	0

$\bar{x}$ = 23.31

% S.E. = 20.59

S.E. ($S_{\bar{x}}$) = 4.8

C.V.$_{\underline{n}}$ = 94.38

Species: Lepidosaphes ulmi (L.)
Stage sampled: A. mytilaspidis
Sample: 2 leaf clusters

Date of sampling: July 10, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	2	0	1	2	5	3	0	0	11	14	19
2	0	1	6	4	11	2	0	0	3	5	16
3	6	5	3	5	19	4	0	2	1	7	26
4	0	0	0	2	2	0	2	0	1	3	5
5	1	0	0	1	2	0	0	0	1	1	3
6	0	1	0	0	1	0	0	0	0	0	1
Total	9	7	10	14	40	9	2	2	17	30	70

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	64.0	5	(MST)	12.8	3.29	2.48	3.58
Within trees							
Levels	2.08	1		2.08	0.53	4.11	7.39
Quadrants	23.8	3		7.9	2.03	2.86	4.38
Levels x Quadrants	6.12	3		2.04	0.52	2.86	4.38
Error	136.0	35	(MSR)	3.88	0	0	0

$\bar{x}$ = 1.45

% S.E. = 34.4

S.E. ($S_{\bar{x}}$) = 0.5

C.V.$_{\underline{n}}$ = 62.01

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *H. malus* and others
Sample: 2 leaf clusters

Date of sampling: July 10, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	15	13	3	0	31	0	3	7	2	12	43
2	2	1	7	1	11	1	1	1	1	4	15
3	2	3	1	4	10	0	0	2	0	2	12
4	2	1	1	5	9	7	0	0	2	9	18
5	0	1	1	0	2	1	0	0	0	1	3
6	0	2	0	0	2	0	0	0	0	0	2
Total	21	21	13	10	65	9	4	10	5	28	93

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	139.0	5	(MST)	27.8	3.47	2.48	3.58
Within trees							
Levels	28.0	1		28.0	3.5	4.11	7.39
Quadrants	9.0	3		3.0	0.37	2.86	4.38
Levels x Quadrants	11.0	3		3.6	0.45	2.86	4.38
Error	282.0	35	(MSR)	8.0	0	0	0

$\bar{x}$ = 1.94

% S.E. = 30.00

S.E. ($S_{\bar{x}}$) = 0.58

C.V.$_{\underline{n}}$ = 179.22

Species: Lepidosaphes ulmi (L.)
Stage sampled: Larvae 2
Sample: 2 leaf clusters

Date of sampling: July 10, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	65	43	247	102	457	134	18	17	79	248	705
2	12	17	54	25	108	253	153	68	61	535	643
3	110	5	50	114	279	95	134	99	64	392	671
4	36	42	64	128	270	133	76	43	105	357	627
5	52	2	4	38	96	87	46	14	18	165	261
6	9	19	71	14	113	11	17	5	26	59	172
Total	284	128	490	421	1323	713	444	246	353	1756	3079

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.			
Between trees	33938.0	5	(MST)	6787.0	2.84	2.48	3.58
Within trees							
Levels	3906.0	1		3906.0	1.63	4.11	7.39
Quadrants	7658.0	3		2552.0	1.07	2.86	4.38
Levels x Quadrants	25099.0	3		8366.0	3.50	2.86	4.38
Error	83469.0	35	(MSR)	2384.0	0	0	0

$\bar{x}$ = 64.14

% S.E. = 18.59

S.E. ($S_{\bar{x}}$) = 11.9

C.V.$_{\underline{n}}$ = 72.25

Species: Lepidosaphes ulmi (L.)
Stage sampled: Predated larvae 2
Sample: 2 leaf clusters

Date of sampling: July 10, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	46	29	177	79	331	110	1	7	14	132	463
2	5	5	28	15	53	4	7	20	9	40	93
3	37	5	17	32	91	6	8	27	12	53	144
4	26	35	50	53	164	23	10	16	64	113	277
5	28	1	0	19	48	44	19	7	11	81	129
6	5	16	32	5	58	9	10	2	8	29	87
Total	147	91	304	203	745	196	55	79	118	448	1193

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	13435.0	5	(MST)2687.0	3.82	2.48	3.58
Within trees						
Levels	1837.0	1	1837.0	2.61	4.11	7.39
Quadrants	2740.0	3	913.0	1.30	2.86	4.38
Levels x Quadrants	3292.0	3	1097.0	2.09	2.86	4.38
Error	24586.0	35	(MSR) 702.0	0	0	0

$\bar{x}$ = 24.85

% S.E. = 29.77

S.E. ($S_{\bar{x}}$) = 7.4

C.V.$_{\underline{n}}$ = 136.68

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *A. mytilaspidis*
Sample: 2 leaf clusters

Date of sampling: July 10, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	0	11	3	4	18	0	0	0	9	9	27
2	0	0	0	0	0	2	1	1	4	8	8
3	12	3	1	0	16	0	1	1	0	2	18
4	1	0	0	1	2	0	0	0	0	0	2
5	3	0	0	0	3	0	1	0	0	1	4
6	0	0	0	0	0	0	0	0	1	1	1
Total	16	14	4	5	39	2	3	2	14	21	60

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	67.0	5	(MST)	13.4	2.03	2.48	3.58
Within trees							
Levels	6.75	1		6.75	1.01	4.11	7.39
Quadrants	9.16	3		3.05	0.45	2.86	4.38
Levels x Quadrants	26.75	3		8.91	1.33	2.86	4.38
Error	233.34	35	(MSR)	6.66	0	0	0

$\bar{x}$ = 1.25   % S.E. = 41.6

S.E. ($S_{\bar{x}}$) = 0.52   C.V.$_{n}$ = 192.0

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *H. malus* and others
Sample: 2 leaf clusters

Date of sampling: July 10, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	5	3	1	1	10	1	4	1	0	6	16
2	4	0	0	1	5	2	1	2	0	5	10
3	1	0	0	5	6	2	10	0	1	13	19
4	5	1	0	0	6	2	2	0	0	4	10
5	1	1	2	3	7	0	0	0	0	0	7
6	0	0	0	0	0	0	0	0	0	0	0
Total	16	5	3	10	34	7	17	3	1	28	62

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	28.0	5	(MST) 5.6	1.86	2.48	3.58
Within trees						
Levels	0.75	1	0.75	0.25	4.11	7.39
Quadrants	17.0	3	5.6	1.8	2.86	4.38
Levels x Quadrants	25.25	3	8.41	2.80	2.86	4.38
Error	109.0	35	(MSR) 3.0	0	0	0

$\bar{x}$ = 1.29

% S.E. = 26.35

S.E. ($S_{\bar{x}}$) = 0.12

C.V.$_{\underline{n}}$ = 102.46

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Larvae 2
Sample: 2 leaf clusters

Date of sampling: July 18, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	109	30	98	34	271	111	10	78	116	315	586
2	2	2	72	74	150	226	176	40	105	547	697
3	200	222	139	69	630	176	137	114	34	461	1091
4	103	22	28	114	267	153	83	197	161	594	861
5	25	7	5	40	77	128	65	51	112	356	433
6	0	0	8	10	18	25	35	56	9	125	143
Total	439	283	350	341	1413	819	506	536	537	2398	3811

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	68516.0	5	(MST)13703.0	4.93	2.48	3.58
Within trees						
Levels	20213.0	1	20213.0	7.28	4.11	7.39
Quadrants	10836.0	3	3612.0	1.30	2.86	4.38
Levels x Quadrants	2049.0	3	683.0	0.24	2.86	4.38
Error	97104.0	35	(MSR) 2774.0	0	0	0

$\bar{x}$ = 79.39

% S.E. = 21.5

S.E. ($S_{\bar{x}}$) = 17.0

C.V.$_{\underline{n}}$ = 98.28

Species: Lepidosaphes ulmi (L.)
Stage sampled: Predated larvae 2
Sample: 2 leaf clusters

Date of sampling: July 18, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
		QUADRANTS					QUADRANTS				
	N	S	E	W		N	S	E	W		
1	97	16	21	26	160	91	7	21	34	153	313
2	1	1	25	25	52	24	14	9	21	68	120
3	56	66	31	23	176	13	14	10	9	46	222
4	46	13	17	80	156	41	18	30	55	144	300
5	16	4	3	8	31	52	28	27	19	126	157
6	0	0	6	3	9	15	20	32	6	73	82
Total	216	100	103	165	584	236	101	129	144	610	1194

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	5678.0	5	(MST)1135.0	2.53	2.48	3.58
Within trees						
Levels	14.0	1	14.0	0.03	4.11	7.39
Quadrants	3134.0	3	1044.0	2.33	2.86	4.38
Levels x Quadrants	112.0	3	37.0	0.08	2.86	4.38
Error	15702.0	35	(MSR) 448.0	0	0	0

$\bar{x}$ = 24.87

% S.E. = 19.3

S.E. ($S_{\bar{x}}$) = 4.8

C.V.$_{\underline{n}}$ = 96.48

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *H. malus* and others
Sample: 2 leaf clusters

Date of sampling: July 18, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	8	1	0	4	13	5	0	1	1	7	20
2	2	1	4	2	9	2	1	0	3	6	15
3	0	6	1	0	7	2	2	2	2	8	15
4	1	0	1	0	2	0	0	0	0	0	2
5	0	4	0	0	4	1	1	0	0	2	6
6	1	0	0	1	2	0	2	3	1	6	8
Total	12	12	6	7	37	10	6	6	7	29	66

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	29.0	5	(MST)	5.8	1.9	2.48	3.58
Within trees							
Levels	1.33	1		1.33	0.44	4.11	7.39
Quadrants	5.6	3		1.8	0.6	2.86	4.38
Levels x Quadrants	2.07	3		0.69	0.23	2.86	4.38
Error	108.0	35	(MSR)	3.0	0	0	0

$\bar{x}$ = 1.38

S.E. ($S_{\bar{x}}$) = 0.34

% S.E. = 24.64

C.V.$_n$ = 123.8

Species: _Lepidosaphes_ _ulmi_ (L.)
Stage sampled: _A_. _mytilaspidis_
Sample: 2 leaf clusters

Date of sampling: July 18, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	13	1	4	4	22	5	0	0	12	17	39
2	0	0	0	0	0	0	3	1	6	10	10
3	2	6	8	4	20	7	0	4	0	11	31
4	4	1	0	1	6	1	1	9	0	11	17
5	2	0	2	1	5	4	0	0	3	7	12
6	0	0	0	0	0	1	2	3	1	7	7
Total	21	8	14	10	53	18	6	17	22	63	116

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	103.0	5	(MST)	34.1	3.65	2.48	3.58
Within trees							
Levels	2.08	1		2.08	2.22	4.11	7.39
Quadrants	28.0	3		9.3	1.0	2.86	4.38
Levels x Quadrants	11.92	3		3.97	0.42	2.86	4.38
Error	327.0	35	(MSR)	9.34	0	0	0

$\bar{x}$ = 2.41

% S.E. = 34.85

S.E. ($S_{\bar{x}}$) = 0.84

C.V.$_{\underline{n}}$ = 168.49

Species: _Lepidosaphes_ _ulmi_ (L.)
Stage sampled: Larvae 2
Sample: 2 leaf clusters

Date of sampling: July 18, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A" QUADRANTS N	S	E	W	Total "A"	Level "B" QUADRANTS N	S	E	W	Total "B"	Total (A+B)
1	98	34	33	31	196	115	28	88	45	276	472
2	8	13	13	14	48	185	119	28	104	436	484
3	221	133	197	52	603	143	127	169	24	463	1066
4	168	33	37	136	374	113	40	100	133	386	760
5	57	7	3	38	105	31	17	52	105	205	310
6	39	1	5	14	59	71	2	19	5	97	156
Total	591	221	288	285	1385	658	333	456	416	1863	3248

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	66648.0	5	(MST) 13329.0	6.25	2.48	3.58
Within trees						
Levels	4760.0	1	4760.0	2.23	4.11	7.39
Quadrants	22873.0	3	7624.0	3.57	2.86	4.38
Levels x Quadrants	442.0	3	147.0	0.06	2.86	4.38
Error	74566.0	35	(MSR) 2130.0	0	0	0

$\bar{x}$ = 67.66

% S.E. = 23.5

S.E. ($S_{\bar{x}}$) = 16.0

C.V.$_{\underline{n}}$ = 110.25

Species: Lepidosaphes ulmi (L.)
Stage sampled: Predated larvae 2
Sample: 2 leaf clusters

Date of sampling: July 18, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A" QUADRANTS N	S	E	W	Total "A"	Level "B" QUADRANTS N	S	E	W	Total "B"	Total (A+B)
1	77	5	9	18	109	107	11	31	11	160	269
2	5	2	4	6	17	15	13	8	26	62	79
3	71	49	24	14	158	29	16	16	13	74	232
4	85	33	35	96	249	45	3	20	41	109	358
5	27	3	1	15	46	18	7	33	16	74	120
6	26	1	3	9	39	47	0	10	0	57	96
Total	291	93	76	158	618	261	50	118	107	536	1154

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	7781.0	5	(MST)	1556.0	3.86	2.48	3.58
Within trees							
Levels	140.0	1		140.0	0.34	4.11	7.39
Quadrants	8340.0	3		2780.0	6.89	2.86	4.38
Levels x Quadrants	453.0	3		151.0	0.37	2.86	4.38
Error	14132.0	35	(MSR)	403.0	0	0	0

$\bar{x}$ = 24.04

% S.E. = 23.29

S.E. ($S_{\bar{x}}$) = 5.6

C.V.$_{\underline{n}}$ = 137.28

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *A. mytilaspidis*
Sample: 2 leaf clusters

Date of sampling: July 18, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	7	1	0	5	13	0	1	0	3	4	17
2	0	0	0	0	0	6	2	0	7	15	15
3	1	3	7	1	12	2	0	1	0	3	15
4	7	0	0	7	14	0	2	0	1	3	17
5	2	0	0	0	2	2	0	2	0	4	6
6	0	0	0	0	0	0	0	0	0	0	0
Total	17	4	7	13	41	10	5	3	11	29	70

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	31.0	5	(MST) 6.16	1.12	2.48	3.58
Within trees						
Levels	3.0	1	3.0	0.54	4.11	7.39
Quadrants	21.0	3	7.0	1.27	2.86	4.38
Levels x Quadrants	3.0	3	1.0	0.18	2.86	4.38
Error	194.0	35	(MSR) 5.5	0	0	0

$\bar{x}$ = 1.46

% S.E. = 24.13

S.E. ($S_{\bar{x}}$) = 0.35

C.V.$_{n}$ = 89.57

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: <u>H.</u> <u>malus</u> and others
Sample: 2 leaf clusters

Date of sampling: July 18, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total		QUADRANTS			Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	10	0	4	0	14	10	3	0	0	13	27
2	1	1	9	6	17	1	1	1	1	4	21
3	0	0	0	1	1	0	5	1	0	6	7
4	1	0	2	8	11	0	0	0	0	0	11
5	2	0	0	2	4	0	0	0	0	0	4
6	1	0	0	0	1	0	0	0	0	0	1
Total	15	1	15	17	48	11	9	2	1	23	71

Analysis of Variance

SOURCES OF VARIANCE	<u>S.S.</u>	<u>d.f.</u>	<u>M.S.</u>	<u>F</u>	<u>F_{05}</u>	<u>F_{01}</u>
Between trees	64.0	5	(MST) 12.8	1.93	2.48	3.58
Within trees						
Levels	13.0	1	13.0	1.96	4.11	7.39
Quadrants	10.0	3	3.3	0.50	2.86	4.38
Levels x Quadrants	29.0	3	9.6	1.45	2.86	4.38
Error	232.0	35	(MSR) 6.6	0	0	0

$\bar{x}$ = 1.48

% S.E. = 18.24

S.E. ($S_{\bar{x}}$) = 0.27

C.V.$_{\underline{n}}$ = 170.90

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Larvae 2
Sample: 2 leaf clusters

Date of sampling: July 27, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	47	31	18	103	199	70	10	121	18	219	418
2	30	7	116	71	224	201	102	37	61	401	625
3	122	82	192	50	446	98	68	109	43	318	764
4	84	30	59	27	200	70	58	37	88	253	453
5	44	7	66	17	134	33	58	5	50	146	280
6	3	4	21	17	45	12	5	37	3	57	102
Total	330	161	472	285	1248	484	301	346	263	1394	2642

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	34961.0	5	(MST)6992.0	4.88	2.48	3.58
Within trees						
Levels	4440.0	1	4440.0	3.10	4.11	7.39
Quadrants	8096.0	3	2698.0	1.88	2.86	4.38
Levels x Quadrants	806.0	3	268.0	0.18	2.86	4.38
Error	50069.0	35	(MSR)1430.0	0	0	0

$\bar{x}$ = 55.04

% S.E. = 21.9

S.E. ($S_{\bar{x}}$) = 12.08

C.V.$_{\underline{n}}$ = 101.36

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: Predated larvae 2
Sample: 2 leaf clusters

Date of sampling: July 27, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	36	11	7	33	87	10	2	30	4	46	133
2	5	2	33	23	63	61	17	6	11	95	158
3	14	23	43	13	93	1	13	26	12	52	145
4	62	17	42	14	135	13	58	17	15	103	238
5	22	3	32	7	64	12	35	5	15	67	131
6	2	0	12	7	21	7	2	12	2	23	44
Total	141	56	169	97	463	104	127	96	59	386	849

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	2411.0	5	(MST)	482.0	2.21	2.48	3.58
Within trees							
Levels	123.5	1		123.5	0.56	4.11	7.39
Quadrants	656.0	3		218.0	1.0	2.86	4.38
Levels x Quadrants	975.5	3		325.0	1.49	2.86	4.38
Error	7663.0	35	(MSR)	218.0	0	0	0

$\bar{x}$ = 17.68

% S.E. = 17.53

S.E. ($S_{\bar{x}}$) = 3.1

C.V.$_{\underline{n}}$ = 88.70

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *A. mytilaspidis*
Sample: 2 leaf clusters

Date of sampling: July 27, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	1	0	4	5	10	6	0	8	0	14	24
2	2	0	2	0	4	0	1	0	0	1	5
3	0	0	3	2	5	0	0	1	0	1	6
4	1	0	4	0	5	0	0	0	3	3	8
5	0	1	0	0	1	1	0	0	2	3	4
6	0	0	0	0	0	0	0	1	1	2	2
Total	4	1	13	7	25	7	1	10	6	24	49

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	40.0	5	(MST)	8.0	3.16	2.48	3.58
Within trees							
Levels	0.02	1		0.02	0	4.11	7.39
Quadrants	18.5	3		6.16	2.43	2.86	4.38
Levels x Quadrants	1.64	3		0.54	0.21	2.86	4.38
Error	88.84	35	(MSR)	2.53	0	0	0

$\bar{x}$ = 1.02

% S.E. = 39.21

S.E. ($S_{\bar{x}}$) = 0.4

C.V.$_{\underline{n}}$ = 192.31

Species: Lepidosaphes ulmi (L.)
Stage sampled: H. malus and others
Sample: 2 leaf clusters

Date of sampling: July 27, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	3	1	1	3	8	0	1	8	0	9	17
2	0	0	1	1	2	0	0	1	1	2	4
3	0	0	7	3	10	1	1	0	2	4	14
4	1	0	0	2	3	0	1	0	0	1	4
5	1	1	0	0	2	0	5	1	0	6	8
6	0	2	3	0	5	0	0	1	0	1	6
Total	5	4	12	9	30	1	8	11	3	23	53

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	19.0	5	(MST)	3.8	1.26	2.48	3.58
Within trees							
Levels	1.02	1		1.02	0.3	4.11	7.39
Quadrants	13.0	3		4.3	1.4	2.86	4.38
Levels x Quadrants	3.98	3		1.32	0.44	2.86	4.38
Error	106.0	35	(MSR)	3.0	0	0	0

$\bar{x}$ = 1.10

% S.E. = 25.45

S.E. ($S_{\bar{x}}$) = 0.28

C.V.$_{\underline{n}}$ = 109.08

Species: Lepidosaphes ulmi (L.)
Stage sampled: Larvae 2
Sample: 2 leaf clusters

Date of sampling: July 27, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	130	22	37	136	325	78	29	67	17	191	516
2	37	3	123	13	176	213	119	144	98	574	750
3	105	170	252	36	563	105	84	90	18	297	860
4	28	60	31	101	220	132	30	56	149	367	587
5	36	6	12	60	114	23	25	6	60	114	228
6	5	5	10	12	32	15	16	22	6	59	91
Total	341	266	465	358	1430	566	303	385	348	1602	3032

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	55127.0	5	(MST) 11025.0	3.86	2.48	3.58
Within trees						
Levels	616.0	1	616.0	0.21	4.11	7.39
Quadrants	5757.0	3	1919.0	0.67	2.86	4.38
Levels x Quadrants	4259.0	3	1419.0	0.49	2.86	4.38
Error	99816.00	35	(MSR) 2851.0	0	0	0

$\bar{x}$ = 63.16 % S.E. = 24.0

S.E. ($S_{\bar{x}}$) = 15.13 C.V.$_{n}$ = 115.34

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Predated larvae 2
Sample: 2 leaf clusters

Date of sampling: July 27, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	108	5	27	32	172	15	4	15	2	36	208
2	10	1	56	5	72	40	8	16	27	91	163
3	53	21	26	13	113	10	15	12	10	47	160
4	13	33	23	40	109	56	11	48	42	157	266
5	17	4	9	17	47	6	12	3	7	28	75
6	0	2	0	6	8	12	6	21	1	40	48
Total	201	66	141	113	521	139	56	115	89	399	920

Analysis of Variance

SOURCES OF VARIANCE	<u>S.S.</u>	<u>d.f.</u>		<u>M.S.</u>	<u>F</u>	F_{05}	F_{01}
Between trees	4131.0	5	(MST)	826.0	2.32	2.48	3.58
Within trees							
Levels	310.0	1		310.0	0.87	4.11	7.39
Quadrants	2102.0	3		700.0	1.96	2.86	4.38
Levels x Quadrants	123.0	3		41.0	0.11	2.86	4.38
Error	12475.0	35	(MSR)	356.0	0	0	0

$\bar{x}$ = 19.16

% S.E. = 6.85

S.E. ($S_{\bar{x}}$) = 4.1

C.V.$_{\underline{n}}$ = 107.73

Species: Lepidosaphes ulmi (L.)
Stage sampled: A. mytilaspidis
Sample: 2 leaf clusters

Date of sampling: July 27, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	3	0	5	0	8	6	2	3	0	11	19
2	0	0	0	1	1	2	0	1	0	3	4
3	0	3	4	3	10	0	0	0	0	0	10
4	2	0	1	0	3	3	0	0	0	3	6
5	0	1	0	0	1	0	0	0	2	2	3
6	0	0	0	0	0	0	0	0	1	1	1
Total	5	4	10	4	23	11	2	4	3	20	43

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	26.87	5	(MST)	5.37	2.90	2.48	3.58
Within trees							
Levels	0.18	1		0.18	0.09	4.11	7.39
Quadrants	6.25	3		2.08	1.12	2.86	4.38
Levels x Quadrants	6.23	3		2.07	1.11	2.86	4.38
Error	64.97	35	(MSR)	1.85	0	0	0

$\bar{x}$ = 0.89

% S.E. = 37.07

S.E. ($S_{\bar{x}}$) = 0.33

C.V.$_{\underline{n}}$ = 179.2

Species: Lepidosaphes ulmi (L.)
Stage sampled: H. malus and others
Sample: 2 leaf clusters

Date of sampling: July 27, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	3	0	4	3	10	2	3	5	2	12	22
2	1	3	5	0	9	0	0	0	0	0	9
3	1	1	1	0	3	2	2	0	1	5	8
4	1	0	2	0	3	1	0	0	6	7	10
5	0	0	0	0	0	1	0	0	0	1	1
6	2	2	0	1	5	0	0	1	0	1	6
Total	8	6	12	4	30	6	5	6	9	26	56

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	30.0	5	(MST) 6.0	3.00	2.48	3.58
Within trees						
Levels	0.33	1	0.33	0.16	4.11	7.39
Quadrants	2.0	3	0.66	0.33	2.86	4.38
Levels x Quadrants	5.67	3	1.89	0.94	2.86	4.38
Error	73.0	35	(MSR) 2.0	0	0	0

$\bar{x}$ = 1.16

% S.E. = 30.17

S.E. ($S\bar{x}$) = 0.35

C.V.$_{\underline{n}}$ = 149.12

Species: Lepidosaphes ulmi (L.)
Stage sampled: Adults
Sample: 2 leaf clusters

Date of sampling: August 6, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	29	25	98	21	173	35	5	72	55	167	340
2	42	8	30	40	120	156	90	80	91	417	537
3	68	48	25	55	196	155	72	71	22	320	516
4	67	20	4	27	118	77	23	64	70	234	352
5	26	3	5	26	60	20	6	62	29	117	177
6	3	46	25	9	83	17	7	17	4	45	128
Total	235	150	187	178	750	460	203	366	271	1300	2050

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	17678.0	5	(MST)	3535.0	4.07	2.48	3.58
Within trees							
Levels	6302.0	1		6302.0	7.26	4.11	7.39
Quadrants	5368.0	3		1789.0	2.06	2.86	4.38
Levels x Quadrants	1542.0	3		514.0	0.59	2.86	4.38
Error	30354.0	35	(MSR)	867.0	0	0	0

$\bar{x}$ = 42.70

% S.E. = 19.5

S.E. ($S_{\bar{x}}$) = 8.4

C.V.$_{\underline{n}}$ = 88.16

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Predated adults
Sample: 2 leaf clusters

Date of sampling: August 6, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	20	9	21	15	65	30	0	53	41	124	189
2	18	1	13	9	41	4	5	11	4	24	65
3	29	8	10	16	63	6	0	0	6	12	75
4	9	14	0	0	23	13	7	26	20	66	89
5	4	2	0	9	15	5	1	6	12	24	39
6	0	13	9	1	23	6	0	3	0	9	32
Total	80	47	53	50	230	64	13	99	83	259	489

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	2023.0	5	(MST)	404.0	4.78	2.48	3.58
Within trees							
Levels	1.75	1		1.75	0.02	4.11	7.39
Quadrants	446.0	3		148.0	0.17	2.86	4.38
Levels x Quadrants	385.25	3		128.4	1.51	2.86	4.38
Error	2960.0	35	(MSR)	84.5	0	0	0

$\bar{x}$ = 10.18

% S.E. = 28.48

S.E. ($S_{\bar{x}}$) = 2.9

C.V.$_{\underline{n}}$ = 126.42

Species: Lepidosaphes ulmi (L.)
Stage sampled: A. mytilaspidis
Sample: 2 leaf clusters

Date of sampling: August 6, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	3	2	1	1	7	6	0	0	2	8	15
2	1	0	2	3	6	0	2	0	0	2	8
3	2	4	3	6	15	3	0	0	2	5	20
4	2	0	0	0	2	0	3	2	0	5	7
5	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
Total	8	6	6	10	30	9	5	2	4	20	50

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	40.0	5	(MST)	8.0	4.12	2.48	3.58
Within trees							
Levels	2.08	1		2.08	1.07	4.11	7.39
Quadrants	3.8	3		1.26	0.64	2.86	4.38
Levels x Quadrants	2.12	3		0.70	0.36	2.86	4.38
Error	68.0	35	(MSR)	1.94	0	0	0

$\bar{x}$ = 1.04 % S.E. = 38.5

S.E. ($S_{\bar{x}}$) = 0.4 C.V.$_{\underline{n}}$ = 176.91

Species: Lepidosaphes ulmi (L.)
Stage sampled: H. malus and others
Sample: 2 leaf clusters

Date of sampling: August 6, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A" QUADRANTS N	S	E	W	Total "A"	Level "B" QUADRANTS N	S	E	W	Total "B"	Total (A+B)
1	3	2	1	0	6	1	1	1	1	4	10
2	1	1	1	0	3	2	0	2	2	6	9
3	0	4	1	0	5	0	0	0	0	0	5
4	0	0	0	0	0	0	1	0	1	2	2
5	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
Total	4	7	3	0	14	3	2	3	4	12	26

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	12.0	5	(MST)	2.4	3.87	2.48	3.58
Within trees							
Levels	0.08	1		0.08	0.12	4.11	7.39
Quadrants	1.0	3		0.33	0.53	2.86	4.38
Levels x Quadrants	2.92	3		0.97	1.56	2.86	4.38
Error	22.0	35	(MSR)	0.62	0	0	0

$\bar{x}$ = 0.54

% S.E. = 37.03

S.E. ($S_{\bar{x}}$) = 0.2

C.V.$_{n}$ = 149.85

Species: Lepidosaphes ulmi (L.)
Stage sampled: Adults
Sample: 2 leaf clusters

Date of sampling: August 6, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A" QUADRANTS N	S	E	W	Total "A"	Level "B" QUADRANTS N	S	E	W	Total "B"	Total (A+B)
1	35	5	81	11	132	45	10	56	35	146	278
2	22	5	41	12	80	157	197	45	76	475	555
3	48	41	30	31	150	58	41	50	44	193	343
4	83	36	10	35	164	137	51	35	114	337	501
5	58	1	5	36	100	73	21	47	46	187	287
6	9	13	20	16	58	6	0	20	11	37	95
Total	255	101	187	141	684	476	320	253	326	1375	2059

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	17347.0	5	(MST)	3469.0	2.86	2.48	3.58
Within trees							
Levels	9947.0	1		9947.0	8.20	4.11	7.39
Quadrants	5285.0	3		1761.0	1.45	2.86	4.38
Levels x Quadrants	1335.0	3		445.0	0.36	2.86	4.38
Error	42447.0	35	(MSR)	1212.0	0	0	0

$\bar{x}$ = 42.89

% S.E. = 19.8

S.E. ($S_{\bar{x}}$) = 8.5

C.V.$_{n}$ = 39.44

Species: _Lepidosaphes_ _ulmi_ (L.)
Stage sampled: Predated adults
Sample: 2 leaf clusters

Date of sampling: August 6, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS N	S	E	W	Total "A"	QUADRANTS N	S	E	W	Total "B"	Total (A+B)
1	29	4	12	9	54	39	1	18	31	89	143
2	9	4	2	6	21	3	7	0	6	16	37
3	11	6	6	5	28	3	4	0	4	12	40
4	13	12	0	21	46	41	32	9	37	119	165
5	22	0	1	11	34	14	1	6	14	35	69
6	1	6	12	0	19	5	0	11	1	23	42
Total	85	32	33	52	202	105	45	44	99	294	496

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	2021.0	5	(MST)	404.0	5.57	2.48	3.58
Within trees							
Levels	176.0	1		176.0	2.43	4.11	7.39
Quadrants	771.0	3		257.0	3.54	2.86	4.38
Levels x Quadrants	66.0	3		22.0	0.30	2.86	4.38
Error	2540.0	35	(MSR)	72.57	0	0	0

$\bar{\bar{x}}$ = 10.33

% S.E. = 28.15

S.E. ($S_{\bar{\bar{x}}}$) = 2.9

C.V.$_{\underline{n}}$ = 72.75

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *A. mytilaspidis*
Sample: 2 leaf clusters

Date of sampling: August 6, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	2	0	1	0	3	0	1	1	0	1	4
2	0	0	2	1	3	4	5	0	4	13	16
3	2	1	7	9	19	3	0	0	2	5	24
4	1	0	0	0	1	0	0	0	0	0	1
5	2	0	0	2	4	0	0	0	1	1	5
6	1	1	1	0	3	0	0	0	0	0	3
Total	8	2	10	12	32	7	6	1	7	21	53

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	51.5	5	(MST)	10.3	3.55	2.48	3.58
Within trees							
Levels	2.5	1		2.5	0.86	4.11	7.39
Quadrants	5.75	3		1.91	0.65	2.86	4.38
Levels x Quadrants	7.75	3		2.58	0.88	2.86	4.38
Error	104.0	35	(MSR)	2.9	0	0	0

$\bar{x}$ = 1.10

% S.E. = 40.90

S.E. ($S_{\bar{x}}$) = 0.45

$C.V._{n}$ = 190.8

Species: Lepidosaphes ulmi (L.)
Stage sampled: H. malus
Sample: 2 leaf clusters

Date of sampling: August 6, 1963.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	1	2	1	1	5	1	2	2	1	6	11
2	1	0	1	1	3	0	0	0	0	0	3
3	0	1	0	0	1	0	0	0	0	0	1
4	0	0	0	0	0	0	0	1	0	1	1
5	2	0	0	0	2	0	0	0	0	0	2
6	0	0	0	0	0	0	0	3	2	5	5
Total	4	3	2	2	11	1	2	6	3	12	23

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	9.0	5	(MST)	1.8	3.00	2.48	3.58
Within trees							
Levels	0.02	1		0.02	0.03	4.11	7.39
Quadrants	0	3		0	0	2.86	4.38
Levels x Quadrants	1.78	3		0.59	0.9	2.86	4.38
Error	21.20	35	(MSR)	0.60	0	0	0

$\bar{x}$ = 0.47

% S.E. = 2.08

S.E. ($S_{\bar{x}}$) = 0.038

C.V.$_{n}$ = 182.32

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Eggs
Sample: 2 leaf clusters

Date of sampling: May 12, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	3166	3873	4244	1543	12826	3064	4674	1275	1942	10955	23781
2	1138	297	706	1068	3209	4687	617	2858	3517	11679	14888
3	1569	293	1235	2065	5162	38	698	2318	5150	8204	13366
4	10042	1084	1462	1658	14246	2179	3177	3219	1709	10284	24530
5	4399	356	1216	3517	9488	700	3654	8523	3122	15999	25487
6	2305	601	2628	0	5534	2194	1996	1203	1924	7317	12851
Total	22619	6504	11491	9851	50465	12862	14816	19396	17364	64438	114903

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	22730604.0	5	(MST)4546121.0	1.23	2.48	3.58
Within trees						
Levels	4067599.0	1	4067599.0	1.10	4.11	7.39
Quadrants	8952659.0	3	2984219.0	0.81	2.86	4.38
Levels x Quadrants	19534283.0	3	6511428.0	1.76	2.86	4.38
Error	129446303.0	35	(MSR)3698465.8	0	0	0

$\bar{x}$ = 2393.81 % S.E. = 12.86

S.E. ($S_{\bar{x}}$) = 307.75 C.V.$_{\underline{n}}$ = 51.98

Species: Lepidosaphes ulmi (L.)
Stage sampled: Predated eggs
Sample: 2 leaf clusters

Date of sampling: May 12, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	1066	387	874	553	2880	1654	1350	415	643	4062	6942
2	221	89	244	487	1041	1000	124	306	444	1874	2915
3	212	14	54	136	416	0	53	202	972	1227	1643
4	2861	212	764	725	4562	861	2131	1661	1039	5692	10254
5	1015	30	190	964	2199	97	752	2643	674	4166	6365
6	963	89	1038	0	2090	1371	1053	740	1016	4180	6270
Total	6338	821	3164	2865	13188	4983	5463	5967	4788	21201	34389

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	5907266.0	5	(MST)1181453.0	3.88	2.48	3.58
Within trees						
Levels	1337670.0	1	1337670.0	4.40	4.11	7.39
Quadrants	1162203.0	3	387401.0	1.27	2.86	4.38
Levels x Quadrants	1573908.0	3	524636.0	1.72	2.86	4.38
Error	10648357.0	35	(MSR) 304239.0	0	0	0

$\bar{x}$ = 716.44

% S.E. = 21.90

S.E. ($S_{\bar{x}}$) = 156.89

C.V.$_{n}$ = 105.70

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: Parasitized eggs
Sample: 2 leaf clusters

Date of sampling: May 12, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	25	127	79	37	268	74	63	25	66	228	496
2	58	25	29	84	196	55	24	35	16	130	326
3	51	6	23	29	109	0	6	9	12	27	136
4	78	59	33	47	217	19	46	3	24	92	309
5	20	17	40	33	110	8	102	67	93	270	380
6	101	76	122	0	299	15	31	16	58	120	419
Total	333	310	326	230	1199	171	272	155	269	867	2066

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	9355.0	5	(MST)	1871.0	1.87	2.48	3.58
Within trees							
Levels	2296.0	1		2296.0	2.30	4.11	7.39
Quadrants	501.0	3		167.0	0.17	2.86	4.38
Levels x Quadrants	2575.0	3		858.0	0.86	2.86	4.38
Error	34951.0	35	(MSR)	999.0	0	0	0

$\bar{x}$ = 43.04

% S.E. = 14.49

S.E. ($S_{\bar{x}}$) = 6.24

C.V.$_{\underline{n}}$ = 71.6

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *A. mytilaspidis*
Sample: 2 leaf clusters

Date of sampling: May 12, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	15	38	18	10	81	2	45	10	14	71	152
2	16	9	11	26	62	50	5	24	32	111	173
3	13	4	9	12	38	0	4	12	36	52	90
4	61	33	17	50	161	33	41	16	20	110	271
5	22	6	23	40	91	7	45	76	10	138	229
6	21	12	45	1	79	84	53	13	27	177	256
Total	148	102	123	139	512	176	193	151	139	659	1171

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	3001.0	5	(MST)	600.0	1.50	2.48	3.58
Within trees							
Levels	450.0	1		450.0	1.12	4.11	7.39
Quadrants	129.0	3		43.0	0.11	2.86	4.38
Levels x Quadrants	371.0	3		124.0	0.31	2.86	4.38
Error	14022.0	35	(MSR)	401.0	0	0	0

$\bar{x}$ = 24.40

% S.E. = 14.51

S.E. ($S_{\bar{x}}$) = 3.54

C.V.$_{\underline{n}}$ = 67.65

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *H. malus* and others
Sample: 2 leaf clusters

Date of sampling: May 12, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	42	10	20	28	100	86	65	8	20	179	279
2	2	2	10	17	31	75	2	0	7	84	115
3	2	0	2	0	4	0	0	22	0	22	26
4	158	2	25	10	195	17	68	60	40	185	380
5	84	0	16	21	121	3	19	118	25	165	286
6	51	3	36	2	92	84	40	47	50	221	313
Total	339	17	109	78	543	265	194	255	142	856	1399

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	11213.0	5	(MST)	2243.0	2.46	2.48	3.58
Within trees							
Levels	2041.0	1		2041.0	2.24	4.11	7.39
Quadrants	8411.0	3		2804.0	3.08	2.86	4.38
Levels x Quadrants	3144.0	3		1048.0	1.15	2.86	4.38
Error	31869.0	35	(MSR)	911.0	0	0	0

$\bar{x}$ = 29.15

% S.E. = 24.43

S.E. ($S_{\bar{x}}$) = 6.83

C.V.$_{\underline{n}}$ = 115.93

Species: *Lepidosaphes* *ulmi* (L.)
Stage sampled: Scales ♀♀
Sample: 2 leaf clusters

Date of sampling: May 12, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	84	106	83	41	314	86	120	33	67	306	620
2	40	10	33	49	132	147	20	96	88	351	483
3	46	6	37	56	145	2	15	72	108	197	342
4	263	63	48	96	470	114	150	106	50	420	890
5	76	14	49	115	254	24	132	253	165	574	828
6	77	29	114	3	223	92	129	56	94	371	594
Total	586	228	364	360	1538	465	566	616	572	2219	3757

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	26583.0	5	(MST)	5317.0	1.86	2.48	3.58
Within trees							
Levels	9662.0	1		9662.0	3.37	4.11	7.39
Quadrants	2941.0	3		980.0	0.34	2.86	4.38
Levels x Quadrants	10116.0	3		3372.0	1.18	2.86	4.38
Error	100337.0	35	(MSR)	2867.0	0	0	0

$\bar{x}$ = 78.27

% S.E. = 13.47

S.E. ($S_{\bar{x}}$) = 10.54

C.V.$_{\underline{n}}$ = 65.92

Species: Lepidosaphes ulmi (L.)
Stage sampled: Larvae 1
Sample: 2 leaf clusters

Date of sampling: June 9, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	170	694	51	488	1403	1769	1934	605	171	4479	5882
2	612	36	369	605	1622	59	1248	750	276	2333	3955
3	314	101	186	63	664	121	284	627	68	1100	1764
4	24	437	126	415	1002	83	415	287	316	1101	2103
5	154	1875	83	691	2803	249	751	1326	638	2964	5767
6	370	169	80	639	1258	241	201	150	207	799	2057
Total	1644	3312	895	2901	8752	2522	4833	3745	1676	12776	21528

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	2252666.0	5	(MST)450533.0	2.54	2.48	3.58
Within trees						
Levels	337345.0	1	337345.0	1.90	4.11	7.39
Quadrants	859285.0	3	286428.0	1.62	2.86	4.38
Levels x Quadrants	721609.0	3	240536.0	1.36	2.86	4.38
Error	6208181.0	35	(MSR)177377.0	0	0	0

$\bar{x}$ = 448.50

% S.E. = 21.60

S.E. ($S_{\bar{x}}$) = 96.88

C.V.$_{\underline{n}}$ = 100.98

Species: Lepidosaphes ulmi (L.)
Stage sampled: Predated larvae 1
Sample: 2 leaf clusters

Date of sampling: June 9, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	20	92	0	267	379	527	488	337	12	1364	1743
2	280	10	107	225	622	47	199	291	30	567	1189
3	101	8	50	6	165	54	22	202	16	294	459
4	17	287	28	147	479	13	196	76	176	461	940
5	35	1071	18	354	1478	140	369	581	361	1451	2929
6	259	43	8	268	578	58	13	57	48	176	754
Total	712	1511	211	1267	3701	839	1287	1544	643	4313	8014

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	498697.0	5	(MST)99739.0	2.99	2.48	3.58
Within trees						
Levels	7803.0	1	7803.0	0.24	4.11	7.39
Quadrants	75540.0	3	25180.0	0.76	2.86	4.38
Levels x Quadrants	178245.0	3	59415.0	1.79	2.86	4.38
Error	1164517.0	35	(MSR)33272.0	0	0	0

$\bar{x}$ = 166.96

% S.E. = 27.31

S.E. ($S_{\bar{x}}$) = 45.59

C.V.$_{\underline{n}}$ = 125.67

Species: Lepidosaphes ulmi (L.)
Stage sampled: Desiccated larvae 1
Sample: 2 leaf clusters

Date of sampling: June 9, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	38	201	28	54	321	626	397	93	30	1146	1467
2	171	5	81	135	392	9	218	89	54	370	762
3	72	44	70	21	207	15	28	146	14	203	410
4	0	63	33	46	142	8	42	29	40	119	261
5	48	156	28	86	318	81	201	73	72	427	745
6	22	62	15	144	243	49	44	9	44	146	389
Total	351	531	255	486	1623	788	930	439	254	2411	4034

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	120389	5	(MST)	24078.0	2.35	2.48	3.58
Within trees							
Levels	12936.0	1		12936.0	1.26	4.11	7.39
Quadrants	32733.0	3		10911.0	1.06	2.86	4.38
Levels x Quadrants	23551.0	3		7850.0	0.77	2.86	4.38
Error	358803.0	35	(MSR)	10252.0	0	0	0

$\bar{x}$ = 84.04

% S.E. = 26.67

S.E. ($S_{\bar{x}}$) = 22.41

C.V.$_{\underline{n}}$ = 123.90

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: Unhatched eggs
Sample: 2 leaf clusters

Date of sampling: June 9, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	375	198	11	369	953	1381	3117	959	1080	6537	7490
2	670	99	398	778	1945	118	401	184	281	984	2929
3	55	16	204	21	296	94	238	523	87	942	1238
4	499	1275	57	523	2354	61	778	138	1011	1988	4342
5	65	4038	115	860	5078	323	1876	643	1305	4147	9225
6	1074	1236	113	2781	5204	743	401	182	480	1806	7010
Total	2738	6862	898	5332	15830	2720	6811	2629	4244	16404	32234

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	5766710.0	5	(MST)1153342.0	1.92	2.48	3.58
Within trees						
Levels	6864.0	1	6864.0	0.01	4.11	7.39
Quadrants	5093543.0	3	1697848.0	2.82	2.86	4.38
Levels x Quadrants	341721.0	3	113907.0	0.19	2.86	4.38
Error	21080100.0	35	(MSR) 602289.0	0	0	0

$\bar{x}$ = 671.54

% S.E. = 23.08

S.E. ($S_{\bar{x}}$) = 155.01

C.V.$_{n}$ = 104.98

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Larvae 2
Sample: 2 leaf clusters

Date of sampling: July 3, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	2	137	17	56	212	19	93	408	296	816	1028
2	13	16	5	26	60	0	99	45	202	346	406
3	45	13	13	16	87	32	122	93	37	284	371
4	66	30	32	207	335	12	37	72	40	161	496
5	66	217	39	263	585	37	424	477	245	1183	1768
6	84	15	127	52	278	124	6	31	21	182	460
Total	276	428	233	620	1557	224	781	1126	841	2972	4529

Analysis of Variance

SOURCES OF VARIANCE	<u>S.S.</u>	<u>d.f.</u>		<u>M.S.</u>	<u>F</u>	<u>F_{05}</u>	<u>F_{01}</u>
Between trees	190508.0	5	(MST)	38102.0	4.26	2.48	3.58
Within trees							
Levels	41713.0	1		41713.0	4.67	4.11	7.39
Quadrants	47094.0	3		15698.0	1.76	2.86	4.38
Levels x Quadrants	39420.0	3		13140.0	0.147	2.86	4.38
Error	312712.0	35	(MSR)	8935.0	0	0	0

$\bar{x}$ = 94.35

% S.E. = 29.86

S.E. ($S_{\bar{x}}$) = 28.17

C.V.$_{\underline{n}}$ = 103.32

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: Predated larvae 2
Sample: 2 leaf clusters

Date of sampling: July 3, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	0	91	12	44	147	11	87	279	90	467	614
2	5	8	1	21	35	0	69	17	98	184	219
3	34	8	11	13	66	28	111	76	23	238	304
4	55	21	22	165	263	2	29	52	38	121	384
5	37	193	34	180	444	34	272	301	192	799	1243
6	62	13	79	44	198	69	5	25	20	119	317
Total	193	334	159	467	1153	144	573	750	461	1928	3081

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	91034.0	5	(MST)	18207.0	5.09	2.48	3.58
Within trees							
Levels	12513.0	1		12513.0	3.50	4.11	7.39
Quadrants	20878.0	3		6959.0	1.94	2.86	4.38
Levels x Quadrants	21557.0	3		7186.0	2.01	2.86	4.38
Error	125301.0	35	(MSR)	3580.0	0	0	0

$\bar{x}$ = 64.19

% S.E. = 30.3

S.E. ($S_{\bar{x}}$) = 19.47

C.V.$_n$ = 104.16

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: Parasitized larvae 2
Sample: 2 leaf clusters

Date of sampling: July 3, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	0	16	2	3	21	0	2	58	26	86	107
2	0	1	0	0	1	0	8	2	13	23	24
3	2	1	0	0	3	0	0	0	2	5	8
4	1	3	1	1	6	0	1	3	10	14	20
5	4	7	0	14	25	0	42	59	13	114	139
6	1	0	5	1	7	5	0	0	1	6	13
Total	8	28	8	19	63	5	53	122	65	248	311

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	1982.0	5	(MST)	396.0	3.05	2.48	3.58
Within trees							
Levels	713.0	1		713.0	5.48	4.11	7.39
Quadrants	542.0	3		181.0	1.39	2.86	4.38
Levels x Quadrants	599.0	3		199.7	1.54	2.86	4.38
Error	4559.0	35	(MSR)	130.0	0	0	0

$\bar{x}$ = 6.48

% S.E. = 44.29

S.E. ($S_{\bar{x}}$) = 2.87

C.V.$_{\underline{n}}$ = 159.58

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *A. mytilaspidis*
Sample: 2 leaf clusters

Date of sampling: July 3, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	0	14	2	3	19	0	2	58	26	86	105
2	0	2	0	0	2	0	8	3	13	24	26
3	2	1	0	0	3	0	0	0	2	2	5
4	1	3	1	10	15	0	1	3	1	5	20
5	4	7	0	13	24	0	42	59	13	114	138
6	1	0	5	1	7	2	0	0	1	3	10
Total	8	27	8	27	70	2	53	123	56	234	304

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	1984.0	5	(MST)	396.8	3.05	2.48	3.58
Within trees							
Levels	560.0	1		560.0	4.31	4.11	7.39
Quadrants	621.0	3		207.0	1.59	2.86	4.38
Levels x Quadrants	671.0	3		224.0	1.72	2.86	4.38
Error	4548.0	35	(MSR)	130.0	0	0	0

$\bar{x}$ = 6.33

% S.E. = 45.49

S.E. ($S_{\bar{x}}$) = 2.88

C.V.$_{\underline{n}}$ = 159.40

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *H. malus* and others
Sample: 2 leaf clusters

Date of sampling: July 3, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A" QUADRANTS				Total "A"	Level "B" QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	0	0	0	0	0	0	6	77	0	83	83
2	0	0	0	0	0	0	0	0	0	0	0
3	1	0	0	0	1	0	1	0	0	1	2
4	1	0	0	1	2	0	1	0	0	1	3
5	0	8	0	1	9	0	3	9	0	12	21
6	2	0	2	2	6	0	0	0	0	0	6
Total	4	8	2	4	18	0	11	86	0	97	115

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	646.0	5	(MST)	129.0	1.07	2.48	3.58
Within trees							
Levels	130.0	1		130.0	1.07	4.11	7.39
Quadrants	402.0	3		134.0	1.11	2.86	4.38
Levels x Quadrants	462.0	3		154.0	1.27	2.86	4.38
Error	4221.0	35	(MSR)	121.0	0	0	0

$\bar{x}$ = 2.40

% S.E. = 68.3

S.E. ($S_{\bar{x}}$) = 1.64

C.V.$_{\underline{n}}$ = 149.97

Species: Lepidosaphes ulmi (L.)
Stage sampled: Larvae 2
Sample: 2 leaf clusters

Date of sampling: July 23, 1964.
Location: Macdonald College, Que.

Counts

	Level "A"					Level "B"					
Tree No.	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	210	96	16	10	332	16	100	103	58	277	609
2	9	18	3	8	38	58	143	10	64	275	313
3	0	2	4	9	15	1	6	81	13	101	116
4	13	0	30	5	48	30	1	45	50	126	174
5	13	207	3	167	390	7	23	328	38	396	786
6	17	15	17	6	55	3	12	26	10	51	106
Total	262	338	73	205	878	115	285	593	233	1226	2104

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	50477.0	5	(MST) 10095.0	2.72	2.48	3.58
Within trees						
Levels	2523.0	1	2523.0	0.68	4.11	7.39
Quadrants	4913.0	3	1638.0	0.44	2.86	4.38
Levels x Quadrants	22111.0	3	7370.0	1.99	2.86	4.38
Error	129817.0	35	(MSR) 3709.0	0	0	0

$\bar{x}$ = 43.83

% S.E. = 33.05

S.E. ($S_{\bar{x}}$) = 14.49

C.V.$_{\underline{n}}$ = 117.19

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Predated larvae 2
Sample: 2 leaf clusters

Date of sampling: July 23, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	174	32	6	4	216	6	62	90	35	193	409
2	1	15	1	2	19	28	113	3	41	185	204
3	0	0	1	5	6	1	2	56	8	67	73
4	2	0	6	1	9	12	0	12	18	42	51
5	3	146	1	105	255	6	8	268	16	298	553
6	5	3	9	4	21	1	8	12	5	26	47
Total	185	196	24	121	526	54	193	441	123	811	1337

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	28365.0	5	(MST)	5673.0	2.36	2.48	3.58
Within trees							
Levels	1692.0	1		1692.0	0.70	4.11	7.39
Quadrants	3109.0	3		1036.0	0.43	2.86	4.38
Levels x Quadrants	14230.0	3		4743.0	1.97	2.86	4.38
Error	84174.0	35	(MSR)	2405.0	0	0	0

$\bar{x}$ = 27.85

% S.E. = 38.9

S.E. ($S_{\bar{x}}$) = 10.86

C.V.$_{\underline{n}}$ = 136.0

Species: *Lepidosaphes* *ulmi* (L.)
Stage sampled: Parasitized larvae 2
Sample: 2 leaf clusters

Date of sampling: July 23, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	2	18	2	1	23	0	5	3	0	8	31
2	2	0	0	1	3	2	6	0	1	9	12
3	0	0	0	0	0	0	0	1	1	2	2
4	0	0	1	2	3	0	0	0	6	6	9
5	0	5	0	3	8	0	1	11	4	16	24
6	0	0	0	0	0	0	1	0	0	1	1
Total	4	23	3	7	37	2	13	15	12	42	79

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	91.0	5	(MST)	18.20	1.84	2.48	3.58
Within trees							
Levels	0.52	1		0.52	0.05	4.11	7.39
Quadrants	38.08	3		12.69	1.28	2.86	4.38
Levels x Quadrants	22.40	3		7.47	0.75	2.86	4.38
Error	347.0	35	(MSR)	9.91	0	0	0

$\bar{x}$ = 1.65

% S.E. = 37.58

S.E. ($S_{\bar{x}}$) = 0.62

C.V.$_{\underline{n}}$ = 121.20

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: <u>A</u>. <u>mytilaspidis</u>
Sample: 2 leaf clusters

Date of sampling: July 23, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A" QUADRANTS N	S	E	W	Total "A"	Level "B" QUADRANTS N	S	E	W	Total "B"	Total (A+B)
1	2	2	0	0	4	0	3	1	0	4	8
2	0	0	0	1	1	2	0	0	0	2	3
3	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	2	2	0	0	0	3	3	5
5	0	5	0	4	9	0	1	1	4	6	15
6	0	0	0	0	0	0	0	0	0	0	0
Total	2	7	0	7	16	2	4	2	7	15	31

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	20.4	5	(MST)	4.08	3.14	2.48	3.58
Within trees							
Levels	0.02	1		0.02	0.015	4.11	7.39
Quadrants	8.0	3		2.67	2.05	2.86	4.38
Levels x Quadrants	1.15	3		0.38	0.29	2.86	4.38
Error	45.43	35	(MSR)	1.30	0	0	0

$\bar{x}$ = 0.65

% S.E. = 44.62

S.E. ($S_{\bar{x}}$) = 0.29

C.V.$_{\underline{n}}$ = 153.80

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: <u>H</u>. <u>malus</u> and others
Sample: 2 leaf clusters

Date of sampling: July 23, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	8	1	2	4	15	0	4	1	2	7	22
2	1	3	1	0	5	1	1	0	1	3	8
3	0	0	0	0	0	0	0	0	0	0	0
4	6	0	2	1	9	2	0	1	3	6	15
5	0	4	0	1	5	0	0	1	7	8	13
6	2	1	2	0	5	0	3	0	1	4	9
Total	17	9	7	6	39	3	8	3	14	28	67

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	34.48	5	(MST)	6.90	2.30	2.48	3.58
Within trees							
Levels	2.52	1		2.52	0.84	4.11	7.39
Quadrants	5.48	3		1.83	0.61	2.86	4.38
Levels x Quadrants	20.48	3		6.83	2.28	2.86	4.38
Error	104.52	35	(MSR)	2.99	0	0	0

$\bar{x}$ = 1.40

S.E. ($S_{\bar{x}}$) = 0.38

% S.E. = 27.14

C.V.$_{\underline{n}}$ = 94.96

Species: Lepidosaphes ulmi (L.)
Stage sampled: Adults
Sample: 2 leaf clusters

Date of sampling: July 30, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	5	4	6	27	42	26	49	70	32	177	219
2	34	2	0	16	52	7	1	13	23	44	96
3	1	3	16	6	26	19	80	27	10	136	162
4	15	3	21	0	39	17	15	5	18	55	94
5	8	11	3	60	82	11	23	35	28	97	179
6	7	5	15	17	44	22	6	14	43	85	129
Total	70	28	61	126	285	102	174	164	154	594	879

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	1520.0	5	(MST)	304.0	1.06	2.48	3.58
Within trees							
Levels	1989.0	1		1989.0	6.93	4.11	7.39
Quadrants	521.0	3		174.0	0.61	2.86	4.38
Levels x Quadrants	822.0	3		274.0	0.96	2.86	4.38
Error	10058.0	35	(MSR)	287.0	0	0	0

$\bar{\bar{x}}$ = 18.31

% S.E. = 13.70

S.E. ($S_{\bar{x}}$) = 2.51

C.V.$_{\underline{n}}$ = 29.80

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Predated adults
Sample: 2 leaf clusters

Date of sampling: July 30, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	2	2	1	10	15	7	19	48	3	77	92
2	8	0	0	1	9	1	1	4	8	14	23
3	1	0	1	0	2	11	11	7	1	30	32
4	2	0	13	0	15	2	0	2	14	18	33
5	2	1	2	34	39	11	10	20	11	52	91
6	0	3	8	5	16	6	2	2	10	20	36
Total	15	6	25	50	96	36	43	83	47	211	307

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	621.0	5	(MST)	124.0	1.69	2.48	3.58
Within trees							
Levels	276.0	1		276.0	3.76	4.11	7.39
Quadrants	209.0	3		69.7	0.95	2.86	4.38
Levels x Quadrants	156.0	3		52.0	0.71	2.86	4.38
Error	2573.0	35	(MSR)	73.5	0	0	0

$\bar{x}$ = 6.40

% S.E. = 25.51

S.E. ($S_{\bar{x}}$) = 1.61

C.V.$_{\underline{n}}$ = 84.24

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Parasitized adults
Sample: 2 leaf clusters

Date of sampling: July 30, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	3	0	4	7	14	8	21	7	20	56	70
2	10	1	0	6	17	1	0	2	10	13	30
3	0	1	4	3	8	4	42	8	3	57	65
4	6	2	5	0	13	12	6	1	4	23	36
5	5	7	0	18	30	4	13	10	14	41	71
6	2	2	7	6	17	14	4	5	23	46	63
Total	26	13	20	40	99	43	86	33	107	236	335

Analysis of Variance

SOURCES OF VARIANCE	<u>S.S.</u>	<u>d.f.</u>	<u>M.S.</u>	<u>F</u>	F_{05}	F_{01}
Between trees	203.0	5	(MST) 41.0	1.71	2.48	3.58
Within trees						
Levels	391.0	1	391.0	16.27	4.11	7.39
Quadrants	910.0	3	303.0	12.61	2.86	4.38
Levels x Quadrants	466.0	3	155.0	6.45	2.86	4.38
Error	841.0	35	(MSR) 24.03	0	0	0

$\bar{x}$ = 6.98

% S.E. = 13.18

S.E. ($S_{\bar{x}}$) = 0.92

C.V.$_{\underline{n}}$ = 44.39

Species: <u>Lepidosaphes ulmi</u> (L.)
Stage sampled: <u>A. mytilaspidis</u>
Sample: 2 leaf clusters

Date of sampling: July 30, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	3	0	5	10	18	10	22	7	20	59	77
2	11	1	0	7	19	1	0	2	11	14	33
3	0	1	4	4	9	4	46	8	3	61	70
4	7	2	6	0	15	13	7	1	4	25	40
5	6	6	0	18	30	4	14	11	14	43	73
6	2	2	8	4	16	14	4	5	22	45	61
Total	29	12	23	43	107	46	93	34	74	247	354

Analysis of Variance

SOURCES OF VARIANCE	<u>S.S.</u>	<u>d.f.</u>		<u>M.S.</u>	<u>F</u>	F_{05}	F_{01}
Between trees	210.0	5	(MST)	42.0	0.70	2.48	3.58
Within trees							
Levels	408.0	1		408.0	6.83	4.11	7.39
Quadrants	188.0	3		62.7	1.05	2.86	4.38
Levels x Quadrants	253.0	3		84.3	1.41	2.86	4.38
Error	2090.0	35	(MSR)	59.7	0	0	0

$\bar{x}$ = 7.38

% S.E. = 12.74

S.E. ($S_{\bar{x}}$) = 0.94

C.V.$_{\underline{n}}$ = 38.75

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *H. malus* and others
Sample: 2 leaf clusters

Date of sampling: July 30, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	2	3	3	2	10	3	4	11	1	19	29
2	1	0	0	0	1	1	1	0	8	10	11
3	0	0	0	1	1	5	0	0	0	5	6
4	1	4	5	0	10	3	0	0	3	6	16
5	0	0	3	9	12	5	6	8	6	25	37
6	5	1	7	6	19	7	0	0	4	11	30
Total	9	8	18	18	53	24	11	19	22	76	129

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	93.0	5	(MST)	18.6	2.40	2.48	3.58
Within trees							
Levels	11.0	1		11.0	1.42	4.11	7.39
Quadrants	21.0	3		7.0	0.90	2.86	4.38
Levels x Quadrants	10.0	3		3.33	0.43	2.86	4.38
Error	270.98	35	(MSR)	7.74	0	0	0

$\bar{x}$ = 2.69

% S.E. = 23.05

S.E. ($S_{\bar{x}}$) = 0.62

C.V.$_{\underline{n}}$ = 57.98

Species: <u>Lepidosaphes ulmi</u> (L.)
Stage sampled: Adults
Sample: 2 leaf clusters

Date of sampling: August 6, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	17	14	4	39	74	2	6	4	84	96	170
2	35	3	10	23	71	5	6	2	40	53	124
3	1	1	2	8	12	28	122	16	5	171	183
4	7	1	14	7	29	6	41	11	21	79	108
5	4	22	8	13	47	6	23	17	61	107	154
6	35	24	4	37	100	5	11	31	31	78	178
Total	99	65	42	127	333	52	209	81	242	584	917

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	585.0	5	(MST) 117.0	0.24	2.48	3.58
Within trees						
Levels	1313.0	1	1313.0	2.65	4.11	7.39
Quadrants	3245.0	3	1082.0	2.19	2.86	4.38
Levels x Quadrants	1828.0	3	609.0	1.23	2.86	4.38
Error	17327.0	35	(MSR) 495.0	0	0	0

$\bar{x}$ = 19.10

% S.E. = 8.17

S.E. ($S_{\bar{x}}$) = 1.56

C.V.$_{\underline{n}}$ = 25.10

Species: Lepidosaphes ulmi (L.)
Stage sampled: Predated adults
Sample: 2 leaf clusters

Date of sampling: August 6, 1964.
Location: Macdonald College, Que.

Counts

	Level "A"					Level "B"					
Tree No.	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	6	6	2	13	27	0	3	2	40	45	72
2	12	1	2	6	21	1	2	1	26	30	51
3	1	0	0	5	6	4	15	2	1	22	28
4	0	0	5	2	7	2	20	1	4	27	34
5	3	8	3	7	21	1	11	9	21	42	63
6	6	6	1	14	27	2	4	5	10	21	48
Total	28	21	13	47	109	10	55	20	102	187	296

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	175.0	5	(MST) 35.0	0.80	2.48	3.58
Within trees						
Levels	127.0	1	127.0	2.89	4.11	7.39
Quadrants	718.0	3	239.0	5.44	2.86	4.38
Levels x Quadrants	252.25	3	84.08	1.91	2.86	4.38
Error	1539.0	35	(MSR) 43.97	0	0	0

$\bar{x}$ = 6.17

% S.E. = 13.84

S.E. ($S_{\bar{x}}$) = 0.85

C.V.$_{\underline{n}}$ = 42.93

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: Parasitized adults
Sample: 2 leaf clusters

Date of sampling: August 6, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	8	6	2	18	34	2	1	8	24	35	69
2	14	0	7	12	33	4	1	0	10	15	48
3	0	1	1	1	3	11	31	7	1	50	53
4	5	0	5	4	14	4	20	7	10	41	55
5	1	11	3	4	19	2	12	4	30	48	67
6	20	10	2	15	47	1	6	16	10	33	80
Total	48	28	20	54	150	24	71	42	85	222	372

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	91.0	5	(MST) 18.2	0.31	2.48	3.58
Within trees						
Levels	108.0	1	108.0	1.81	4.11	7.39
Quadrants	296.0	3	98.66	1.66	2.86	4.38
Levels x Quadrants	215.0	3	71.66	1.20	2.86	4.38
Error	2085.0	35	(MSR) 59.57	0	0	0

$\bar{x}$ = 7.75

% S.E. = 7.95

S.E. ($S_{\bar{x}}$) = 0.62

C.V.$_{\underline{n}}$ = 36.89

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *A. mytilaspidis*
Sample: 2 leaf clusters

Date of sampling: August 6, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	8	6	2	18	34	2	1	10	40	53	87
2	15	0	7	12	34	4	1	0	10	15	49
3	0	1	1	1	3	11	31	8	1	51	54
4	5	0	5	4	14	5	17	7	12	41	55
5	1	11	3	4	19	3	12	4	31	50	69
6	21	10	2	17	50	1	6	16	10	33	83
Total	50	28	20	56	154	26	68	45	104	243	397

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	161.0	5	(MST) 32.20	0.43	2.48	3.58
Within trees						
Levels	165.0	1	165.0	2.23	4.11	7.39
Quadrants	451.0	3	150.33	2.03	2.86	4.38
Levels x Quadrants	260.0	3	86.6	1.18	2.86	4.38
Error	2574.0	35	(MSR) 73.54	0	0	0

$\bar{x}$ = 8.27

% S.E. = 9.91

S.E. ($S_{\bar{x}}$) = 0.82

C.V.$_{\underline{n}}$ = 36.27

Species: Lepidosaphes ulmi (L.)
Stage sampled: H. malus and others
Sample: 2 leaf clusters

Date of sampling: August 6, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	1	0	0	11	12	0	1	0	24	25	37
2	6	2	1	2	11	0	0	4	10	14	25
3	0	1	0	3	4	2	2	0	1	5	9
4	4	0	0	2	6	0	1	0	1	2	8
5	0	0	0	0	0	0	0	0	0	0	0
6	1	3	5	5	14	3	0	3	10	16	30
Total	12	6	6	23	47	5	4	7	46	62	109

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	132.0	5	(MST)	26.4	2.03	2.48	3.58
Within trees							
Levels	4.68	1		4.68	0.36	4.11	7.39
Quadrants	195.0	3		65.0	5.00	2.86	4.38
Levels x Quadrants	44.32	3		14.77	1.14	2.86	4.38
Error	455.0	35	(MSR)	13.0	0	0	0

$\bar{x}$ = 2.27 % S.E. = 32.59

S.E. ($S_{\bar{x}}$) = 0.74 C.V.$_{\underline{n}}$ = 113.20

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Adults
Sample: 2 leaf clusters

Date of sampling: August 14, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	2	15	0	11	28	5	3	57	63	128	156
2	21	0	5	4	30	9	2	6	9	26	56
3	2	3	1	18	24	7	2	27	4	40	64
4	26	0	22	2	50	12	2	18	14	46	96
5	8	43	4	8	63	3	32	11	33	79	142
6	18	3	43	7	71	4	5	2	39	50	121
Total	77	64	75	50	266	40	46	121	162	369	635

Analysis of Variance

SOURCES OF VARIANCE	<u>S.S.</u>	<u>d.f.</u>		<u>M.S.</u>	<u>F</u>	F_{05}	F_{01}
Between trees	1048.0	5	(MST)	209.6	0.94	2.48	3.58
Within trees							
Levels	221.0	1		221.0	0.996	4.11	7.39
Quadrants	695.0	3		231.7	1.04	2.86	4.38
Levels x Quadrants	1142.0	3		380.7	1.72	2.86	4.38
Error	7780.0	35	(MSR)	222.0	0	0	0

$\bar{x}$ = 13.23

% S.E. = 15.80

S.E. ($S_{\bar{x}}$) = 2.09

C.V.$_{\underline{n}}$ = 29.48

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: Predated adults
Sample: 2 leaf clusters

Date of sampling: August 14, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	0	3	0	0	3	2	2	24	10	38	41
2	4	0	0	3	7	1	0	1	1	3	10
3	0	1	0	1	2	0	0	1	0	1	3
4	4	0	7	0	11	0	0	4	4	8	19
5	5	18	1	2	26	1	18	0	21	40	66
6	1	0	1	0	2	0	0	0	1	1	3
Total	14	22	9	6	51	4	20	30	37	91	142

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	395.0	5	(MST)	79.0	2.85	2.48	3.58
Within trees							
Levels	33.33	1		33.33	1.20	4.11	7.39
Quadrants	34.80	3		11.60	0.42	2.86	4.38
Levels x Quadrants	91.87	3		30.62	1.11	2.86	4.38
Error	969.0	35	(MSR)	27.69	0	0	0

$\bar{x}$ = 2.96

% S.E. = 43.41

S.E. ($S_{\bar{x}}$) = 1.285

C.V.$_{\underline{n}}$ = 152.0

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Parasitized adults
Sample: 2 leaf clusters

Date of sampling: August 14, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	1	4	0	9	14	1	1	32	27	61	75
2	8	0	5	1	14	5	1	2	5	13	27
3	0	0	1	11	12	1	0	16	2	19	31
4	16	0	5	2	23	7	1	10	9	27	50
5	2	23	1	5	31	1	12	7	3	23	54
6	10	2	27	3	42	4	3	2	25	34	76
Total	37	29	39	31	136	19	18	69	71	177	313

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	272.0	5	(MST)	54.4	0.81	2.48	3.58
Within trees							
Levels	35.0	1		35.0	0.52	4.11	7.39
Quadrants	243.0	3		81.0	1.20	2.86	4.38
Levels x Quadrants	211.0	3		70.33	1.05	2.86	4.38
Error	2353.0	35	(MSR)	67.23	0	0	0

$\bar{x}$ = 6.52

% S.E. = 16.26

S.E. ($S_{\bar{x}}$) = 1.06

C.V.$_{\underline{n}}$ = 44.15

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *A. mytilaspidis*
Sample: 2 leaf clusters

Date of sampling: August 14, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	1	4	0	9	14	2	1	33	27	63	77
2	9	0	5	1	15	2	1	2	5	10	25
3	0	0	1	12	13	1	0	15	2	18	31
4	16	0	5	2	23	7	1	10	9	27	50
5	2	24	1	5	32	1	12	7	3	23	55
6	9	2	26	3	40	4	3	2	24	33	73
Total	37	30	38	32	137	17	18	69	70	174	311

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	281.0	5	(MST)	56.2	0.84	2.48	3.58
Within trees							
Levels	29.0	1		29.0	0.43	4.11	7.39
Quadrants	241.0	3		80.33	1.19	2.86	4.38
Levels x Quadrants	217.0	3		72.33	1.08	2.86	4.38
Error	2354.0	35	(MSR)	67.26	0	0	0

$\bar{x}$ = 6.48

% S.E. = 16.67

S.E. ($S_{\bar{x}}$) = 1.08

C.V.$_{\underline{n}}$ = 44.15

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *H. malus* and others
Sample: 2 leaf clusters

Date of sampling: August 14, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	1	3	0	3	7	2	0	4	8	14	21
2	7	0	0	2	9	2	0	2	2	6	15
3	0	2	0	2	4	0	0	0	0	0	4
4	15	0	2	0	17	5	3	1	5	14	31
5	0	10	0	0	10	0	7	1	3	11	21
6	2	1	3	1	7	1	0	0	3	4	11
Total	25	16	5	8	54	10	10	8	21	49	103

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	54.63	5	(MST)	10.93	1.21	2.48	3.58
Within trees							
Levels	0.52	1		0.52	0.06	4.11	7.39
Quadrants	21.58	3		7.19	0.80	2.86	4.38
Levels x Quadrants	36.07	3		12.02	1.33	2.86	4.38
Error	315.20	35	(MSR)	9.01	0	0	0

$\bar{x}$ = 2.15

% S.E. = 21.86

S.E. ($S_{\bar{x}}$) = 0.47

$C.V._{\underline{n}}$ = 62.31

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: Adults
Sample: 2 leaf clusters

Date of sampling: August 28, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	10	14	10	67	101	14	9	14	74	111	212
2	41	42	3	2	88	0	8	5	21	34	122
3	1	8	0	2	11	6	106	29	6	147	158
4	21	4	16	15	56	8	21	6	12	47	103
5	7	40	4	5	56	5	55	34	76	170	226
6	12	38	22	37	109	6	23	21	56	106	215
Total	92	146	55	128	421	39	222	109	245	615	1036

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	1728.0	5	(MST) 345.6	0.69	2.48	3.58
Within trees						
Levels	784.0	1	784.0	1.56	4.11	7.39
Quadrants	4191.0	3	1397.0	2.79	2.86	4.38
Levels x Quadrants	1315.0	3	438.0	0.87	2.86	4.38
Error	17540.0	35	(MSR) 501.0	0	0	0

$\bar{x}$ = 21.58

% S.E. = 3.93

S.E. ($S_{\bar{x}}$) = 0.85

C.V.$_{n}$ = 24.07

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Predated adults
Sample: 2 leaf clusters

Date of sampling: August 28, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A" QUADRANTS N	S	E	W	Total "A"	Level "B" QUADRANTS N	S	E	W	Total "B"	Total (A+B)
1	5	1	1	10	17	8	1	5	0	14	31
2	2	3	1	0	6	0	3	1	0	4	10
3	1	2	0	1	4	2	12	12	0	26	30
4	2	0	1	0	3	1	10	1	0	12	15
5	2	20	2	1	25	1	16	21	16	54	79
6	2	12	11	0	25	1	3	5	11	20	45
Total	14	38	16	12	80	13	45	45	27	130	210

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	387.75	5	(MST)	77.55	3.08	2.48	3.58
Within trees							
Levels	52.08	1		52.08	2.07	4.11	7.39
Quadrants	153.25	3		51.08	2.03	2.86	4.38
Levels x Quadrants	40.92	3		13.64	0.54	2.86	4.38
Error	881.27	35	(MSR)	25.18	0	0	0

$\bar{x}$ = 4.38

% S.E. = 29.20

S.E. ($S_{\bar{x}}$) = 1.28

C.V.$_{\underline{n}}$ = 107.30

Species: Lepidosaphes ulmi (L.)
Stage sampled: Parasitized adults
Sample: 2 leaf clusters

Date of sampling: August 28, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS					QUADRANTS					
	N	S	E	W	Total "A"	N	S	E	W	Total "B"	Total (A+B)
1	2	5	7	28	42	5	5	7	40	57	99
2	20	26	2	1	49	0	4	3	18	25	74
3	0	2	0	1	3	4	35	8	5	52	55
4	17	4	15	13	49	7	12	4	11	34	83
5	3	0	2	3	8	5	35	12	52	104	112
6	10	19	8	24	61	4	16	13	45	78	139
Total	52	56	34	70	212	25	107	47	171	350	562

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	552.0	5	(MST)	110.4	0.91	2.48	3.58
Within trees							
Levels	396.75	1		396.75	3.27	4.11	7.39
Quadrants	1515.0	3		505.0	4.16	2.86	4.38
Levels x Quadrants	745.25	3		248.4	2.04	2.86	4.38
Error	4253.0	35	(MSR)	121.5	0	0	0

$\bar{x}$ = 11.71

% S.E. = 12.80

S.E. ($S_{\bar{x}}$) = 1.50

$C.V._{\underline{n}}$ = 30.70

Species: Lepidosaphes ulmi (L.)
Stage sampled: A. mytilaspidis
Sample: 2 leaf clusters

Date of sampling: August 28, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	2	2	1	17	22	5	5	1	23	34	56
2	20	3	0	0	23	0	1	0	10	11	34
3	0	1	0	1	2	2	3	2	2	9	11
4	3	0	0	1	4	2	0	0	0	2	6
5	0	1	0	1	2	0	0	1	5	6	8
6	0	3	1	0	4	1	3	1	2	7	11
Total	25	9	2	20	57	10	12	5	42	69	126

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	579.25	5	(MST)	115.85	5.75	2.48	3.58
Within trees							
Levels	3.0	1		3.0	0.15	4.11	7.39
Quadrants	132.50	3		44.17	2.19	2.86	4.38
Levels x Quadrants	57.58	3		19.19	0.95	2.86	4.38
Error	705.67	35	(MSR)	20.16	0	0	0

$\bar{x}$ = 2.64

% S.E. = 58.33

S.E. ($S_{\bar{x}}$) = 1.54

C.V.$_{\underline{n}}$ = 208.2

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *H. malus* and others
Sample: 2 leaf clusters

Date of sampling: August 28, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	1	1	4	4	10	0	7	0	8	15	25
2	1	1	0	0	2	0	0	0	1	1	3
3	0	4	0	1	5	2	2	2	0	6	11
4	5	0	4	5	14	2	3	1	0	6	20
5	0	2	0	0	2	0	2	1	1	4	6
6	1	8	5	3	17	3	3	0	1	7	24
Total	8	16	13	13	50	7	17	4	11	39	89

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	55.86	5	(MST)	11.17	2.74	2.48	3.58
Within trees							
Levels	2.52	1		2.52	0.62	4.11	7.39
Quadrants	16.56	3		5.52	1.37	2.86	4.38
Levels x Quadrants	4.73	3		1.58	0.39	2.86	4.38
Error	142.31	35	(MSR)	4.07	0	0	0

$\bar{x}$ = 1.85

% S.E. = 25.94

S.E. ($S_{\bar{x}}$) = 0.48

C.V.$_{\underline{n}}$ = 154.98

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Adults
Sample: 2 leaf clusters

Date of sampling: September 23, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	11	4	1	14	30	18	10	16	14	58	88
2	20	2	2	3	27	10	45	8	17	80	107
3	0	0	0	39	39	5	1	4	5	15	54
4	21	31	24	32	108	26	24	15	8	73	181
5	5	15	4	46	70	11	85	29	14	139	209
6	33	33	16	7	89	14	58	1	42	115	204
Total	90	85	47	141	363	84	223	73	100	480	843

Analysis of Variance

SOURCES OF VARIANCE	<u>S.S.</u>	<u>d.f.</u>		<u>M.S.</u>	<u>F</u>	F_{05}	F_{01}
Between trees	2715.87	5	(MST)	543.17	2.42	2.48	3.58
Within trees							
Levels	285.15	1		285.15	1.27	4.11	7.39
Quadrants	1510.16	3		503.33	2.24	2.86	4.38
Levels x Quadrants	1654.49	3		551.49	2.46	2.86	4.38
Error	7838.30	35	(MSR)	223.95	0	0	0

$\bar{x}$ = 17.56

% S.E. = 19.13

S.E. ($S_{\bar{x}}$) = 3.36

C.V.$_{\underline{n}}$ = 67.36

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Predated adults
Sample: 2 leaf clusters

Date of sampling: September 23, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	6	4	1	7	18	9	7	9	2	27	45
2	5	1	0	1	7	2	19	5	11	37	44
3	0	0	0	11	11	3	0	1	0	4	15
4	7	12	6	6	37	10	10	6	4	30	67
5	3	7	3	10	23	4	34	21	9	68	91
6	11	19	5	4	39	5	8	1	8	22	61
Total	32	43	15	39	135	33	78	43	34	188	323

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	411.10	5	(MST)	82.22	2.47	2.48	3.58
Within trees							
Levels	58.52	1		58.52	1.75	4.11	7.39
Quadrants	123.06	3		41.02	1.23	2.86	4.38
Levels x Quadrants	110.90	3		36.96	1.11	2.86	4.38
Error	1163.90	35	(MSR)	33.25	0	0	0

$\bar{x}$ = 6.72 % S.E. = 19.49

S.E. ($S_{\bar{x}}$) = 1.31 C.V.$_{\underline{n}}$ = 66.96

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Parasitized adults
Sample: 2 leaf clusters

Date of sampling: September 23, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	4	0	0	6	10	8	3	7	10	28	38
2	11	1	2	1	15	7	25	3	5	40	55
3	0	0	0	0	0	0	0	0	5	5	5
4	14	18	4	24	60	16	12	8	4	40	100
5	3	8	0	35	46	6	48	6	5	65	111
6	19	38	8	3	68	8	21	0	31	60	128
Total	51	65	14	69	199	45	109	24	60	238	437

Analysis of Variance

SOURCES OF VARIANCE	<u>S.S.</u>	<u>d.f.</u>		<u>M.S.</u>	<u>F</u>	$\underline{F}_{05}$	$\underline{F}_{01}$
Between trees	1421.36	5	(MST)	284.27	2.95	2.48	3.58
Within trees							
Levels	31.69	1		31.69	0.33	4.11	7.39
Quadrants	819.56	3		273.19	2.84	2.86	4.38
Levels x Quadrants	147.73	3		49.24	0.51	2.86	4.38
Error	3370.14	35	(MSR)	96.29	0	0	0

$\bar{x}$ = 9.10

% S.E. = 0.27

S.E. ($S_{\bar{x}}$) = 2.43

C.V.$_{\underline{n}}$ = 94.32

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: <u>H.malus</u> and others
Sample: 2 leaf clusters

Date of sampling: September 23, 1964.
Location: Macdonald College, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	1	0	1	4	6	5	2	2	2	11	17
2	5	1	0	0	6	1	3	0	1	4	10
3	0	0	0	2	2	0	0	0	0	0	2
4	0	2	2	1	5	0	8	4	1	13	18
5	0	5	2	3	10	2	1	2	0	5	15
6	5	3	3	1	12	0	1	0	0	1	13
Total	11	11	8	11	41	8	15	8	4	34	75

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	21.69	5	(MST)	4.33	1.19	2.48	3.58
Within trees							
Levels	1.02	1		1.02	0.28	4.11	7.39
Quadrants	9.32	3		3.10	0.85	2.86	4.38
Levels x Quadrants	5.14	3		1.71	0.42	2.86	4.38
Error	127.65	35	(MSR)	3.64	0	0	0

$\bar{\bar{x}}$ = 1.56

% S.E. = 19.23

S.E. ($S_{\bar{\bar{x}}}$) = 0.30

C.V.$_{\underline{n}}$ = 51.28

Species: Lepidosaphes ulmi (L.)
Stage sampled: Eggs
Sample: 2 leaf clusters

Date of sampling: May 14, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	10003	16035	18614	11126	55778	33633	14266	10564	22902	81365	137143
2	10283	1306	3325	7423	22337	5730	3010	7604	12297	28641	50978
3	3136	104	346	384	3970	1144	1681	10355	3131	16311	20281
4	0	0	0	86	86	0	5622	45	0	5667	5753
5	0	0	0	0	0	412	0	0	72	484	484
6	43	104	38	219	404	583	77	570	571	1801	2205
Total	23465	17549	22323	19238	82575	41502	24656	29138	38973	134269	216844

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	1752448058.0	5	(MST)350489611.0	21.76	2.48	3.58
Within trees						
Levels	55672284.0	1	55672284.0	3.46	4.11	7.39
Quadrants	23616506.0	3	7872168.6	4.88	2.86	4.38
Levels x Quadrants	11974155.0	3	3991377.6	2.47	2.86	4.38
Error	563583949.0	35	(MSR) 16102399.0	0	0	0

$\bar{x}$ = 4517.58

% S.E. = 59.78

S.E. ($S\bar{x}$) = 2701.0

C.V.$_n$ = 177.80

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: Predated eggs
Sample: 2 leaf clusters

Date of sampling: May 14, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	1921	3200	2497	2685	10303	2526	4065	3952	1205	11748	22051
2	2691	227	694	727	4339	1680	228	920	1567	4395	8734
3	352	23	46	43	464	17	435	912	52	1416	1880
4	0	0	0	15	15	0	831	45	0	876	891
5	0	0	0	0	0	131	0	0	18	149	149
6	0	30	3	17	50	138	2	120	56	316	366
Total	4964	3480	3240	3487	15171	4492	5561	5949	2898	18900	34071

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	46692702.0	5	(MST)9338540.0	28.87	2.48	3.58
Within trees						
Levels	289697.0	1	289697.0	0.90	4.11	7.39
Quadrants	512775.0	3	170925.0	0.53	2.86	4.38
Levels x Quadrants	730215.0	3	243405.0	0.75	2.86	4.38
Error	11320180.0	35	(MSR) 323434.0	0	0	0

$\bar{x}$ = 709.81

% S.E. = 62.14

S.E. ($S_{\bar{x}}$) = 441.08

C.V.$_{\underline{n}}$ = 196.0

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *H. malus* and others
Sample: 2 leaf clusters

Date of sampling: May 14, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	120	217	129	140	606	102	720	43	56	921	1527
2	82	2	8	6	98	42	8	29	9	88	186
3	8	0	0	1	9	2	19	75	6	102	111
4	0	0	0	0	0	0	4	0	0	4	4
5	0	0	0	0	0	2	0	0	0	2	2
6	0	0	0	1	1	4	0	0	0	4	5
Total	210	219	137	148	714	152	751	147	71	1121	1835

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	227185.0	5	(MST)45437.0	5.38	2.48	3.58
Within trees						
Levels	3451.0	1	3451.0	0.41	4.11	7.39
Quadrants	29896.0	3	9965.0	1.18	2.86	4.38
Levels x Quadrants	20917.0	3	6972.0	0.83	2.86	4.38
Error	295625.0	35	(MSR) 8446.0	0	0	0

$\bar{x}$ = 38.23   % S.E. = 80.49

S.E. ($S_{\bar{x}}$) = 30.77   C.V.$_{\underline{n}}$ = 301.61

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: Adults
Sample: 2 leaf clusters

Date of sampling: May 14, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	287	479	416	306	1488	733	308	391	450	1882	3370
2	339	44	49	167	599	262	87	235	370	954	1553
3	71	3	13	8	95	22	36	191	60	309	404
4	0	0	0	2	2	0	174	1	0	175	177
5	0	0	0	0	0	10	0	0	5	15	15
6	4	6	1	8	19	37	5	1	10	63	82
Total	701	532	479	491	2203	1064	610	829	895	3398	5601

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	$\underline{F}$	$\underline{F}_{05}$	$\underline{F}_{01}$
Between trees	1092708.0	5	(MST) 218542.0	29.2	2.48	3.58
Within trees						
Levels	29751.0	1	29751.0	3.98	4.11	7.39
Quadrants	17370.0	3	5790.0	0.77	2.86	4.38
Levels x Quadrants	5547.0	3	1849.0	0.25	2.86	4.38
Error	261860.0	35	(MSR) 7482.0	0	0	0

$\bar{x}$ = 116.69

% S.E. = 57.83

S.E. ($S_{\bar{x}}$) = 67.48

C.V.$_{\underline{n}}$ = 182.75

Species: Lepidosaphes ulmi (L.)
Stage sampled: Larvae 1
Sample: 2 leaf clusters

Date of sampling: June 11, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS					QUADRANTS					
	N	S	E	W	Total "A"	N	S	E	W	Total "B"	Total (A+B)
1	2207	696	2440	2469	7812	4735	2065	823	3140	10763	18575
2	2194	2580	769	1896	7439	3879	363	1784	917	6943	14373
3	111	35	44	151	341	790	3230	2384	46	6450	6791
4	5	23	1	31	60	18	5	3	3	29	89
5	24	1	10	54	89	710	10	122	847	1689	1778
6	51	29	1	203	284	33	25	43	95	196	480
Total	4592	3364	3265	4804	16025	10165	5698	5159	5048	26070	42086

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	38240726.0	5	(MST)7648145.0	9.91	2.48	3.58
Within trees						
Levels	2102126.0	1	2102126.0	2.73	4.11	7.39
Quadrants	2002227.0	3	667409.0	0.87	2.86	4.38
Levels x Quadrants	1243929.0	3	414643.0	0.54	2.86	4.38
Error	26984775.0	35	(MSR) 770994.0	0	0	0

$\bar{x}$ = 876.79

% S.E. = 45.53

S.E. ($S_{\bar{x}}$) = 399.17

C.V.$_{\underline{n}}$ = 137.61

Species: Lepidosaphes ulmi (L.)
Stage sampled: Predated larvae 1
Sample: 2 leaf clusters

Date of sampling: June 11, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	1257	344	1456	2185	5242	3735	1004	353	2412	7504	12746
2	1068	1096	224	934	3322	3196	200	1309	367	5072	8394
3	68	7	17	37	129	316	2395	1350	3	4064	4193
4	2	2	0	14	18	6	0	0	2	8	26
5	2	0	2	17	21	210	0	20	467	697	718
6	18	10	1	139	168	8	3	17	20	48	216
Total	2415	1459	1700	3326	8900	7471	3602	3049	3271	17393	26293

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	16980443.0	5	(MST)3396089.0	6.84	2.48	3.58
Within trees						
Levels	1502730.0	1	1502730.0	3.03	4.11	7.39
Quadrants	1382472.0	3	460824.0	0.93	2.86	4.38
Levels x Quadrants	1162137.0	3	387379.0	0.78	2.86	4.38
Error	17378136.0	35	(MSR) 496518.0	0	0	0

$\bar{x}$ = 547.77

% S.E. = 48.56

S.E. ($S_{\bar{x}}$) = 265.99

C.V.$_{\underline{n}}$ = 153.7

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Desiccated larvae 1
Sample: 2 leaf clusters

Date of sampling: June 11, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	577	282	650	129	1638	781	749	347	511	2388	4026
2	318	139	90	138	685	683	55	193	78	1009	1694
3	24	11	16	32	83	54	626	243	32	955	1038
4	1	4	0	11	16	4	3	3	1	11	27
5	8	0	5	20	33	62	0	21	48	131	164
6	10	17	12	27	66	19	10	12	59	100	166
Total	938	453	773	357	2521	1603	1443	819	729	4594	7115

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	1471717.0	5	(MST)294343.0	13.1	2.48	3.58
Within trees						
Levels	89528.0	1	89528.0	3.99	4.11	7.39
Quadrants	92463.0	3	30821.0	1.37	2.86	4.38
Levels x Quadrants	40708.0	3	13569.0	0.61	2.86	4.38
Error	784897.0	35	(MSR) 22426.0	0	0	0

$\bar{x}$ = 148.23

% S.E. = 52.83

S.E. ($S_{\bar{x}}$) = 78.31

C.V.$_{\underline{n}}$ = 180.90

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Unhatched eggs
Sample: 2 leaf clusters

Date of Sampling: June 11, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	10447	4814	8876	12497	36634	5841	1795	3148	3349	14133	50767
2	911	1184	64	752	2911	10718	242	3970	331	15261	18172
3	79	0	32	9	120	302	1331	1722	13	3368	3488
4	0	0	0	20	20	0	0	0	0	0	20
5	5	0	1	27	33	496	1	41	71	609	642
6	13	9	0	10	32	97	0	4	32	133	165
Total	11455	6007	8973	13315	39750	17454	3369	8885	3796	33504	73254

Analysis of Variance

SOURCES OF VARIANCE	<u>S.S.</u>	<u>d.f.</u>	<u>M.S.</u>	<u>F</u>	$\underline{F}_{05}$	$\underline{F}_{01}$
Between trees	253219714.0	5	(MST)50643943.0	10.30	2.48	3.58
Within trees						
Levels	812761.0	1	812761.0	0.165	4.11	7.39
Quadrants	16149752.0	3	5383251.0	1.09	2.86	4.38
Levels x Quadrants	10317751.0	3	3439250.0	0.70	2.86	4.38
Error	172149245.0	35	(MSR) 4918550.0	0	0	0

$\bar{x}$ = 1526.13   % S.E. = 67.30

S.E. ($S_{\bar{x}}$) = 1027.15   C.V.$_{\underline{n}}$ = 236.40

Species: <u>Lepidosaphes ulmi</u> (L.)
Stage sampled: Larvae 2
Sample: 2 leaf clusters

Date of sampling: July 7, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"					Level "B"					
		QUADRANTS			Total		QUADRANTS			Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	230	69	56	177	532	562	90	49	20	721	1253
2	235	246	398	201	1080	2	50	103	822	977	2057
3	146	0	46	0	192	51	163	114	62	390	582
4	1	194	0	0	195	1	209	0	0	210	405
5	7	11	5	16	39	0	18	34	476	528	567
6	24	11	2	41	78	41	2	25	0	68	146
Total	643	531	507	435	2116	657	532	325	1380	2894	5010

Analysis of Variance

SOURCES OF VARIANCE	<u>S.S.</u>	<u>d.f.</u>	<u>M.S.</u>	<u>F</u>	F_{05}	F_{01}
Between trees	307934.0	5	(MST)61587.0	2.53	2.48	3.58
Within trees						
Levels	12610.0	1	12610.0	0.52	4.11	7.39
Quadrants	44284.0	3	14761.0	0.61	2.86	4.38
Levels x Quadrants	64585.0	3	21528.0	0.88	2.86	4.38
Error	853843.0	35	(MSR)24396.0	0	0	0

$\bar{\bar{x}}$ = 104.38

% S.E. = 34.32

S.E. ($S_{\bar{\bar{x}}}$) = 35.82

C.V.$_{\underline{n}}$ = 113.28

Species: Lepidosaphes ulmi (L.)
Stage sampled: Predated larvae 2
Sample: 2 leaf clusters

Date of sampling: July 7, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	131	34	17	91	273	123	49	32	11	215	488
2	56	20	74	65	215	1	7	34	178	38	253
3	41	0	10	0	51	5	26	27	11	69	120
4	0	11	0	0	11	0	7	0	0	7	18
5	0	3	0	1	4	0	2	2	36	40	44
6	0	0	0	4	4	2	0	1	0	3	7
Total	228	68	101	161	558	131	91	96	236	372	930

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	21839.0	5	(MST)	4368.0	3.46	2.48	3.58
Within trees							
Levels	721.0	1		721.0	0.57	4.11	7.39
Quadrants	11196.0	3		3732.0	2.96	2.86	4.38
Levels x Quadrants	578.0	3		193.0	0.15	2.86	4.38
Error	44173.0	35	(MSR)	1262.0	0	0	0

$\bar{x}$ = 19.38

% S.E. = 49.23

S.E. ($S_{\bar{x}}$) = 9.54

C.V.$_{\underline{n}}$ = 162.52

Species: Lepidosaphes ulmi (L.)
Stage sampled: H. malus and others
Sample: 2 leaf clusters

Date of sampling: July 7, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS					QUADRANTS					
	N	S	E	W	Total "A"	N	S	E	W	Total "B"	Total (A+B)
1	11	2	24	22	59	24	5	0	0	29	88
2	27	9	27	15	78	0	0	13	1	14	92
3	9	0	2	0	11	0	3	3	7	13	24
4	0	2	0	0	2	0	1	0	0	1	3
5	0	2	0	0	2	0	1	0	3	4	6
6	0	0	0	0	0	0	0	0	0	0	0
Total	47	15	53	37	152	24	10	16	11	61	213

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	1159.0	5	(MST)	231.8	5.59	2.48	3.58
Within trees							
Levels	173.0	1		173.0	4.17	4.11	7.39
Quadrants	116.0	3		38.7	0.93	2.86	4.38
Levels x Quadrants	44.0	3		14.7	0.35	2.86	4.38
Error	1454.0	35	(MSR)	41.5	0	0	0

$\bar{x}$ = 4.44

% S.E. = 49.55

S.E. ($S_{\bar{x}}$) = 2.20

C.V.$_n$ = 157.5

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: Larvae 2
Sample: 2 leaf clusters

Date of sampling: July 20, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	47	82	32	136	297	88	77	44	27	236	533
2	36	461	416	426	1339	0	238	129	336	703	2042
3	419	3	42	9	473	332	15	2	0	349	822
4	119	34	18	2	173	2	53	0	2	57	230
5	14	38	12	3	67	10	6	1	52	69	136
6	57	5	0	39	101	42	0	15	3	60	161
Total	692	623	520	615	2450	474	389	191	420	1474	3924

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	332570.0	5	(MST)66514.0	5.37	2.48	3.58
Within trees						
Levels	19845.0	1	19845.0	1.60	4.11	7.39
Quadrants	9250.0	3	3083.0	0.25	2.86	4.38
Levels x Quadrants	867.0	3	289.0	0.02	2.86	4.38
Error	433759.0	35	(MSR)12393.0	0	0	0

$\bar{x}$ = 81.75

% S.E. = 45.54

S.E. ($S_{\bar{x}}$) = 37.23

C.V.$_{\underline{n}}$ = 147.6

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Predated larvae 2
Sample: 2 leaf clusters

Date of sampling: July 20, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A" QUADRANTS				Total "A"	Level "B" QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	30	8	1	48	87	39	22	14	5	80	167
2	13	261	237	118	629	0	47	74	163	284	913
3	218	0	4	0	222	119	3	1	0	123	345
4	13	2	2	2	19	0	7	0	2	9	28
5	2	6	0	1	9	0	1	1	31	33	42
6	13	0	0	3	16	11	0	3	2	16	32
Total	289	277	244	172	982	169	80	93	203	545	1527

Analysis of Variance

SOURCES OF VARIANCE	<u>S.S.</u>	<u>d.f.</u>	<u>M.S.</u>	<u>F</u>	<u>F</u>$_{05}$	<u>F</u>$_{01}$
Between trees	74429.0	5	(MST)14886.0	4.68	2.48	3.58
Within trees						
Levels	3979.0	1	3979.0	1.25	4.11	7.39
Quadrants	706.0	3	235.0	0.07	2.86	4.38
Levels x Quadrants	2435.0	3	812.0	0.26	2.86	4.38
Error	111266.0	35	(MSR) 3179.0	0	0	0

$\bar{x}$ = 31.81

% S.E. = 55.36

S.E. ($S_{\bar{x}}$) = 17.61

C.V.$_{\underline{n}}$ = 180.5

Species: Lepidosaphes ulmi (L.)
Stage sampled: H. malus and others
Sample: 2 leaf clusters

Date of sampling: July 20, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A" QUADRANTS N	S	E	W	Total "A"	Level "B" QUADRANTS N	S	E	W	Total "B"	Total (A+B)
1	2	5	0	5	12	68	27	5	2	102	114
2	1	43	42	139	225	0	10	12	26	48	273
3	37	0	4	0	41	36	4	1	0	41	82
4	4	2	2	2	10	1	7	0	0	8	18
5	4	1	1	1	7	1	0	0	48	49	56
6	1	0	0	4	5	5	0	2	0	7	12
Total	49	51	49	151	300	111	48	20	76	255	555

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	5815.0	5	(MST)	1163.0	2.02	2.48	3.58
Within trees							
Levels	42.0	1		42.0	0.07	4.11	7.39
Quadrants	1224.0	3		408.0	0.71	2.86	4.38
Levels x Quadrants	818.0	3		272.7	0.47	2.86	4.38
Error	20121.0	35	(MSR)	574.9	0	0	0

$\bar{x}$ = 11.56   % S.E. = 42.56

S.E. ($S_{\bar{x}}$) = 4.92   C.V.$_{n}$ = 136.67

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: Adults
Sample: 2 leaf clusters

Date of sampling: July 28, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	28	26	47	13	114	22	20	19	36	97	211
2	15	368	23	78	484	9	177	9	170	365	849
3	140	9	6	1	156	70	0	8	0	78	234
4	4	2	11	2	19	29	20	49	13	111	130
5	18	2	5	24	49	22	315	0	20	357	406
6	8	83	0	5	96	6	9	5	1	21	117
Total	213	490	92	123	918	158	541	90	240	1029	1947

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	47936.0	5	(MST) 9587.0	1.84	2.48	3.58
Within trees						
Levels	257.0	1	257.0	0.05	4.11	7.39
Quadrants	34816.0	3	11605.0	2.23	2.86	4.38
Levels x Quadrants	1353.0	3	451.0	0.09	2.86	4.38
Error	182465.0	35	(MSR) 5213.0	0	0	0

$\bar{x}$ = 40.56

% S.E. = 34.84

S.E. ($S_{\bar{x}}$) = 14.13

C.V.$_{\underline{n}}$ = 103.07

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: Predated adults
Sample: 2 leaf clusters

Date of sampling: July 28, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A" QUADRANTS N	S	E	W	Total "A"	Level "B" QUADRANTS N	S	E	W	Total "B"	Total (A+B)
1	1	3	1	0	5	6	0	0	17	23	28
2	1	211	13	34	259	2	108	2	67	179	438
3	14	0	2	0	16	23	0	3	0	26	42
4	0	0	0	0	0	3	4	2	2	11	11
5	5	0	0	0	5	1	83	0	2	86	91
6	1	4	0	0	5	2	3	0	0	5	10
Total	22	218	16	34	290	37	198	7	88	330	620

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	17354.0	5	(MST) 3471.0	3.34	2.48	3.58
Within trees						
Levels	33.0	1	33.0	0.03	4.11	7.39
Quadrants	7988.0	3	2663.0	2.56	2.86	4.38
Levels x Quadrants	269.0	3	89.7	0.09	2.86	4.38
Error	36412.0	35	(MSR) 1040.0	0	0	0

$\bar{x}$ = 12.91

% S.E. = 65.84

S.E. ($S_{\bar{x}}$) = 8.50

C.V.$_{\underline{n}}$ = 205.4

Species: Lepidosaphes ulmi (L.)
Stage sampled: H. malus and others
Sample: 2 leaf clusters

Date of sampling: July 28, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	5	1	11	10	27	4	2	5	9	20	47
2	6	66	13	6	91	4	121	12	66	203	294
3	11	1	6	1	19	12	0	9	0	21	40
4	0	0	2	1	3	0	7	2	0	9	12
5	3	0	2	6	11	0	32	0	1	33	44
6	2	0	0	0	2	6	0	0	0	6	8
Total	27	68	34	24	153	26	162	28	76	292	445

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	7423.0	5	(MST)	1484.6	4.52	2.48	3.58
Within trees							
Levels	403.0	1		403.0	1.23	4.11	7.39
Quadrants	1670.0	3		556.7	1.69	2.86	4.38
Levels x Quadrants	562.0	3		187.3	0.57	2.86	4.38
Error	11499.0	35	(MSR)	328.5	0	0	0

$\bar{x}$ = 9.27

% S.E. = 59.98

S.E. ($S_{\bar{x}}$) = 5.56

C.V.$_{\underline{n}}$ = 185.7

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Adults
Sample: 2 leaf clusters

Date of sampling: August 3, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	87	9	4	37	137	47	59	42	68	216	353
2	42	514	140	107	803	12	32	28	0	72	875
3	44	0	0	167	211	9	228	4	2	243	454
4	3	18	0	0	21	3	3	54	1	61	82
5	6	24	4	35	69	6	11	29	5	51	120
6	9	19	8	8	44	8	27	6	0	41	85
Total	191	584	156	354	1285	85	360	163	76	684	1969

Analysis of Variance

SOURCES OF VARIANCE	<u>S.S.</u>	<u>d.f.</u>	<u>M.S.</u>	<u>F</u>	<u>F05</u>	<u>F01</u>
Between trees	59817.0	5	(MST)11963.0	1.79	2.48	3.58
Within trees						
Levels	525.0	1	525.0	0.08	4.11	7.39
Quadrants	23728.0	3	7909.0	1.19	2.86	4.38
Levels x Quadrants	4037.0	3	1346.0	0.20	2.86	4.38
Error	233650.0	35	(MSR) 6676.0	0	0	0

$\bar{\bar{x}}$ = 41.02

% S.E. = 38.47

S.E. ($S_{\bar{x}}$) = 15.78

C.V.$_{\underline{n}}$ = 111.78

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: Predated adults
Sample: 2 leaf clusters

Date of sampling: August 3, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	29	1	0	19	49	18	18	13	34	83	132
2	14	345	83	77	519	4	17	25	0	46	565
3	18	0	0	55	73	3	124	4	0	131	204
4	0	6	0	0	6	1	1	8	0	10	16
5	0	0	0	2	2	3	1	3	1	8	10
6	2	0	1	1	4	1	7	1	0	9	13
Total	63	352	84	154	653	30	168	54	35	287	940

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	28941.0	5	(MST)	5788.0	2.15	2.48	3.58
Within trees							
Levels	2791.0	1		2791.0	1.04	4.11	7.39
Quadrants	9410.0	3		3136.7	1.17	2.86	4.38
Levels x Quadrants	1376.0	3		458.7	0.17	2.86	4.38
Error	94151.0	35	(MSR)	2690.0	0	0	0

$\bar{x}$ = 19.58 % S.E. = 56.18

S.E. ($S_{\bar{x}}$) = 11.0 C.V.$_{\underline{n}}$ = 167.0

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: <u>H.</u> <u>malus</u> and others
Sample: 2 leaf clusters

Date of sampling: August 3, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS					QUADRANTS					
	N	S	E	W	Total "A"	N	S	E	W	Total "B"	Total (A+B)
1	29	6	4	12	51	50	37	21	33	141	192
2	24	837	70	175	1106	4	1	12	0	17	1123
3	10	5	3	108	126	5	93	6	2	106	232
4	0	2	0	2	4	1	1	5	0	7	11
5	1	2	0	2	5	4	1	2	3	10	15
6	2	1	0	4	7	5	0	2	0	7	14
Total	66	853	77	303	1299	69	133	48	38	288	1587

Analysis of Variance

SOURCES OF VARIANCE	<u>S.S.</u>	<u>d.f.</u>	<u>M.S.</u>	<u>F</u>	$\underline{F}_{05}$	$\underline{F}_{01}$
Between trees	116575.0	5	(MST)23315.0	1.62	2.48	3.58
Within trees						
Levels	21294.0	1	21294.0	1.48	4.11	7.39
Quadrants	41057.0	3	13686.0	0.95	2.86	4.38
Levels x Quadrants	27829.0	3	9276.0	0.64	2.86	4.38
Error	504678.0	35	(MSR)14419.0	0	0	0

$\bar{x}$ = 33.06

% S.E. = 66.70

S.E. ($S_{\bar{x}}$) = 22.05

C.V.$_{\underline{n}}$ = 189.0

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Adults
Sample: 2 leaf clusters

Date of sampling: August 11, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS					QUADRANTS					
	N	S	E	W	Total "A"	N	S	E	W	Total "B"	Total (A+B)
1	104	23	18	35	180	35	94	76	51	256	436
2	184	315	1	122	622	20	45	10	135	210	832
3	5	6	45	100	156	50	147	0	72	269	425
4	15	1	8	3	27	11	395	76	1	483	510
5	2	22	6	80	110	15	28	1	28	72	182
6	35	40	11	72	158	34	334	10	5	383	541
Total	345	407	89	412	1253	165	1043	173	292	1673	2926

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	27742.0	5	(MST) 5548.0	0.86	2.48	3.58
Within trees						
Levels	3675.0	1	3675.0	0.57	4.11	7.39
Quadrants	65541.0	3	21847.0	3.42	2.86	4.38
Levels x Quadrants	34521.0	3	11507.0	1.80	2.86	4.38
Error	223491.0	35	(MSR) 6385.0	0	0	0

$\bar{x}$ = 60.95

% S.E. = 17.54

S.E. ($S_{\bar{x}}$) = 10.7

C.V.$_{\underline{n}}$ = 12.3

Species: <u>Lepidosaphes</u> <u>ulmi</u> (L.)
Stage sampled: Predated adults
Sample: 2 leaf clusters

Date of sampling: August 11, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	25	2	2	27	56	10	68	47	13	138	194
2	160	223	0	116	499	5	44	7	111	167	666
3	0	2	2	48	52	45	137	0	54	236	288
4	0	0	1	0	1	0	91	0	0	91	92
5	0	8	0	2	10	0	2	0	25	27	37
6	4	4	1	6	15	25	216	3	1	245	260
Total	189	239	6	199	633	85	558	57	204	904	1537

Analysis of Variance

SOURCES OF VARIANCE	<u>S.S.</u>	<u>d.f.</u>		<u>M.S.</u>	<u>F</u>	<u>F_{05}</u>	<u>F_{01}</u>
Between trees	30980.0	5	(MST)	6196.0	2.70	2.48	3.58
Within trees							
Levels	1530.0	1		1530.0	0.67	4.11	7.39
Quadrants	23839.0	3		7946.0	3.46	2.86	4.38
Levels x Quadrants	8071.0	3		2690.0	1.17	2.86	4.38
Error	80305.0	35	(MSR)	2294.0	0	0	0

$\bar{x}$ = 32.02

% S.E. = 35.48

S.E. ($S_{\bar{x}}$) = 11.36

C.V.$_{\underline{n}}$ = 109.2

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: Parasitized adults
Sample: 2 leaf clusters

Date of sampling: August 11, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	0	0	0	0	0	0	2	0	0	2	2
2	0	0	0	0	0	0	0	0	0	0	0
3	0	2	0	0	2	0	0	0	2	2	4
4	0	0	0	0	0	5	7	0	0	12	12
5	0	11	0	8	19	1	1	0	0	2	21
6	0	5	0	0	5	1	0	3	0	4	9
Total	0	18	0	8	26	7	10	3	2	22	48

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	37.75	5	(MST) 7.55	1.48	2.48	3.58
Within trees						
Levels	0.33	1	0.33	0.065	4.11	7.39
Quadrants	30.5	3	10.17	1.99	2.86	4.38
Levels x Quadrants	12.83	3	4.28	0.84	2.86	4.38
Error	178.59	35	(MSR) 5.10	0	0	0

$\bar{x}$ = 1.0

% S.E. = 40.0

S.E. ($S_{\bar{x}}$) = 0.4

C.V.$_{n}$ = 109.0

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *H. malus* and others
Sample: 2 leaf clusters

Date of sampling: August 11, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	30	4	14	62	110	28	87	92	17	224	334
2	48	8	0	25	81	30	4	6	170	210	291
3	5	2	1	70	78	9	42	3	38	92	170
4	2	0	0	2	4	0	46	0	0	46	50
5	2	0	1	2	5	0	5	0	5	10	15
6	4	2	0	0	6	16	298	1	0	315	321
Total	91	16	16	161	284	83	482	102	230	897	1181

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	12305.0	5	(MST)2461.0	1.00	2.48	3.58
Within trees						
Levels	7829.0	1	7829.0	3.19	4.11	7.39
Quadrants	8032.0	3	2677.0	1.09	2.86	4.38
Levels x Quadrants	11286.0	3	3762.0	1.53	2.86	4.38
Error	85889.0	35	(MSR)2454.0	0	0	0

$\bar{x}$ = 24.60

S.E. ($S_{\bar{x}}$) = 7.16

% S.E. = 29.11

C.V.$_{\underline{n}}$ = 23.54

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: Adults
Sample: 2 leaf clusters

Date of sampling: August 26, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"				Total "A"	Level "B"				Total "B"	Total (A+B)
	QUADRANTS					QUADRANTS					
	N	S	E	W		N	S	E	W		
1	13	26	32	40	111	36	25	66	9	136	247
2	39	284	74	161	558	14	60	30	510	614	1172
3	34	0	0	33	67	3	0	0	0	3	70
4	46	1	8	1	56	1	24	5	2	32	88
5	2	31	0	75	108	17	1	9	10	37	145
6	5	50	9	52	116	32	6	8	0	46	162
Total	139	392	123	362	1016	103	116	118	531	868	1884

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	112866.0	5	(MST)22573.0	7.06	2.48	3.58
Within trees						
Levels	465.3	1	465.3	0.15	4.11	7.39
Quadrants	23732.0	3	7911.0	2.47	2.86	4.38
Levels x Quadrants	83819.0	3	27939.6	8.74	2.86	4.38
Error	111914.0	35	(MSR) 3197.54	0	0	0

$\bar{x}$ = 39.25

% S.E. = 55.28

S.E. ($S_{\bar{x}}$) = 21.7

C.V.$_{\underline{n}}$ = 168.15

Species: Lepidosaphes ulmi (L.)
Stage sampled: Predated adults
Sample: 2 leaf clusters

Date of sampling: August 26, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A" QUADRANTS N	S	E	W	Total "A"	Level "B" QUADRANTS N	S	E	W	Total "B"	Total (A+B)
1	10	4	17	37	68	25	19	48	9	101	169
2	37	268	72	161	538	12	59	24	505	600	1138
3	32	0	0	14	46	0	0	0	0	0	46
4	8	0	1	0	9	1	17	2	0	20	29
5	0	1	0	19	20	11	0	3	1	15	35
6	2	11	3	27	43	13	0	5	0	18	61
Total	89	284	93	258	724	62	95	82	515	754	1478

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	66983.5	5	(MST) 13396.6	2.07	2.48	3.58
Within trees						
Levels	18.75	1	18.75	0.003	4.11	7.39
Quadrants	20706.0	3	6902.0	1.05	2.86	4.38
Levels x Quadrants	8533.25	3	2844.0	0.43	2.86	4.38
Error	230046.5	35	(MSR) 6572.7	0	0	0

$\bar{x}$ = 30.79   % S.E. = 52.21

S.E. ($S_{\bar{x}}$) = 16.6   C.V.$_{\underline{n}}$ = 162.92

Species: *Lepidosaphes ulmi* (L.)
Stage sampled: *H. malus* and others
Sample: 2 leaf clusters

Date of sampling: August 26, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total "A"	QUADRANTS				Total "B"	Total (A+B)
	N	S	E	W		N	S	E	W		
1	17	0	3	7	27	18	0	52	9	79	106
2	39	279	75	162	555	9	53	25	539	626	1181
3	28	0	0	37	65	0	0	0	0	0	65
4	14	0	0	0	14	2	33	3	0	38	52
5	0	2	0	47	49	6	1	4	1	12	61
6	0	11	7	12	30	6	0	0	0	6	36
Total	98	292	85	265	740	41	87	84	549	761	1501

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	130306.0	5	(MST)26061.0	4.49	2.48	3.58
Within trees						
Levels	9.19	1	9.19	0.16	4.11	7.39
Quadrants	24239.0	3	8079.7	1.39	2.86	4.38
Levels x Quadrants	10402.0	3	3467.0	0.60	2.86	4.38
Error	202897.0	35	(MSR) 5797.0	0	0	0

$\bar{x}$ = 31.27

% S.E. = 74.51

S.E. ($S_{\bar{x}}$) = 23.30

C.V.$_{n}$ = 229.68

Species: Lepidosaphes ulmi (L.)
Stage sampled: Adults
Sample: 2 leaf clusters

Date of sampling: September 23, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	26	50	19	22	117	6	29	27	14	76	193
2	10	164	0	156	330	12	78	24	81	195	525
3	0	9	15	0	24	4	3	0	27	34	58
4	6	22	2	0	30	0	1	0	3	4	34
5	2	1	1	39	43	4	0	4	7	15	58
6	0	20	0	23	43	5	34	2	7	48	91
Total	44	266	37	240	587	31	145	57	139	372	959

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	21969.0	5	(MST)4393.8	6.24	2.48	3.58
Within trees						
Levels	963.0	1	963.0	1.36	4.11	7.39
Quadrants	8091.0	3	2697.0	3.83	2.86	4.38
Levels x Quadrants	1155.0	3	385.0	0.55	2.86	4.38
Error	24647.0	35	(MSR) 704.0	0	0	0

$\bar{x}$ = 19.97

% S.E. = 47.87

S.E. ($S_{\bar{x}}$) = 9.56

C.V.$_{n}$ = 147.0

Species: Lepidosaphes ulmi (L.)
Stage sampled: Predated adults
Sample: 2 leaf clusters

Date of sampling: September 23, 1964.
Location: Ile Bizard, Que.

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	19	15	9	15	58	5	23	17	11	56	114
2	10	163	0	156	329	10	73	23	80	186	515
3	0	6	12	0	18	3	3	0	26	32	50
4	4	5	1	0	10	0	0	0	0	0	10
5	0	0	0	22	22	0	0	0	0	5	27
6	0	3	0	8	11	4	6	1	6	17	28
Total	33	192	22	201	448	22	105	41	128	296	744

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.	M.S.	F	F_{05}	F_{01}
Between trees	23759.75	5	(MST)4751.95	6.65	2.48	3.58
Within trees						
Levels	481.33	1	481.33	0.67	4.11	7.39
Quadrants	5421.66	3	1807.22	2.53	2.86	4.38
Levels x Quadrants	634.0	3	211.33	0.29	2.86	4.38
Error		35	(MSR) 713.66	0	0	0

$\bar{x}$ = 15.50

% S.E. = 64.19

S.E. ($S_{\bar{x}}$) = 9.95

C.V.$_{n}$ = 196.72

Species: Lepidosaphes ulmi (L.)   Date of sampling: September 23, 1964.
Stage sampled: H. malus and others   Location: Ile Bizard, Que.
Sample: 2 leaf clusters

Counts

Tree No.	Level "A"					Level "B"					
	QUADRANTS				Total	QUADRANTS				Total	Total
	N	S	E	W	"A"	N	S	E	W	"B"	(A+B)
1	11	70	37	7	125	10	31	11	6	58	183
2	3	0	1	4	8	4	3	1	1	9	17
3	2	2	0	0	4	4	0	0	3	7	11
4	2	20	2	0	24	0	2	0	0	26	50
5	2	0	0	28	30	1	0	0	5	6	36
6	0	4	0	1	5	0	6	0	1	7	12
Total	20	96	40	40	196	19	42	12	16	113	309

Analysis of Variance

SOURCES OF VARIANCE	S.S.	d.f.		M.S.	F	F_{05}	F_{01}
Between trees	2740.89	5	(MST)	548.17	3.72	2.48	3.58
Within trees							
Levels	143.52	1		143.52	0.97	4.11	7.39
Quadrants	211.0	3		70.33	0.47	2.86	4.38
Levels x Quadrants	213.13	3		71.04	0.48	2.86	4.38
Error	5154.20	35	(MSR)	147.26	0	0	0

$\bar{x}$ = 6.43   % S.E. = 52.56

S.E. ($S_{\bar{x}}$) = 3.38   C.V.$_n$ = 163.28