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ECOLOGIE DE RODOPHON SWAINEI. CARTE DE DISSECTION: PARASITES.

ECOLOGIE DE RODOPHON SWAINEI. CARTE DE DISSECTION: PARASITES.

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# INFORMATION RETRIEVAL for the Swaine jack pine sawfly life system

FORTRAN STATEMENT

IDENTIFICATION

## A MANUAL OF CODED SAMPLING FORMS

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CENTRE DE RECHERCHES FORESTIERES  
DES LAURENTIDES  
SERVICE CANADIEN DES FORETS

INFORMATION RETRIEVAL FOR THE SWAINE JACK PINE  
SAWFLY LIFE SYSTEM  
A MANUAL OF CODED SAMPLING FORMS

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#### ABSTRACT

Coded sampling forms used during studies on the life-system of the Swaine jack pine sawfly, *Neodiprion swainei* Middleton, are described. The forms permit the transfer of scientific data direct to punch-cards or magnetic tape. They are used for population sampling of various stages of the sawfly, as well as for sawfly dissection data, small mammal and bird census data, forest inventories, and climatological records.

#### RESUME

Les formules d'échantillonnage codifiées décrites sont utilisées durant les études de l'écologie des populations de la tenthrède de Swaine, *Neodiprion swainei* Middleton. Ces formules permettent le transfert de données scientifiques directement sur cartes perforées ou bande magnétique. Elles servent aux échantillonnages des populations de divers stades de la tenthrède, ainsi que pour diverses données de dissection, prélèvements des populations de petits mammifères et d'oiseaux, d'inventaires forestiers et des données climatologiques.





## INTRODUCTION

An information retrieval system is essential for summarizing and analysing life table data during population dynamics studies, and for developing descriptive mathematical models. This is especially true if the data are to be obtained for several study areas and years. Basic to the system are sampling forms which permit the transfer of field or laboratory data direct to cards or to magnetic tape for computer storage.

This manual summarizes the data collection system now used in studies of the population dynamics of the Swaine jack pine sawfly, *Neodiprion swainei* Middleton, in Quebec. Data on the described sampling forms are punched on IBM cards. A manual of basic data summaries, written in Fortran IV language is in preparation.

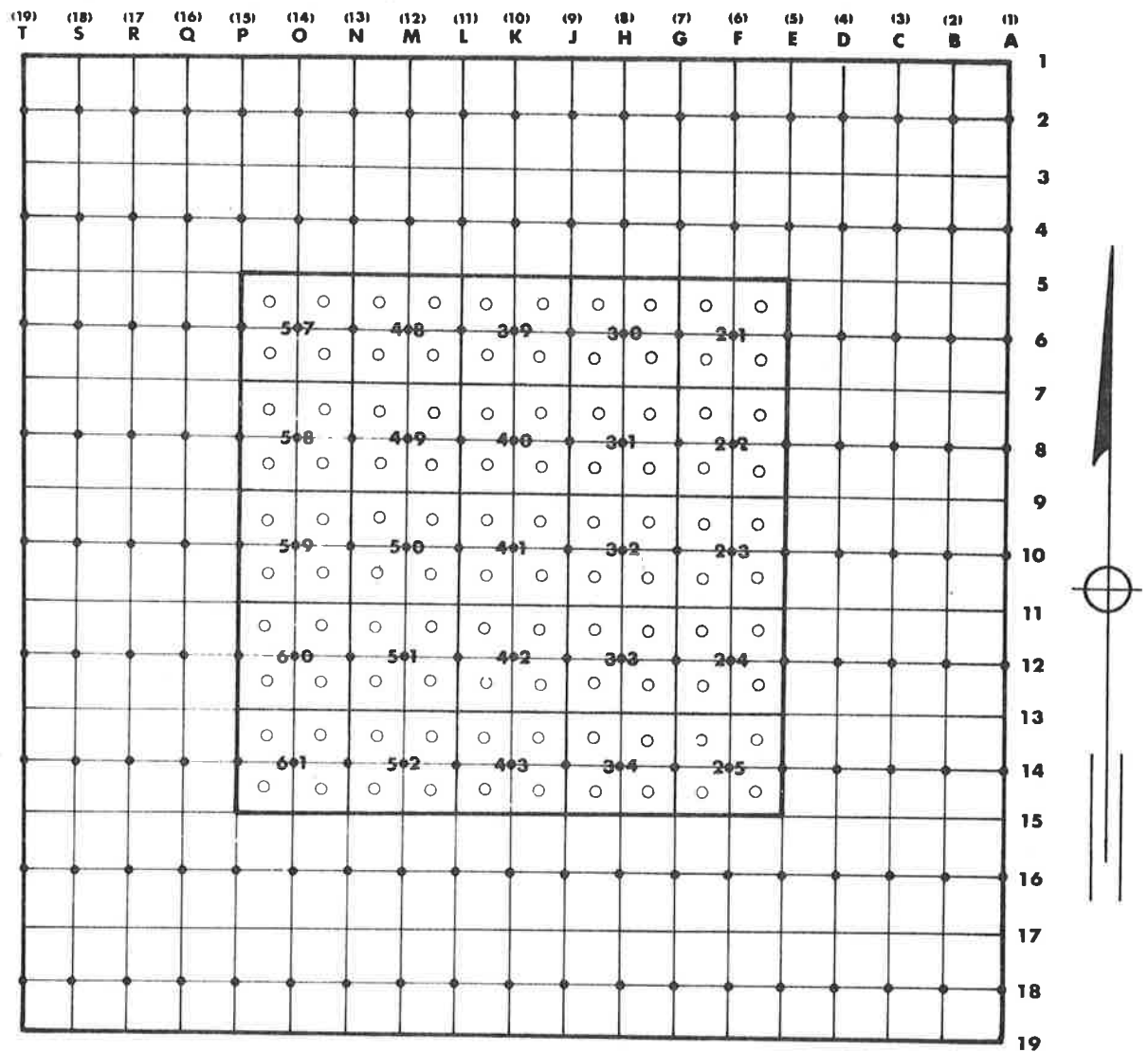
The writing on the forms is in French, the working language of our group. However, the English translation of each cell in the forms is duplicated in the text, so that there should be no difficulty in interpretation. A French text is in preparation.

The forms illustrated in the text are reproduced actual size except for Form 07:01 (Fig.13A,B) which is reduced approximately .6X.

### DESCRIPTION OF A STUDY AREA

The largest unit, a 32.4 acre (13.1 hectare) grid (Fig.1) is used for bird population studies. This unit is called the study area. The small black circles along every second line are the observation points for birds. The next largest unit, outlined in the center of the study area is called the plot, and is 10X10 chains (201.168X201.168 metres) on each side. The total area of the plot is 10 acres (4.068 hectares), and it is used among other things for sawfly population studies. Within the plot, the units numbered in the center are called the blocks. They are 2X2 chains (40.234X40.234 metres), and are used to facilitate laying out of the samples. The smallest unit is 1X1 chains (20.117X20.117 metres) and is .10 acres in area (.0406 hectares). The open circles at the centre of each of these units, called sub-blocks, are trapping points for small mammals.

Reference posts within the study areas are at one-chain intervals. They are numbered from the northeast corner of the study area. The south coordinates are represented by numbers and the west coordinates by letters. On sampling forms however, only numbers are used, and the numeric equivalents are shown above the letters (Fig.1). Samples are selected from within each sub-block by a set of randomised coordinates from 0 to 65 inclusive (1 chain = 66 feet). Measurements are always taken from the northeast corner post of each sub-block.

**LEGEND:**

BIRD OBSERVATION POINTS =



SMALL MAMMAL TRAPPING POINTS =

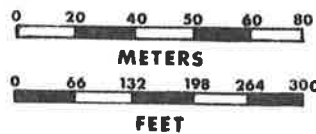
**SCALE**

Fig.1. Study area used in *Neodiprion swainei* population dynamics investigations.

In 1973 we will begin conversion to the metric system. The smallest unit, presently .10 acres will become 20X20 meters. The adjusted study areas will thus be 2.102 meters shorter on each side and 1.16 per cent less in total surface area than the old ones.

The layout for the plots was first designed by Lyons (1964).

The advantages of the system are as follows:

*Adaptability*

The basic unit (.10 acres) remains fixed, and the number of units per study area can vary according to local requirements. Thus, a study area can be a multiple of the basic unit.

*Ease of Measurement*

All samples are selected by a system of randomised coordinates, which facilitates selection and assures representativeness.

*Graphical Interpretation*

Using a grid system, state variables can be shown on a three dimensional graph, facilitating interpretation. A well prepared graph is often much more revealing than a mass of dry statistics. The two examples of bird and sawfly population distributions (Fig.2) show this clearly. It is the interpretation of the observed variations in population distribution which are of interest to the ecologist.

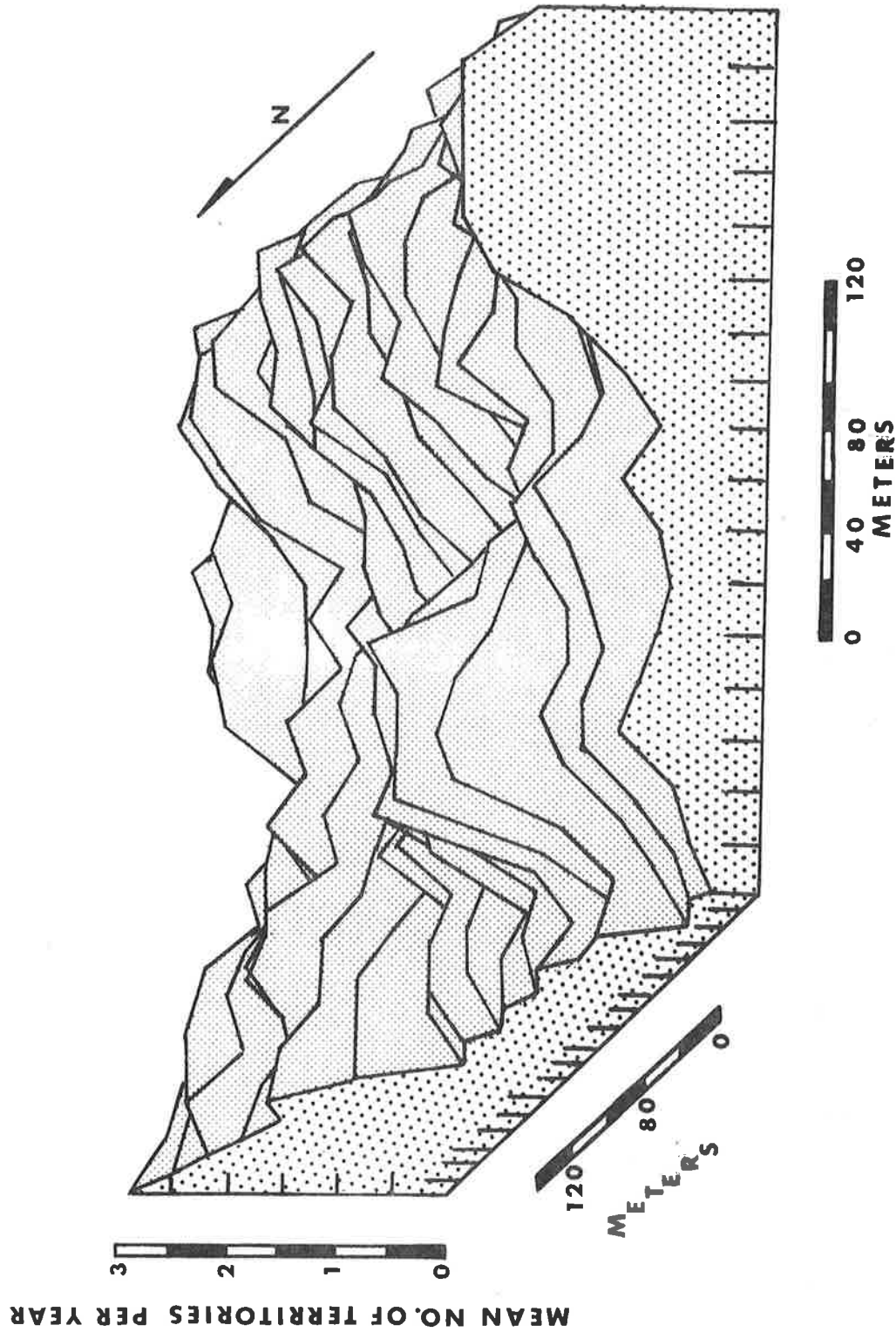


Fig.2A. Population distribution of breeding birds in a jack pine stand at Study Area 4, Rivière à Mars, Chicoutimi Co. P.Q. Expressed as mean number of breeding pairs per year for the years 1966 to 1972 inclusive.



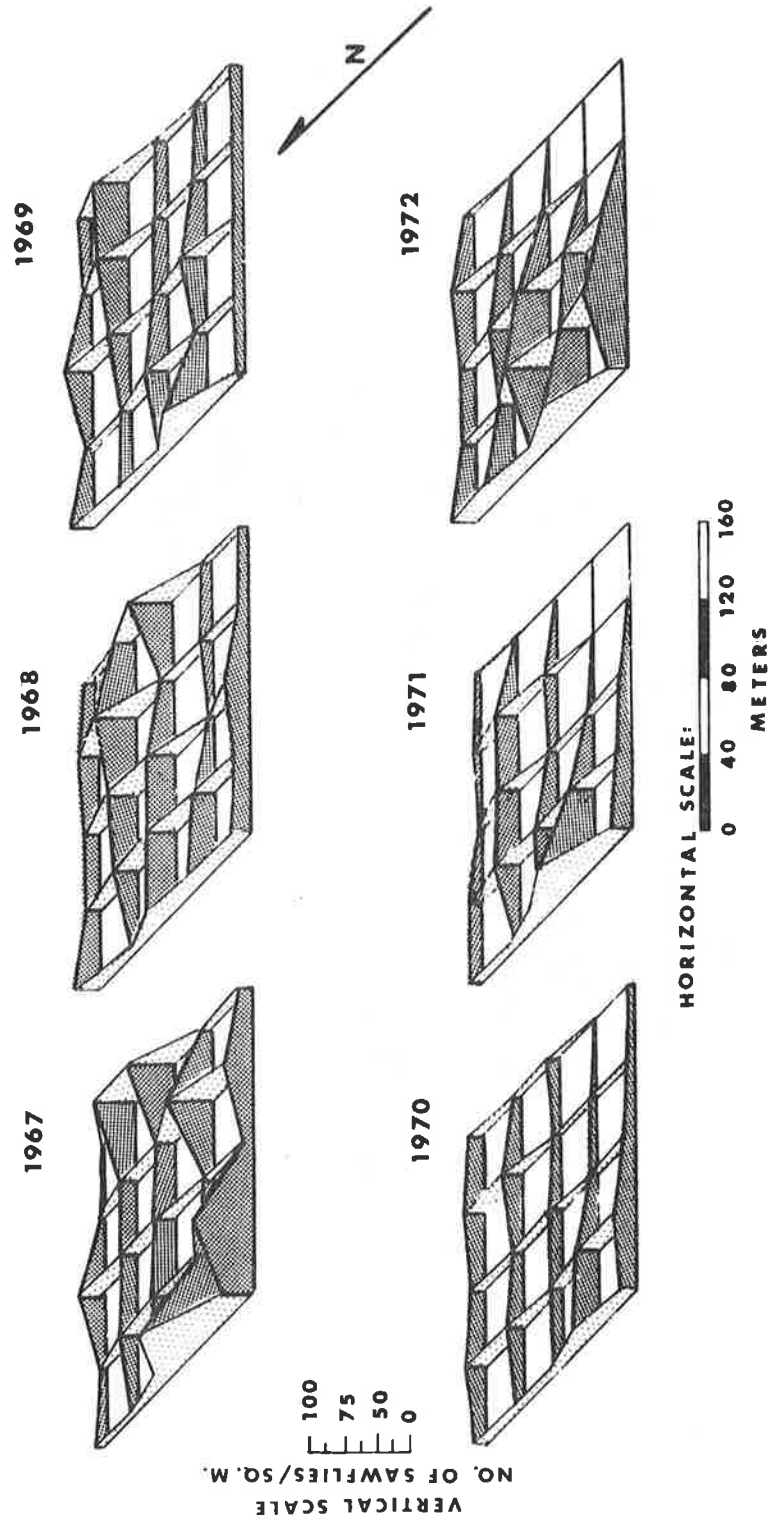


Fig.2B. Population distribution of *Neodiprion swainei* pre-spinning eonymphs in a jack pine stand at Study Area 6, Lac du Chevalier, Lavolette Co. P.Q. Expressed as the number of pre-spinning eonymphs per sq.m. years 1967 to 1972 inclusive. Each year is illustrated.

## BASIC INFORMATION CODE

To properly interpret the forms on the following pages, it suffices to know that a *sampling unit* is equivalent to one I.B.M. card and that *response variables* are sets of measurements which are made within a sampling unit.

For example, population sampling form 01:04 (Fig.6) is for sampling populations of cocoons. The sampling unit in this case is a one-square foot section of soil, cut to the mineral soil. The response variables measured for each sampling unit include the location and time of sample, the number of cocoons of various categories, sex determinations etc. All the *response variables* for each *sampling unit* are entered on one I.B.M. card.

The numbers printed at the top of each cell in the forms are equivalent to the columns in an 80 column I.B.M. card.

*Basic Information (Fig.3)*

CELL

NUMBER

EXPLANATION

Basic Information fixes the sample in space and time, and is located in cells 1 to 26 inclusive. The format for Basic Information is found in the following forms:

<u>Form No.</u>	<u>Page No.</u>	<u>Remarks</u>
	<u>in Text</u>	
01:01	15	-
01:02	23	-

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
caté- gorie		date de collection						loca- lité		âge		année de la géné.		espèce		no. de la par- celle		coordonnées de la placette				coordonnées de l'échantillon			
		année		mois		jour												sud		ouest		sud		ouest	

Fig.3. Basic information entered on *Neodiprion swaini* sampling forms.

*Basic Information (Cont'd)*CELL  
NUMBER

## EXPLANATION

Page No.Form No.in TextRemarks

01:03

25

-

01:04

31

-

02:01

35

-

02:03

51

-

03:01

52

-

04:01

54

Skip cells 11-16

06:01

73

-

07:01

77

Skip cells 11-16,  
and cells 23-26

08:01

83

Skip cells 11-26

05:01

63

Cells 1-8 only contain  
basic information, and  
the skipped cells 9-26  
are filled with other  
information

09:01

88

Same as form 05:01

1-2

*Sample Category*

The codes are as follows:

CodeCategory

01

Sawfly population count

*Basic Information (Cont'd)*

CELL

NUMBER

## EXPLANATION

1-2

*Sample Category (Cont'd)*CodeCategory

02

Dissection of a population sample

03

Rearing and dissection of a  
population sample

04

Small mammal population count

05

Bird population count

06

Cocoon plant

07

Forest inventory

08

Climatic data

09

Bird dissection data

3-8

*Date of Collection*Sub-Headings: Cells 3-4 = *year*Cells 5-6 = *month*Cells 7-8 = *day*

This is the date when the sample was taken. For  
example:

Cell No.EntryExplanation

3-4

66

The year 1966

5-6

10

October (01 to  
12 = January to  
December)

*Basic Information (Cont'd)*

CELL

NUMBER

## EXPLANATION

3-8

*Date of Collection (Cont'd)*Cell No.EntryExplanation

7-8

01

Day of the month

9-10

*Study Area Number*

There are seven study areas used in Swaine jack pine sawfly population dynamics investigations. Codes are as follows:

Study AreaCodeLocalityLatitude and Longitude

01

Lac McLaren

47°10'

73°29'

02

Lac Oriskany

47°31'

73°44'

03

Lac des Iroquois

48°22'

72°28'

04

Rivière à Mars

48°09'

71°01'

05

Lac Caousacouta

47°16'

73°37'

06

Lac du Chevalier

47°03'

73°43'

07

Lac Baude

47°06'

73°17'

11-12

*Sawfly Age Interval*

This is the age of the sawfly at the time of sampling.

CodeSawfly Age IntervalCodeSawfly Age Interval

00

Eggs

03

Larval instar II

01

Hatched eggs

04

Larval instar III

02

Larval instar I

05

Larval instar IV



*Basic Information (Cont'd)*

CELL

NUMBER

EXPLANATION

11-12

*Sawfly Age Interval (Cont'd)*

<u>Code</u>	<u>Sawfly Age Interval</u>	<u>Code</u>	<u>Sawfly Age Interval</u>
06	Larval instar V	09	Cocoons (fall)
07	Larval instar VI and VII	10	Cocoons (spring)
08	Pre-spinning eonymphs	11	Adults

13-14

*Generation Year*

The generation year is the year in which the eggs were laid. Example:

<u>Entry</u>	<u>Explanation</u>
72	1972 generation

15-16

*Sawfly Species*

A number of sawfly species are found in jack pine stands. These are coded as follows:

<u>Code</u>	<u>Sawfly Species</u>
01	<i>Neodiprion swainei</i>
02	<i>N. virginianus complex</i>
03	<i>N. pratti banksianae</i>
04	<i>N. nanulus nanulus</i>
05	<i>N. compar</i>
06	<i>N. dubiosus</i>

*Basic Information (Cont'd)*

CELL  
NUMBER

## EXPLANATION

15-16

*Sawfly Species (Cont'd)*CodeSawfly Species

07

*Pikonema alaskensis*

08

*Pikonema dimockii*

09

*Diprion hercyniae*

17-18

*Block Number*

This is the designation for the 2X2 chain (.162 hectare) units in the study area (Fig.1). Blocks are numbered from 01 to 81 consecutively starting at the northeast corner of the study area. In the field, only those within the 10 acre plot are numbered.

Example:

EntryExplanation

21

Block number 21

19-22

*Sub-Block Coordinates*Sub-Headings: Cells 19-20 = *south coordinate*Cells 21-22 = *west coordinate*

These are the coordinates of the northeast corner of the 1X1 chain (.041 hectare) sub-blocks. The coordinates are numbered from 01 to 18 on each side of the study area (Fig.1). Example:

*Basic Information (Cont'd)*

CELL

NUMBER

EXPLANATION

19-22

*Sub-Block Coordinates (Cont'd)*EntryExplanation

0705

south coordinate = 07

west coordinate = 05

23-26

*Sample coordinates*Sub-Headings: Cells 23-24 = *south coordinate*Cells 25-26 = *west coordinate*

These are the coordinates defining the position of a sample within the sub-block. The coordinates are numbered in 1 foot (.305 metre) intervals from 01 to 65 inclusive, and are measured first south and then west from the northeast corner of each sub-block. The point defined by the coordinates is the northeast corner of a 1 foot square (.093 square metre) sample, or to the closest tree. Following metric conversion, sub-blocks will be 20X20 metres and the coordinates for selection of samples will be in .25 metre units from 0 to 79 inclusive. The format will remain the same. Example:

EntryExplanation

0265

south coordinate = 2 feet

west coordinate = 65 feet

## SAMPLING FORMS

01:01. *Sampling Form for Populations of Sawfly Adults, Egg Clusters and Larvae; Valid 1971 and After (Fig.4).*

CELL

NUMBER

## EXPLANATION

This is a field sampling form for adults, egg clusters, and larvae of the Swaine jack pine sawfly. Since the female sawfly deposits her total egg compliment on a single jack pine shoot, one egg cluster = one surviving female sawfly.

The Swaine jack pine sawfly is a colonial defoliator. The insects are obtained from whole-tree samples. Progeny from two or more egg clusters often coalesce into groups, and consequently during larval sampling, the sampling unit is the larval group. However, when egg clusters only are sampled, the sampling unit is the whole tree from which the clusters were obtained. Example:

Sampled Sawfly StageAppropriate Sample Unit

Sawfly egg clusters

and adult females

whole tree = one IBM card

Sawfly larvae

larval group = one IBM card

1-26

*Basic Information*

Basic information format on this card is identical to Fig.3.

27-29

*Tree Number*

For each plot-year, the sampled trees are numbered

[illegible]

Fig. 4A. Population sampling form 01.01: sawfly adults, egg clusters and larvae; valid 1971 and after.

[illegible]

Fig. 4B. Population sampling form 01:01 (verso).



01:01. *Sampling Form for Populations of Sawfly Adults, Egg Clusters and Larvae; Valid 1971 and After (Cont'd).*

## CELL

## NUMBER

## EXPLANATION

27-29

*Tree Number (Cont'd)*

consecutively from 001.

30-31

*Tree Height*

Tree height is measured to the nearest foot (.3048 metre). On conversion to metric units, the number of cells for this response variable will be increased by 1 since precision in metric units will be to the nearest .5 metre. The same applies to response variables 32-33, 43-44, and 45-48.

32-33

*Crown Height*

The total length of the foliated section of the tree is measured to the nearest foot.

34-36

*D.B.H. (Inches)*

The diameter of the tree at breast height is measured to the nearest .10 inch. Thus, 084 = 8.4 inches. The format will remain the same for metric units. Precision will be to the nearest 2 cm.

37-38

*Dominance Class*

The dominance class of the sampled tree is coded as follows:

CodeDominance Class

01

Dominant

01:01. *Sampling Form for Populations of Sawfly Adults, Egg Clusters and Larvae: Valid 1971 and After (Cont'd).*

CELL

NUMBER

EXPLANATION

37-38

*Dominance Class (Cont'd)*CodeDominance Class

02

Co-dominant

03

Intermediate

04

Suppressed

99

Class not recorded

39-42

*Total Defoliation (Percent)*

Total sawfly defoliation is measured in fractional increments by a technique described by Benoit (1971). The numbers entered in the cells are the decimal equivalents read to the nearest .5 percent. Thus, 0055 = 5.5 percent.

43-44

*No. of Feet of Dead Crown*

Occasionally, part of the tree crown dies back following sawfly defoliation. The number of feet of dead crown is estimated to the nearest foot.

45-48

*Length of Double Crown*

Occasionally, jack pine have forked, or double crowns. The length of each section is measured to the nearest foot. Thus, 3022 = 30 feet for crown A, and 22 feet for crown B.

01:01. *Sampling Form for Populations of Sawfly Adults, Egg Clusters and Larvae; Valid 1971 and After (Cont'd).*

CELL NUMBER	EXPLANATION
49-51	<p><i>No. of Egg Clusters</i></p> <p>The total number of Swaine jack pine sawfly egg clusters found on the tree is recorded here. Thus, 022 = 22 egg clusters.</p>
64-65	<p><i>Crew Chief</i></p> <p>The code for the name of the field crew chief appears here. Codes are shown in Appendix 1.</p>
66-67	<p><i>Counter</i></p> <p>All the sawfly larvae found on the tree are collected and counted in the laboratory. The code for the name of the counter appears here. See Appendix 1 for details.</p> <p>N.B. The information in cells 1 to 51, and cells 64 to 67 inclusive, applies to one tree. The remainder of the form is for larval counts. If no larval counts are made, enter 9's in cells 52 to 63 inclusive.</p>
52-54	<p><i>Group Number</i></p> <p>Enter the assigned larval group number here. For each tree, larval groups are numbered consecutively from 001. Thus, 134 = larval group number 134. If no groups are present on the tree, enter 000 in the first row on the left.</p>

01:01. *Sampling Form for Populations of Sawfly Adults, Egg Clusters and Larvae; Valid 1971 and After (Cont'd).*

CELL  
NUMBER

EXPLANATION

55

*Group Class*

The sawfly group class is coded as follows:

<u>Code</u>	<u>Group Class</u>
0	No group present
1	Single group
2	Total individual larvae on the collection sheet under the tree
3	Total solitary larvae on the tree
4	Total number of larvae on the whole tree
9	Group class not recorded

56-57

*Sawfly Stage*

These are codes for the stage of the sawfly group at the time of collection. They are:

<u>Code</u>	<u>Sawfly Stage</u>
00	No groups on tree
01 to 07	Larval instars I to VII inclusive
08	Pre-spinning eonymph
09	Cocoon

01:01. *Sampling Form for Populations of Sawfly Adults, Egg Clusters and Larvae; Valid 1971 and After (Cont'd).*

CELL

NUMBER

EXPLANATION

56-57

*Sawfly Stage (Cont'd)*

Code

Sawfly Stage

12

Unhatched egg cluster

The stage entered is the average for the group.

58-63

*Number of Insects*

Enter here the total number of insects found in the group. Thus, 000657 = 657 insects.

N.B. Each larval group occupies one line only of cells 52-63 inclusive on Form 01:01. There are spaces for 52 groups on the front and the reverse side of the form.

Do not forget that each line of cells 52-63 inclusive = one I.R.M. card, plus the information in cells 1-51 and 64-67 inclusive which is repeated for each group.

01:02. *Population Sampling Form for Sawfly Adults, Egg Clusters, and Larvae. Valid until 1971 only (Not Illustrated).*

CELL NUMBER	EXPLANATION						
	Cells 1-38 inclusive are identical to Form 01:01.						
39-40	<i>Total Defoliation</i>  Enter total defoliation on sampled tree in 5 percent classes. Thus, 10 = 10 percent defoliation. Enter 99 if defoliation estimate not recorded.						
41-42	<i>Dead Crown</i>  See cells 43-44 of Form 01:01. The instructions are the same.						
43-45	<i>Number of Sawfly Egg Clusters</i>  See cells 49-51 of Form 01:01. The instructions are the same.						
46-51	<i>Total Number of Insects on the Tree</i>  See cells 58-63 of Form 01:01. The instructions are the same.  N.B. Cells 55-63 are skipped.						
64	<i>Double Crown</i>  Code for forked or double crowned tree.  <table> <tr> <th><u>Code</u></th><th><u>Class</u></th></tr> <tr> <td>0</td><td>Double crown absent</td></tr> <tr> <td>1</td><td>Double crown present</td></tr> </table>	<u>Code</u>	<u>Class</u>	0	Double crown absent	1	Double crown present
<u>Code</u>	<u>Class</u>						
0	Double crown absent						
1	Double crown present						
65-67	<i>Living Unhatched Clusters</i>  This entry is for living but unhatched sawfly egg						



01:02. *Population Sampling Form for Sawfly Adults, Egg Clusters, and Larvae. Valid until 1971 only (Cont'd).*

CELL

NUMBER

EXPLANATION

65-67

*Living Unhatched Clusters (Cont'd)*

clusters at the time of collection. Thus, 012 =  
12 living unhatched egg clusters.

01:03. *Population Sampling Form: Pre-spinning Eonymphs (Fig. 5).*

CELL

NUMBER

# EXPLANATION

Cells 1-26 are basic information exactly as shown in Fig.3. The sampling unit is a 10 inch diameter (.051 m<sup>2</sup>) funnel trap used to catch falling pre-spinning sawfly eonymphs.

27-32

*Number of Sawflies in Check*

Sub-Headings: Cells 27-28 = *sex undetermined*

Cells 29-30 = *males*

Cells 31-32 = *females*

Each sample is examined by one person then verified again by another sampler. The total number of sawflies found by the verifier (all categories pooled) is entered here.

Thus, 000502 indicates that the verifier found 5 male and 2 female sawflies.

33

*Damage Category*

The funnels are occasionally damaged in situ or during transit. Here are the codes for the various categories:

Code

Category

1

Sample intact

2

Sample lost

3

Sample damaged



01:03. *Population Sampling Form: Pre-spinning Eonymphs (Cont'd).*

CELL

NUMBER

EXPLANATION

33

*Damage Category (Cont'd)*

Code

Category

4

Sample damaged by bears

5

Sample stolen

9

Category not recorded

34-39

*Number of Living Cocoons*

Sub-Headings: Cells 34-35 = *Sex not determined*

Cells 36-37 = *Males*

Cells 38-39 = *Females*

Thus, 000102 indicates that 1 male and 2 female cocoons were found.

N.B. Entries in cells 34-57 inclusive *must include* the insects found by the verifier.

40-45

*Number of Dead Cocoons*

Format identical to cells 34-39.

46-51

*Number of Pre-spinning Eonymphs*

Format identical to cells 34-39.

52-57

*Number of Larvae*

This includes both living and dead larvae. Format identical to cells 34-39.

58

*Crown Closure*

Does the sample lie under tree crowns? The codes are:

01:03. *Population Sampling Form: Pre-spinning Eonympha (Cont'd).*

CELL

NUMBER

EXPLANATION

58

*Crown Closure (Cont'd)*CodeClass

1

Under crown

2

In open

9

Class not recorded

59-67

*Trans-Mercator Universal Grid Code*

Our sampling system is being used by the Forest Insect Survey, Laurentian Forest Research Centre, Quebec, to monitor population trends of the Swaine jack pine sawfly. The Universal Trans-Mercator Grid Designation as found in Canada Topographic 1:250,00 maps is entered in cells 59-65 as follows:

Cell NumberExplanation

59-60

Map number

61-62

Grid designation-longitude

63-65

Grid designation-latitude

66-67

Quarter subdivisions of the defined grid which are used by the Forest Insect and Disease Survey to further refine the location of the sample point.

01:03. *Population Sampling Form: Pre-spinning Eonymphs (Cont'd).*

CELL

NUMBER

## EXPLANATION

59-67

*Trans-Mercator Universal Grid Code (Cont'd)*Cell NumberExplanation

66-67

These are numbered from 01 to 04 in a clockwise direction. For our purposes, the T.M.U.G. code must conform to the location of the study area designated in cells 9-10.

68-69

*Altitude*

Altitude in feet of the study area. These are Forest Insect and Disease Survey codes, as follows:

CodeAltitude

01

100 feet

02

200 feet

10

1000 feet

90

9000 feet

70-71

*Examiner*

Enter examiners name here. See Appendix I for codes.

72-73

*Verifier*

Verifier's name. See Appendix I for codes.

01:03. *Population Sampling Form: Pre-spinning Eonymphs (Cont'd).*

CELL

NUMBER

## EXPLANATION

*N.B. Sample Unit Sizes*

Since the inception of the investigation, sample unit sizes for funnels have changed three times as follows:

<u>Years</u>	<u>Funnel</u>	<u>Funnel Area</u>	
	<u>Diameter</u>	<u>Sq. Ft.</u>	<u>Sq. M.</u>
1962-1964 *	18 inches	1.767	.164
1966-1971	13.5406 inches	1.000	.093
1972	10 inches	0.545	.051

\* No funnel samples were taken in 1965

01:04. *Population Sampling Form: Cocoons (Fig.6).*CELL  
NUMBER

## EXPLANATION

This is a form used for sampling Swaine jack pine sawfly cocoons. The sample unit is a one-square foot ( $.305 \text{ m}^2$ ) unit of soil taken to the mineral soil. Following metric conversion the unit will be .25X.25 m.

1-26

*Basic Information*

The format is identical to Fig.3.

27-32

*Emerged Sawflies*

The number of emerged sawflies. The format for sub-headings is identical to cells 34-39 of Form 01:03.

33-40

*Mammal Predation*

The number of sawfly cocoons preyed upon by small mammals. The format is identical to cells 34-39 of Form 01:03 except that for the former, there are 3 cells for males and females instead of 2. Thus, 01009010 = 1 cocoon, sex undetermined, 9 male cocoons, and 10 female cocoons.

41-46

*Insect Predation*

The number of sawfly cocoons preyed upon by insects. The format for sub-headings is identical to cells 34-39 of Form 01:03.

47-52

*Diptera-Emerged*



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
caté- gorie		date de collection						loca- lité		âge		géné-espèce ration		par- celle		coordonnées de la placette de l'échant.										
		année		mois		jour										sud		ouest		sud		ouest				
0		1																								
27		28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
* ténthredes émérgées		prédation de mammifères						prédation d'insectes						diptères émergés												
inc.		♂		♀		inc.		♂		♀		inc.		♂		♀		inc.		♂		♀				
53		54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	
hyménoptères émérgés		morts						non-identifiés						vivants						perd						
inc.		♂		♀		inc.		♂		♀		inc.		♂		♀		inc.		♂		♀				

**ECOLOGIE DE NEODIPRION SWAINI: Carte d'échantillonnage des populations de cocons; âges 09 et 10.**  
 1 carte = 1 échantillon = 1 pi<sup>2</sup> = 0.092903 m<sup>2</sup>.  
 \* les entrées faites dans les colonnes 27 à 76 inclus doivent inclure les recouvrements des vérifications

Fig.6. Population sampling Form 01:04: cocoons.

01:04. *Population Sampling Form: Cocoons (Cont'd).*

## CELL

## NUMBER

## EXPLANATION

47-52

*Diptera-Emerged (Cont'd)*

The number of sawfly cocoons from which dipterous parasitoids emerged. The format for the sub-headings is identical to cells 34-39 of Form 01:03.

53-58

*Hymenoptera-Emerged*

The number of sawfly cocoons from which hymenopterous parasitoids emerged. The format for the sub-headings is identical to cells 34-39 of Form 01:03.

59-64

*Dead*

The number of dead sawfly cocoons. The format for the sub-headings is the same as cells 34-39 on Form 01:03.

65-70

*Unidentified*

These are "empty" sawfly cocoons which could not be placed in any of the previous categories. The format for the sub-headings is the same as cells 34-39 of Form 01:03.

71-76

*Sound*

The number of living sawfly cocoons. The format for the sub-headings is the same as cells 34-39 of Form 01:03.

01:04. *Population Sampling Form: Cocoons (Cont'd).*

CELL

NUMBER

EXPLANATION

77

*Lost*CodesCategory

0

Sample lost

1

Sample intact and  
to be considered  
in analysis

2

Sample damaged

N.B.. Entries in columns 27-76 inclusive must include the cocoons found during verifications. Space did not permit entry of verification data on this form.

However, a 100 percent verification of all samples is made.

02:01. *Dissection Form: Sawfly Egg Clusters (Fig.7).*

CELL

NUMBER

# EXPLANATION

Egg clusters of the sawfly are dissected to determine the number of eggs deposited and mortality in the egg stage. The sample unit is a single sawfly egg cluster. Form 02:01 has space for entry of 25 egg clusters.

1-26

## *Basic Information*

The format is identical to Fig.3. Enter 02 in cells 1-2; this is the code for the dissection of a population sample. If the egg clusters are from a general collection, and not classified as individual colonies, the cells 17-29 are skipped. If classified as individual colonies, and if they are each assigned a group number (cells 30-32), then the entries in cells 1-26 apply to all the egg clusters entered on the form.

27-29

## *Tree Number*

This is the tree number from which the egg cluster was obtained. The same number would be entered in cells 27-29 of Form 01:01. The tree number as well as the group number should be identical to those registered on Form 01:01. If this information does not apply, i.e. if the egg clusters are from a "general" collection, enter 999 in cells 27-29.



[illegible]

Fig.7B. Dissection Form 02:01: sawfly egg clusters (verso).

02:01. *Dissection Form: Sawfly Egg Clusters (Cont'd).*

CELL

NUMBER

EXPLANATION

30-32

*Group Number*

Should be the same as that entered on Form 01:01.

If the information does not apply, enter 999.

33

*Sample*

The type of egg cluster sample is coded as follows:

CodeCategory

1

Egg cluster is from a collection  
in which group numbers were  
registered

2

Egg cluster is from a collection  
in which group numbers were not  
registered

3

other categories

9

information not recorded

34-36

*General Collection Cluster Number*To be used when code in cell 33 is 2. Egg clusters  
are numbered consecutively from 001 for each plot-year.

If information does not apply enter 999.

37

*Category*Sometimes more than one sawfly egg cluster occurs on  
a single jack pine shoot. The codes are as follows:

02:01. *Dissection Form: Sawfly Egg Clusters (Cont'd).*

CELL

NUMBER

EXPLANATION

37

*Category (Cont'd)*CodesCategory

1

single cluster

2

double cluster

3

triple cluster

4

quadruple cluster

5

multiple cluster

9

category not recorded

38-40

*Number of Dead Eggs*

On dissection of the sawfly egg cluster, the total number of dead eggs is entered here. Thus, 021 = 21 dead eggs.

41-43

*Number of Hatched Eggs*

The format is the same as cells 38-40.

44-46

*Parasitised-Tetrastichus*

The number of sawfly eggs parasitised by *Tetrastichus* sp. The format is the same as cells 38-40.

47-49

*Parasitised-Closterocerus*

The number of sawfly eggs parasitised by *Closterocerus* sp. The format is the same as cells 38-40.

50-52

*Predation-Sucking Insects*

The number of sawfly eggs preyed upon by sucking



02-01. *Dissection Form: Sawfly Egg Clusters (Cont'd).*

CELL

NUMBER

EXPLANATION

50-52

*Predation-Sucking Insects (Cont'd)*

insects. The format is the same as cells 38-40.

53-55

*Predation-Mandibulate Insects*

The number of sawfly eggs preyed upon by mandibulate insects. The format is the same as cells 38-40.

56-58

*Not Hatched-Alive*

The number of sawfly eggs not hatched but living. The format is the same as cells 38-40.

02:02. *Dissection Form. Rearing and Dissection of a Population Sample (Fig. 8).*

CELL

NUMBER

# EXPLANATION

This card summarises the results of dissections on various stages of the sawfly. Its principal use is for determining populations of parasitoids. The sampling unit for this form is a *single sawfly parasitoid*. Thus, 1 I.B.M. card = 1 parasitoid. Since 1 sawfly host may contain several parasitoid individuals of various species, this means that there are as many form cards as there are parasitoids.

1-26

## *Basic Information*

The format is the same as Fig.3. Enter 03 in cells 1-2; this is the code for a rearing and dissection of a population sample.

27-29

## *Sawfly Number*

Sawflies are prepared for dissection by placing them in small covered watch glasses with 10 percent K.O.H. At this time a master dissection card is prepared for each sawfly and placed beside the watch glass. The master card is a Form 02:02 with the information in the following cells filled: 1-33, 42-46, and 53.64. For each sawfly age, and plot-year, the sawflies are numbered consecutively from 001. Thus, 023 = sawfly number 23.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
catégorie		date de collection						localité		âge		génération		espèce		parcelle		coordonnées de la placette				coordonnées de l'échantillon			
		année		mois		jour												sud		ouest		sud		ouest	
27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
numéro de l'insecte			sexe du cocon	sexe émergé	destin	stade	espace du	parasite	sexe du parasite	destin du	parasite	stade du	parasite	classe du parasite	fécondité de la ténthrede			largeur du	cocon *	nombre d'encapsulations inconnues	hôte primaire	hôte secondaire			
53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	CFS - 5-1134				
date de dissection						date d'émergence						nom du dissectionneur		numéro de l'arbre		numéro du groupe		classe							
année		mois		jour		année		mois		jour															
<b>ECOLOGIE DE NEODIPRION SWAINI. CARTE DE DISSECTION : PARASITES.</b> 1 carte = 1 parasite. Ages 00 - 10 incl. * en unités ; 1 unité = .0667 mm.																									

Fig.8. Dissection Form 02:02: rearing and dissection of a population sample.

02:02. *Dissection Form. Rearing and Dissection of a Population Sample (Cont'd).*

CELL  
NUMBER

EXPLANATION

30

*Sex-Cocoon*

Prior to rearing, the sex is estimated by measuring the width of the cocoon. Codes are:

<u>Code</u>	<u>Category</u>
0	Not determined
1	Male
2	Female
9	Information not recorded

(This information is entered on master card)

31

*Sex-Sawfly*

The sex of the emerged sawfly. Codes are identical to cell 30.

(This information is entered on master card)

32

*Fate-Sawfly*

The ultimate fate of the sawfly following rearing: codes are as follows:

<u>Code</u>	<u>Fate Class</u>	<u>Code</u>	<u>Fate Class</u>
0	Not recorded	4	Prolonged diapauses
1	Died before rearing	5	Short diapauses
2	Died during rearing	6	Living (use this entry when sample not reared)
3	Sawfly emerged		

02:02. Dissection Form. Rearing and Dissection of a Population  
Sample (Cont'd).

CELL

NUMBER

EXPLANATION

32

*Fate-Sawfly (Cont'd)*

(This information is entered on master card)

33

*Stage-Sawfly*

The stage of the sawfly at the time of dissection:  
codes are:

<u>Code</u>	<u>Stage</u>	<u>Code</u>	<u>Stage</u>
0	Not recorded	4	Pupa
1	Larva	5	Adult
2	Eonymph in cocoon	6	Pre-spinning
3	Pronymph in cocoon		eonymph

(This information is entered on master card)

34-35

*Parasitoid Species*

On dissection, the remainder of the information on the master card is filled out. If the sawfly contains no parasitoids or encapsulations, enter 00 in these cells as well as in cells 36-41 and 47-52. If a parasitoid or encapsulation is found, enter the species code in cells 34-35 as follows:

<u>Code</u>	<u>Species</u>	<u>Code</u>	<u>Species</u>
00	Parasitoid not present	02	<i>Olesicampe lophyri</i>
01	<i>Spathimeigenia auriifrons</i>	03	<i>Lamachus</i> sp.

02:02. Dissection Form. Rearing and Dissection of a Population  
Sample (Cont'd).

CELL

NUMBER

EXPLANATION

34-35

*Parasitoid Species (Cont'd)*

<u>Code</u>	<u>Species</u>	<u>Code</u>	<u>Species</u>
04	<i>Perilampus</i>	13	<i>Gelis</i> sp.
	<i>hyalinus</i>	14	<i>Palexorista</i>
05	<i>Euceros</i>		<i>bohemia</i>
	<i>frigidus</i>	15	<i>Argrothereutes</i> sp.
06	<i>Exenterus</i>	16	<i>Diplostichus</i>
	<i>amictorius</i>		<i>hamatus</i>
07	<i>Exenterus</i>	17	Unidentified
	<i>diprionis</i>		parasitoids
08	<i>Dahlbominus</i>	18	Unknown
	<i>fuscipennis</i>		encapsulations
09	<i>Pleolophus</i>	19	<i>Nematode</i> sp.
	<i>indistinctus</i>	20	<i>Spathius</i> sp.
10	<i>Pleolophus</i>	21	<i>Pleolophus</i> sp.
	<i>basizonus</i>	22	<i>Phygadeuon</i> sp.
11	<i>Endasys</i>	23	<i>Delomerista</i>
	<i>subclavatus</i>		<i>diprionis</i>
12	<i>Mastrus</i>	24	<i>Pimpla</i>
	<i>argae</i>		<i>pedalis</i>

02:02. *Dissection Form. Rearing and Dissection of a Population Sample (Cont'd).*

CELL

NUMBER

EXPLANATION

34-35

*(Cont'd)*

N.B. If, on dissection, the number of parasites found in the host is one or fewer, then the master card alone will suffice. However, do not forget that one additional card must be prepared for each additional parasitoid found in the host. For the additional cards, information duplicated for the same host is as follows: cells 1-33, 42-46 and 53-64.

36

*Sex-Parasitoid*

Code

Class

0

Sex not determined

1

Male

2

Female

9

Information not  
recorded

37-38

*Fate-Parasitoid*

Code

Fate

00

Parasitoid not present

01

Parasitoid died before host was  
placed in rearing

02

Parasitoid died during rearing

03

Parasitoid emerged as adult

02:02. *Dissection Form. Rearing and Dissection of a Population*  
*Sample (Cont'd).*

CELL

NUMBER

EXPLANATION

37-38

*Fate-Parasitoid (Cont'd)*

Code

Fate

04

Parasitoid living and in  
prolonged diapause

05

Parasitoid living but encapsu-  
lated

06

Parasitoid dead and encapsula-  
ted before being placed in  
rearing

07

Parasitoid died during rearing  
and encapsulated

08

Parasitoid hyperparasitised

09

Parasitoid living in emerged host

10

Parasitoid living in the host  
(Use this entry when sample not  
reared)

39-40

*Parasitoid Stage*

The stage of the parasitoid at the time of dissect-  
ion. Codes are:

Code

Stage

00

Parasitoid not present or not  
recorded



02:02. *Dissection Form. Rearing and Dissection of a Population Sample (Cont'd).*

CELL

NUMBER

EXPLANATION

39-40

*Parasitoid Stage (Cont'd)*

Code

Stage

01-06

I to VI instar inclusive

07

Pupa

08

Adult

09

Immature larva

10

Mature larva

11

Larva

12

Egg

41

*Parasitoid Class*

These classes are coded as follows:

Code

Class

0

Parasitoid not present

1

Larval parasitoid

2

Eonymphal parasitoid

3

Cocoon parasitoid

9

Information not recorded

42-44

*Fecundity of Sawfly*

The number of eggs dissected from sawfly females.  
Thus, 123 = 123 eggs. Enter 999 if the information is  
not recorded.

02:02. *Dissection Form. Rearing and Dissection of a Population Sample (Cont'd).*

## CELL

## NUMBER

## EXPLANATION

45-46

*Cocoon Width*

The width of the sawfly cocoon in micrometer units. One unit = .0677 mm. Enter 99 if the information is not recorded.

47-48

*Number of Unknown Encapsulations*

Foreign objects other than parasitoids are encapsulated. The number found is entered here. Thus, 09 = 9 unknown encapsulations.

49-50

*Primary Host*

If the parasitoid is classified as a hyperparasitoid, i.e. class 08 in cells 37-38, then the species code for the primary host of the hyperparasitoid is entered here. See cells 34-35 for the codes.

51-52

*Secondary Host*

If the parasitoid is tertiary, the secondary host is entered here. Instructions are identical to cells 49-50.

53-58

*Dissection Date*

Sub-Headings: cells 53-54 = *Year*

cells 55-56 = *Month*

cells 57-58 = *Day*

Enter 9's if information was not recorded

02:02. *Dissection Form. Rearing and Dissection of a Population Sample (Cont'd).*

CELL NUMBER	EXPLANATION
59-64	<p><i>Emergence Date</i></p> <p>The format is the same as cells 53-58. This is the date when the insect emerged during rearing.</p>
65-66	<p><i>Dissector</i></p> <p>The name of the dissector is entered here. See Appendix I for codes.</p>
67-69	<p><i>Tree Number</i></p> <p>This information as well as the information in cells 70-72 applies only to codes 01 to 07 inclusive in cells 11-12 of Basic Information (Fig.3) and is valid only for 1972 and after. Enter the tree number from which the sample was taken here. The number should be the same as found in cells 27-29 of Form 01:01 for the equivalent sample.</p>
70-72	<p><i>Group Number</i></p> <p>The instructions are the same as for cells 67-69. The group number should correspond to that in cells 52-54 of Form 01:01.</p>

02:03. *Dissection of a Population Sample: Sample not Reared (Fig.8).*

CELL  
NUMBER

# EXPLANATION

The format for this form is identical to Form  
02:02 except for the following points:

<u>Cell No.</u>	<u>Modification</u>
1-2	Enter 02
31	Skip
32	Enter 6 for sawfly fate code
42-44	Skip
59-64	Skip

03:01. *Dissection of a Population Sample; Larvae (Not Illustrated).*

CELL

NUMBER

## EXPLANATION

This form was discontinued in 1971, and all larval dissection data are now entered on Form 02:02. Cells 1-42 of Form 03:01 are identical to population sampling Form 01:02.

43-45

*Sawfly Number*

The number assigned to the sawfly to be dissected. The format is the same as cells 27-29 of Form 02:02.

46-47

*Parasitoid Species*

The format and species codes are the same as cells 34-35 of Form 02:02.

48-49

*Parasitoid Fate*

The format and codes are identical to cells 37-38, of Form 02:02.

50-51

*Parasitoid Stage*

The format and codes are identical to cells 39-40 of Form 02:02.

52-53

*Unknown Encapsulations*

The format is identical to cells 47-48 of Form 02:02.

54

*Double Top*

Enter the presence of a double top here. The format and codes are identical to cell 64 of Form 01:02.

03:01. *Dissection of a Population Sample; Larvae (Cont'd).*

CELL

NUMBER

EXPLANATION

55-57

*Colony Number*

This is the assigned sawfly colony number from which the dissected larva was obtained. Larvae are numbered consecutively from 001 for each age and plot year.

04:01. *Small Mammal Population Sampling Form (Fig.9).*

CELL

NUMBER

## EXPLANATION

The sampling unit for this form is a single trapped animal. The response variables measured for each animal are entered on one line on the card. One card is to be used for each *trapping period* and there is space for entry of 39 trapped animals on each card. The information entered in cells 1-10, 27-28, and 41-61 applies to the trapping period and is common to all animals trapped during one trapping period.

1-2

*Sample Category*

Enter 04, the code for small mammal trapping.

3-8

*Collection Date*

This is the date of the trapping period. The format is identical to Fig.3.

9-10

*Locality*

The format is identical to Fig.3.

11-16

These cells are skipped.

27-28

*Hour*

The hour of the trapping period. There are three trapping periods in a trap day. Codes are as follows:

CodesHour of Trapping Period

08

8.00 hours

16

16:00 hours

[illegible]

Fig.9A. Small mammal population sampling Form 04:01.



**CFS - 5-1131, VERSO.**

Fig.9B. Small mammal population sampling Form 04:01 (verso).

04:01. *Small Mammal Population Sampling Form (Cont'd).*

CELL NUMBER	EXPLANATION						
27-28	<i>Hour (Cont'd)</i>						
	<table> <tr> <th><u>Codes</u></th><th><u>Hour of Trapping Period</u></th></tr> <tr> <td>00</td><td>Midnight</td></tr> <tr> <td>99</td><td>Hour not indicated</td></tr> </table>	<u>Codes</u>	<u>Hour of Trapping Period</u>	00	Midnight	99	Hour not indicated
<u>Codes</u>	<u>Hour of Trapping Period</u>						
00	Midnight						
99	Hour not indicated						
61	<i>Day</i>						
	The trapping day. The trap-day is a 24-hour period starting at 8:00 hours. Trap-days are numbered consecutively from 1.						
41-46	<i>Air Temperature</i>						
	Sub-Headings: Cells 41-42 = <i>maximum temperature</i> Cells 43-44 = <i>minimum temperature</i> Cells 45-46 = <i>present temperature</i>  Air temperature is read to the nearest degree Fahrenheit (to the nearest degree centigrade following conversion).						
47-52	<i>Soil Temperature</i>						
	The format same as cells 41-56.						
53-55	<i>Precipitation</i>						
	The rainfall to the nearest .01 inch (to the nearest .01 cm. following conversion), is entered here. Enter the amount which fell since the last trapping period. Thus, 105 = 1.05 inches.						

04:01. *Small Mammal Population Sampling Form (Cont'd).*

CELL

NUMBER

EXPLANATION

56

*Type*

Codes for the type of precipitation are:

<u>Code</u>	<u>Type</u>
0	No precipitation
1	Rain
2	Snow
3	Hail
9	Not recorded

57-59

*Barometric Pressure*

The barometric pressure is entered to the nearest .1 inch of mercury. Thus, 294 = 29.4 inches of mercury. The format will be the same following conversion to centimeters.

60

*Cloud Cover*

Codes are:

<u>Code</u>	<u>Type</u>
1	Clear
2	Cloudy
3	Partly cloudy
9	Not recorded

17-22

*Basic Information*

Enter the appropriate Block and Sub-Block codes.

04:01. *Small Mammal Population Sampling Form (Cont'd).*

CELL

NUMBER

EXPLANATION

17-22

*Basic Information (Cont'd)*

The format is identical to Fig.3.

23-26

Enter 3333, since the traps are in the centre of each sub-block.

ALPHA

In the field, the west coordinates are alphabetic. Thus, 0505 in cells 19-22, in the field would read 05-E. Therefore the notekeeper is first to copy the south coordinate in cells 19-20, then the alphabetic designation of the west coordinate in the cell marked ALPHA. The numeric equivalent of the west coordinate is afterwards entered in cells 21-22, the two cells immediately to the left of ALPHA. This will prevent errors of transcription in the field.

29-31

*Specimen Mark Number*

Starting at a given year (cell 3-4) and locality (cell 9-10), the specimen mark numbers run consecutively from 001. The numbers should run consecutively for at least three years in any one locality before re-starting at 001.

32-35

*Species Code*

Sub-Headings: Cells 32-33 = *Genera*

04:01. *Small Mammal Population Sampling Form (Cont'd).*

CELL

NUMBER

## EXPLANATION

32-35

*Species Code (Cont'd)*Cells 34-35 = *Species*

The codes below are derived from the mammals listed in Burt and Grossenheider (1964). Genera are numbered consecutively from 01 according to the field guide list, and species within genera from 01. Codes are:

<u>Code</u>	<u>Species</u>	<u>Code</u>	<u>Species</u>
0201	<i>Sorex cinereus</i>	8802	<i>Clethrionomys</i>
0301	<i>Microsorex hoyi</i>		<i>gapperi</i>
0601	<i>Blarina brevicauda</i>	8901	<i>Microtus</i>
0801	<i>Condylura cristata</i>		<i>pennsylvanicus</i>
6501	<i>Tamias striatus</i>	8910	<i>Microtus</i>
6801	<i>Tamiasciurus</i>		<i>ohrotorrhinus</i>
	<i>hudsonicus</i>	9601	<i>Zapus</i>
7905	<i>Peromyscus</i>		<i>hudsonius</i>
	<i>maniculatus</i>	9701	<i>Napeozapus</i>
8501	<i>Synaptomys</i>		<i>insignis</i>
	<i>cooperi</i>	3299	<i>Mustella</i> sp.
8701	<i>Phenacomys</i>		
	<i>intermedius</i>		

04:01. *Small Mammal Population Sampling Form (Cont'd).*

CELL

NUMBER

EXPLANATION

32-35

*Species Code (Cont'd)*

N.B. If the species identification is in doubt, enter 99 in cells 34-35.

36

*Trap Type*CodeTrap type

1

Chitty trap

2

Bucket trap

9

Type not recorded

37

*Age*

The age of the trapped animal. Codes are:

CodeAge

1

Adult

2

Juvenile

3

"Infant"

9

Not recorded

38

*Sex*

Sex of the trapped animal. Codes are:

CodeClass

1

Male

2

Female

3

Sex unknown

9

Sex not recorded

04:01. *Small Mammal Population Sampling Form (Cont'd).*

CELL

NUMBER

EXPLANATION

39

*Fate*

The trapped animal's fate. Codes are:

<u>Code</u>	<u>Fate</u>
1	Living
2	Dead
3	Dead from cannibalism
4	Died during marking
5	Wounded
9	Information not recorded

40

*Reprod.*

Reproductive condition of the female.

<u>Code</u>	<u>Category</u>
1	Mammae visible
2	Mammae not visible
3	Presence doubtful
9	Information not recorded

62-63

*Recapture Sequence*

For a given specimen number, within a trapping period, the first capture = 01, the first recapture = 02, and the second recapture 03, etc.

05:01. *Bird Population Sampling Form (Fig.10).*

CELL

NUMBER

## EXPLANATION

The sampling unit for this form is an individual singing male territory according to Kendøigh's (1944) technique. The field information however is not transferred directly to an I.B.M. card. Observations are usually made twice each day usually by two people in one locality, for at least four consecutive days and plotted on maps. Following this, base maps are prepared for each bird species (Fig.11). The information on the base maps is then transferred to Form 05:01.

1-2

*Sample Category*

Enter 05 in these cells. This is the code for bird population sampling.

3-8

*First Day of Observations*

This is the date of the first observation day for a plot-year. The format is the same as Fig.3.

9-10

*Days Obs.*

Enter the total number of days in the observation period for a plot-year here. Thus, 05 = 5 days observation.

11-12

*Study Area*

Enter the study area number here.





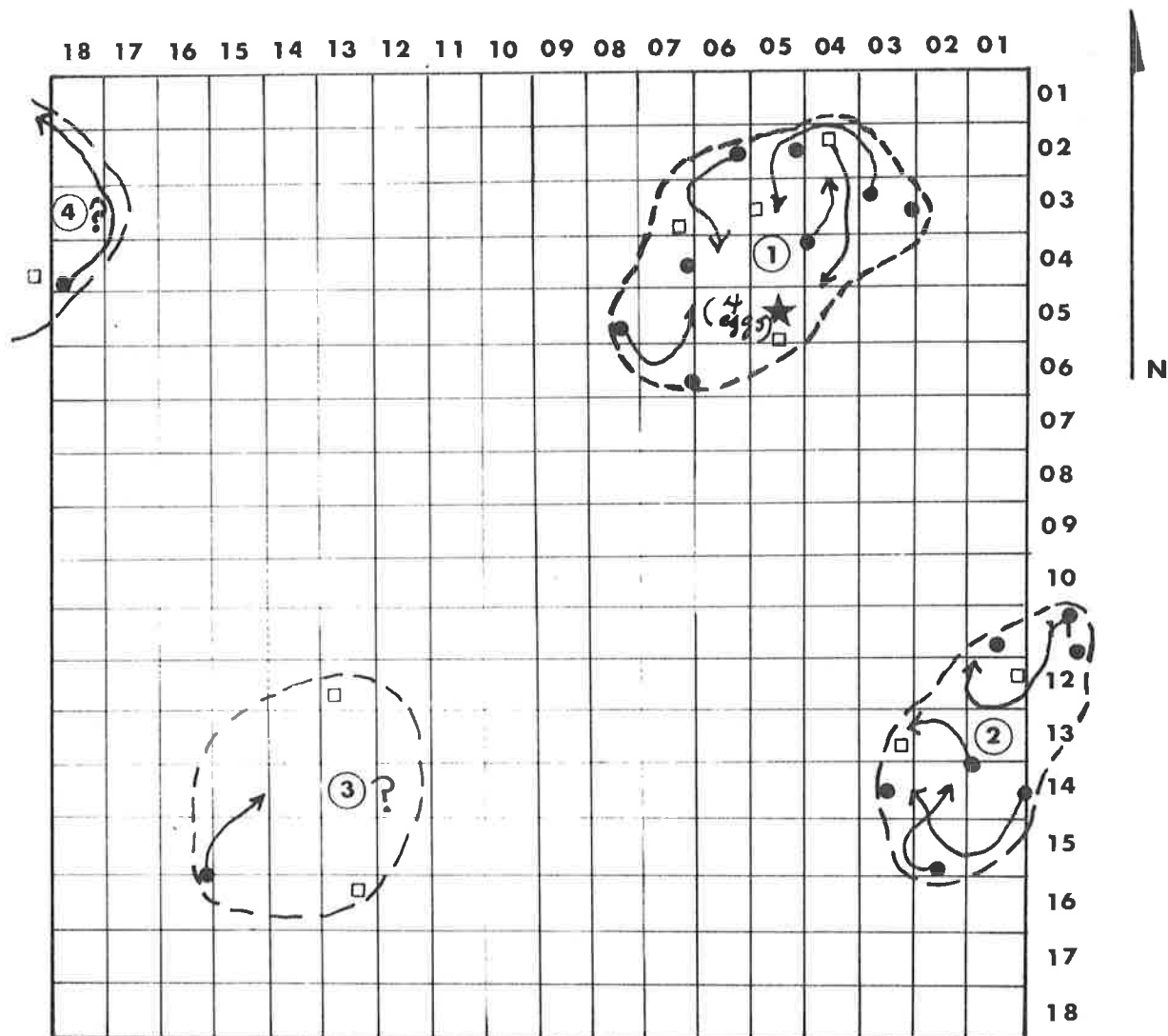


Fig.11. Example of a base map showing extent of territories of a single species.

05:01. *Bird Population Sampling Form (Cont'd).*

CELL

NUMBER

EXPLANATION

11-12

*Study Area (Cont'd)*

Format and codes are the same as cells 9-10 on Form  
01:01.

13-15

*Species*

Birds in the life-list of Peterson (1964) are  
numbered consecutively from 001. Codes for birds  
commonly encountered in Quebec jack pine forests are  
as follows:

94	Broad-winged hawk	261	Tree swallow
107	Spruce grouse	262	Bank swallow
108	Ruffed grouse	264	Barn swallow
210	Mourning dove	265	Cliff swallow
232	Nighthawk	267	Canada jay
234	Ruby-throated hummingbird	268	Blue jay
235	Belted kingfisher	271	Common raven
236	Flicker	274	Black-capped
241	Yellow-bellied sapsucker		chickadee
242	Hairy woodpecker	276	Brown-capped
243	Downy woodpecker		chickadee
245	Arctic three-toed woodpecker	279	Red-breasted
253	Yellow-bellied flycatcher		nuthatch
260	Horned lark	281	Brown creeper

05:01. *Bird Population Sampling Form (Cont'd).*

CELL

NUMBER

EXPLANATION

13-15

*Species (Cont'd)*

283	Winter wren	339	Chestnut-sided
291	Robin		warbler
293	Hermit thrush	340	Bay-breasted
294	Olive-backed thrush		warbler
299	Golden-crowned kinglet	346	Ovenbird
300	Ruby-crowned kinglet	347	Northern
301	American pipit		waterthrush
304	Cedar waxwing	350	Connecticut
305	Northern shrike		warbler
312	Blue-headed vireo (solitary)	352	Yellowthroat
314	Red-eyed vireo	355	Wilson's
315	Philadelphia vireo		warbler
326	Tennessee warbler	356	Canada warbler
328	Nashville warbler	357	American redstart
329	Parula warbler	364	Red-wing
331	Magnolia warbler	367	Rusty blackbird
332	Cape may warbler	371	Bronzed grackle
334	Myrtle warbler	381	Evening grosbeak
335	Black-throated	382	Purple finch
	green warbler	406	Slate-colored
337	Blackburnian warbler		junco

05:01. *Bird Population Sampling Form (Cont'd).*

CELL

NUMBER

EXPLANATION

13-15

*Species (Cont'd)*

409 Chipping sparrow      417 Swamp sparrow

413 White-crowned sparrow   418 Song sparrow

414 White-throated sparrow   423 Snow bunting

16-17

*Territory Number*

Each territory on a base map (Fig.11) is assigned a number. Thus, 01 = territory No.1.

18

*Type*

Type of territory. Codes are:

CodeTerritory Type

1

Complete and confirmed territory.

This is a territory which falls completely within the boundaries of the study area and for which there is no reasonable doubt as to its existence.

Territory No. 01 (Fig.11) is a complete, confirmed territory.

2

Incomplete and confirmed territory.

Territory No. 02 (Fig.11) exceeds the edge of the study area and is therefore incomplete.

05:01. *Bird Population Sampling Form (Cont'd).*

## CELL

## NUMBER

## EXPLANATION

18

*Type (Cont'd)*CodeTerritory Type

3

Complete uncertain territory.

Territory No. 03 is uncertain because of an insufficient number of observations.

4

Incomplete uncertain territory. See territory No. 4 (Fig.11).

19-22

*Coordinates of Nest*

The position of a nest on the base map is indicated by a star, as shown in territory No. 01 (Fig.11). Enter the coordinates of the sub-block in which the nest occurs. The format is the same as cells 19-22 of Form 01:01. The coordinates of the nest in territory No. 01 (Fig.11) are 0505.

23-24

*Progeny*

Enter the number of progeny found in the nest. On the base map (Fig.11) the information is located within parentheses beside the star indicating the position of the nest. Thus, for territory No. 01, there are 4 progeny.

05:01. *Bird Population Sampling Form (Cont'd).*

CELL

NUMBER

EXPLANATION

25

*Progeny Class*

This is also indicated in parentheses beside the nest (Fig.11). Codes are:

CodeClass

1

Eggs

2

Nestlings

3

Nest abandoned

26-31

*Territory Distribution, Row 1*Sub-Headings: Cells 26-27 = *south coordinate*Cells 28-29 = *west coordinate*Cells 30-31 = *No. of sub-blocks in the*  
*row*

Cells 32-37, 38-43, 44-49, 50-55, 56-61, 62-67, 68-73, and 74-79 are identical to cells 26-31. These cells are used to define the dimensions of the bird's territory. The procedure is as follows:

1. The bird's territory is superimposed on a grid (Fig.11).
2. If a territory occupies over one half of a sub-block, then its coordinates are registered. For example, sub-block 0203 (Fig.11) for territory No. 01 is to be registered, whereas sub-block 0302 is

05:01. *Bird Population Sampling Form (Cont'd).*

CELL

NUMBER

EXPLANATION

26-31

*Territory Distribution, Row 1 (Cont'd)*

excluded.

3. The starting point for entry of data for Row 1, Form 05:01, is the sub-block at the northeast extremity of the bird's territory, i.e. sub-block 0203 of territory No. 01 (Fig.11). The sub-block coordinates are entered in cells 26-29, following which the number of sub-blocks to the west of 0203 are counted, and the number entered in cells 30-31. Thus, the first entry for territory No. 01 is 020303 in cells 26-31, meaning that the coordinates of the sub-block on the eastern extremity of the first line comprising the bird's territory are 0203 and there are 3 additional sub-blocks to the west.

Data for the next row to be south are entered in the adjacent cells 32-37. Thus, 030304 in cells 32-37 indicates that for this line, the territory starts at sub-block 0303 and extends 4 sub-blocks to the west. This procedure is repeated until the territory is fully defined.

Thus, the entry 020303030304040304050502060601 in



05:01. *Bird Population Sampling Form (Cont'd).*

CELL

NUMBER

EXPLANATION

26-31

*Territory Distribution, Row 1 (Cont'd)*

cells 26-55 inclusive defines the dimensions of territory No. 1 (Fig.11).

If the territory is large, more than the 9 allocated cells on the card may be required to define it. If so, additional cards may be used, by duplicating the information in cells 1-25 and entering the remainder of territory distribution in cells 27-79.

80

*Card Number*

The card number of a series required to complete the definition of a single bird territory. Numbered consecutively from 1.

06:01. *Cocoon Planting Form (Fig.12).*

## CELL

## NUMBER

## EXPLANATION

The sampling unit for this form is a single planted sawfly cocoon. Cocoons are marked with indelible ink, buried in the duff, and recovered after a specified time in the soil (McLeod, 1966). The purpose is to obtain mortality estimates.

1-2

*Category*

Enter 06, the category for "cocoon plant" here.

3-8

*Planting Date*

The date the cocoon was planted in the duff. The format is identical to cells 3-8, Form 01:01.

9-26

*Basic Information*

The format is the same as Fig.3. Cells 11-12, the age when collected, represent the age of the source material for planting at the time of collection. The sawfly for the planting experiments must first be collected as larvae then reared to obtain the cocoons. Cells 23-26, the coordinates of the cocoon's position, represent the location where the cocoon was planted.

27-30

*Cocoon Number*

For each planting experiment, each cocoon is assigned a number consecutively from 0001.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
catégorie		date de la plantation						localité		âge		géné- ration		espèce		parcelle		coordonnées de la placette		coordonnées de l'emplacement					
		année		mois		jour												sud		ouest		sud		ouest	
0	6																								
27	28	29	30	31	32	33	34	35	36	37	38	39													
numéro du cocon				31	destin		date du recouvrement				jour														
							année	mois	jour																
<p align="center"><b>ECOLOGIE DE NEODIPRION SWAINI: carte d'échantillonnage pour la plantation de cocons.</b></p> <p><b>CFS-5-1137</b></p>																									

Fig.12. Cocoon planting Form 06:01.

06:01. *Cocoon Planting Form (Cont'd).*

CELL

NUMBER

EXPLANATION

31

*Sex*

Cocoon sex. Codes are:

CodeSex

0

Sex undetermined

1

Male

2

Female

9

Sex not recorded

32-33

*Fate*

Fate of the cocoon. Codes are:

CodeFate

01

Emergd sawfly

02

Predation by small  
mammals

03

Predation by insects

04

Parasitoid emerged-  
diptera

05

Cocoon parasitoid  
emerged-hymenoptera

06

Larval parasitoid  
emerged-hymenoptera

07

Parasitoid emerged-  
hymenoptera

06:01. *Cocoon Planting Form (Cont'd).*

CELL

NUMBER

EXPLANATION

32-33

*Fate (Cont'd)*CodeFate

08

Dead

09

Fate not determined

10

Living and not in  
prolonged diapause

11

Living in prolonged  
diapause

12

Cocoon not found-  
presumed removed by  
small mammals

34-39

*Recovery Date*

The date cocoons were removed from the soil. The format is the same as cells 3-8, Form 01:01.

07:01. *Forest Inventory Form (Fig.13).*

CELL

NUMBER

EXPLANATION

This is a form for tree tallies in the sawfly study areas. The tally for 1 sub-block is entered on the form and the sampling unit is a diameter class measured in 1-inch classes from 0.55 inches. The form has spaces for entry of diameter classes from 1 to 15 inches and 1 extra space for trees exceeding 15 inches.

1-2

The code for forest inventory, 07, is entered here.

3-8

*Tally Date*

The format is the same as Fig.3.

9-10

*Locality*

The format is the same as Fig.3.

11-16

Skipped

17-22

The format is the same as Fig.3.

23-26

Skipped

27-28

*Diameter*

The D.B.H. of the tallied trees is measured in 1-inch classes. Each diameter class = 1 I.B.M. card and the information in cells 1-26 is duplicated for each card. Following metric conversion, classes will be in 2 centimeter units, starting at 1.







07:01. *Forest Inventory Form (Cont'd).*

CELL

NUMBER

EXPLANATION

29-35

*Jack Pine*Sub-Headings: Cells 29-31 = *Living jack pine*Cells 32-33 = *Jack pine dead from  
defoliation*Cells 34-35 = *Jack pine dead from  
other causes*

As shown in the example below, the field tally is made in the space above that reserved for the numbers. For the 7 to 15 inch diameter classes, owing to the small expected numbers, no special space has been reserved for the tally above the numbers.

jack pine						
living			dead			
			def.	other		
☒ 7.			..	.		
0	1	6	0	2	0	1

39-59

These cells are reserved for the six most commonly encountered tree species in jack pine stands. The format is the same as for cells 29-35, except that only living and dead trees are considered.

07:01. *Forest Inventory Form (Cont'd).*

CELL

NUMBER

EXPLANATION

60-65

*Additional Tree Species*Sub-Headings: Cells 60-61 = *Species Code*Cells 62-63 = *Living trees*Cells 64-65 = *Dead trees*

The format for cells 66-71, and 72-77 is identical. These cells are reserved for less commonly encountered tree species. Enter the appropriate species code and the number of living and dead trees. Codes are:

<u>Code</u>	<u>Species</u>	<u>Code</u>	<u>Species</u>
01	Balsam fir	14	Striped maple
02	Eastern larch	15	Alder
03	White spruce	16	Mountain holly
04	Black spruce	17	Downy serviceberry
05	Red spruce	18	Yellow birch
06	Jack pine	19	White birch
07	Red pine	20	Grey birch
08	White pine	21	Witch hazel
09	Eastern white cedar	22	Balsam poplar
10	Eastern hemlock	23	Big toothed aspen
11	Moose maple	24	Trembling aspen
12	Red maple	25	Pin cherry
13	Sugar maple	26	Choke cherry

07:01. *Forest Inventory Form (Cont'd).*

CELL

NUMBER

EXPLANATION

60-65

*Additional Tree Species (Cont'd)*

<u>Code</u>	<u>Species</u>	<u>Code</u>	<u>Species</u>
27	Willow	28	American mountain ash

These codes are printed on the form. The common names are from Anon (1961).

78-79

*Crew Chief*

Enter the code for the crew chief here. See Appendix I for names.

08:01. *Climatological Form (Fig.14).*

CELL

NUMBER

# EXPLANATION

Climatological data are obtained from the study areas. Instruments at each station include a Feuss recording hygrothermograph, an 8-inch rain guage and a maximum-minimum soil thermometer. In addition, barometric and actinograph records are kept at the Lac Normand Field Station.

The sampling unit for this form is one day's weather records.

1-2

*Sample Category*

Enter 08 for weather information.

3-10

*Basic Information*

The format is the same as Fig.3.

11-26

Skipped

27-38

*Temperature*

Sub-Headings: Cells 27-28 = 4:00 hours

Cells 29-30 = 8:00 hours

Cells 31-32 = 12:00 hours

Cells 33-34 = 16:00 hours

Cells 35-36 = 20:00 hours

Cells 37-38 = 24:00 hours

Readings are taken in degrees Fahrenheit from the temperature charts at four hour intervals beginning at

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26		
catégorie		date de collection						localité		<div style="text-align: center;"> <div style="display: flex; justify-content: space-between; align-items: center;"> <span>←</span> <span>"skip"</span> <span>→</span> </div> </div>																	
		année	mois	jour																							
0 8																											
CFS-5-1139																											
<div style="display: flex; justify-content: space-between;"> <div> température à: </div> <div> humidité relative à: </div> </div>																											
27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50				
4 h.	8 h.	12 h.	16 h.	20 h.	24 h.	4 h.	8 h.	12 h.	16 h.	20 h.	24 h.																
<div style="display: flex; justify-content: space-between;"> <div> temp. du sol pour la semaine </div> <div> pression barométrique à: </div> <div> actinographe à: </div> <div> codes pour actinographe </div> </div>																											
51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75			
Max.	Min.	pluie (pouces)					6 h.	12 h.	18 h.	24 h.	4 h.	8 h.	12 h.	16 h.	20 h.	24 h.											
<div style="text-align: center;"> <b>ECOLOGIE DE NEODIPRION SWAINI: carte de données climatologiques.</b> </div>																											
<div style="text-align: center;"> 0 = 0 cal./cm<sup>2</sup>/m  1 = .2 " " "  2 = .4 " " "  3 = .6 " " "  4 = .8 " " "  5 = 1.0 " " "  6 = 1.2 " " "  7 = 1.4 " " "  8 = 1.6 " " "  9 = 1.8 " " " </div>																											

Fig.14. Climatological Form 08:01.

08:01. *Climatological Form (Cont'd).*

CELL NUMBER	EXPLANATION
27-38	<p><i>Temperature (Cont'd)</i></p> <p>4:00 hours. Format will remain the same following metric conversion.</p>
39-50	<p><i>Relative Humidity</i></p> <p>The relative humidity to the nearest 1 percent.</p> <p>The format is identical to cells 27-38.</p>
51-54	<p><i>Soil Temp. for Week</i></p> <p>Sub-Headings: Cells 51-52 = <i>Maximum temperature</i></p> <p>Cells 53-54 = <i>Minimum temperature</i></p> <p>Soil temperatures are read from a maximum-minimum thermometer to the nearest degree Fahrenheit. The readings are taken once each week when the hygrothermograph charts are changed. The format will remain the same following metric conversion.</p>
55-57	<p><i>Rain for Week (Inches)</i></p> <p>The rainfall is measured to the nearest .01 inch once each week when the hygrothermograph charts are changed. Thus, 175 = 1.75 inches of rainfall. An extra cell will be required following conversion of these measurements to centimetres.</p>
58-69	<p><i>Barometric Pressure</i></p> <p>Sub-Headings: Cells 58-60 = <i>6:00 hours</i></p>

08:01. *Climatological Form (Cont'd).*

CELL

NUMBER

EXPLANATION

58-69

*Barometric Pressure (Cont'd)*

Cells 61-63 = 12:00 hours

Cells 64-66 = 18:00 hours

Cells 67-69 = 24:00 hours

Barometric pressure is read to the nearest .1 inch at 6 hour intervals. Thus, 298 in cells 58-60 = 29.8 inches of mercury at 6:00 hours. Following metric conversion an extra cell will be required for each observation.

70-75

*Actinograph (Coded)*

Sub-Headings: Cell 70 = 4:00 hours

Cell 71 = 8:00 hours

Cell 72 = 12:00 hours

Cell 73 = 16:00 hours

Cell 74 = 20:00 hours

Cell 75 = 24:00 hours

The actinograph chart records are read at 4-hour intervals starting at 4:00 hours. Units are calories per cm. square per minute, and are coded as follows:

<u>Code</u>	<u>Cal./cm.<sup>2</sup>/min.</u>	<u>Code</u>	<u>Cal./cm.<sup>2</sup>/min.</u>
0	0	2	0.4
1	0.2	3	0.6

08:01. *Climatological Form (Cont'd).*

CELL

NUMBER

EXPLANATION

70-75

*Actinograph (Cont'd)*

<u>Code</u>	<u>Cal./cm.<sup>2</sup>/min.</u>	<u>Code</u>	<u>Cal./cm.<sup>2</sup>/min.</u>
4	0.8	7	1.4
5	1.0	8	1.6
6	1.2	9	1.8



09:01. *Bird Dissection Form (Fig.15).*

CELL

NUMBER

EXPLANATION

This form is used for stomach analysis of birds.

The sampling unit is one bird.

1-2

*Category*

Enter 09, the code for bird dissections.

3-8

*Collection Date*

This is the date the bird was shot. The format is the same as Fig.3.

9-12

*Hour Shot*

Sub-Headings: Cells 9-10 = *Hours*

Cells 11-12 = *Minutes*

The time is read to the nearest 1/4 hour. Thus,  
1130 = 11:30 hours.

13-14

*Study Area*

The format and codes are the same as cells 9-10 of Fig.3.

15-16

*Sawfly Age*

Enter the stage of the sawfly at the time the bird was shot. The format and codes are identical to cells 11-12 of Fig.3.

17-19

*Bird Species*

The bird species code entered here is identical to cells 13-15 of Form 05:01.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
catégorie		date de collection						heure de collection		localité		âge de la fen-thrède		espèce de l'oiseau		longueur de l'oiseau (mm)		longueur de l'oiseau (mm)		étendue des ailes (mm)							
		année		mois		jour																					
0 9																											

28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52		
longueur d'une aile (mm)		longueur de la queue (mm)		longueur du bec (mm)		longueur du tarse (mm)		longueur		nombre de tenthrèdes dans l'estomac										larves						
										adultes					éonymphes											
										♂					♀					sexe inconnu						

53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75												
nombre de carrés de $\frac{1}{8}$ de pouce															poids sec total (milligrammes)										poids sec Diprionidae seulement (milligrammes)									
Diprionidae		autres insectes		graines de semence		grains de sable		autres																										

ECOLOGIE DE NEODIPRION SWAINI: carte de dissection d'oiseaux.																								
---	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Fig.15. Bird dissection Form 09:01.

09:01. *Bird Dissection Form (Cont'd).*

CELL

NUMBER

## EXPLANATION

20

*Sex*

The bird's sex. Codes are:

CodeSex

1

Male

2

Female

3

Sex unknown

9

Sex not recorded

21

*Age*

The bird's age. Codes are:

CodeAge

1

Adult

2

Immature

3

Age unknown

9

Information not  
recorded

22-24

*Length*

The total length of the bird in millimetres from the tip of the bill to the outer tail feathers.

25-27

*Span*

The wingspan, in millimetres. With the wings extended, it is the distance between the tips of the primaries.

09:01. *Dissection Form (Cont'd).*

CELL NUMBER	EXPLANATION
28-30	<p><i>Wing</i></p> <p>The distance from the tip of the mandible to its base in millimetres.</p>
31-33	<p><i>Tail</i></p> <p>The distance from the undertail coverts to the outer tail feathers, in millimetres.</p>
34-35	<p><i>Bill</i></p> <p>The length of the bill. This is the distance from the tip of the mandible to its base in millimetres.</p>
36-37	<p><i>Tarsus</i></p> <p>The length of the tarsus, in millimetres.</p>
38-55	<p><i>Number of Sawflies in the Stomach</i></p> <p>Sub-Headings: Cells 38-40 = <i>Male sawfly adults</i></p> <p>Cells 44-56 = <i>Female sawfly adults</i></p> <p>Cells 47-49 = <i>Sawfly adults, sex not determined</i></p> <p>Cells 50-52 = <i>Sawfly larvae</i></p> <p>Cells 53-55 = <i>Pre-spinning eonymphs</i></p> <p>The number of sawflies (diprionidae) found in the bird's stomach is entered in these cells.</p>
53-67	<p><i>Number of 1/8-Inch Squares</i></p> <p>Sub-Headings: Cells 53-55 = <i>Neodiprion sawflies</i></p>

09:01. *Bird Dissection Form (Cont'd).*

CELL	
NUMBER	EXPLANATION
53-67	<p><i>Number of 1/8-Inch Squares</i></p> <p>Cells 56-58 = <i>Other insects</i></p> <p>Cells 59-61 = <i>Seeds and other vegetable matter</i></p> <p>Cells 62-64 = <i>Stones and grit</i></p> <p>Cells 65-67 = <i>Other materiel</i></p> <p>The stomach contents of the bird are placed in a dish marked in 1/8-inch square units. The number of units occupied by each of the categories in cells 53-67 are counted.</p>
68-71	<p><i>Dry Weight Total Contents</i></p> <p>Enter the dry weight of the stomach contents to the nearest tenth of a milligram.</p>
72-75	<p><i>Dry Weight, Neodiprion Sawflies</i></p> <p>Format the same as cells 68-71.</p>

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## REFERENCES

- Anon. 1961. Native trees of Canada. Can. Dept. For. Bull. No. 61:291pp.
- Benoit, P. 1971. Méthode de classification des pins gris et détermination de leur susceptibilité aux insectes secondaires. For. Chron. 47(4): 201-204.
- Burt, W.H. and R.P. Grossenheider. 1964. A field guide to the mammals. Houghton Mifflin Co., Boston, 284pp.
- Lyons, L.A. 1964. The spatial distribution of two sawflies and methods of sampling for the study of population dynamics. Can. Ent. 96:1373-1407.
- McLeod, J.M. 1966. The spatial distribution of cocoons of *Neodiprion swainei* Middleton in a jack pine stand. I. A cartographic analysis of cocoon distribution with special reference to predation by small mammals. Can. Ent. 98:430-447.
- Peterson, R.T. 1964. A field guide to the birds. Houghton Mifflin Co., Boston, 290pp.

## APPENDIX I

*Codes for the Names of Members of the Swaine Jack Pine Sawfly Project:*

<u>Code</u>	<u>Name</u>	<u>Code</u>	<u>Name</u>
01	G. Désalliers	14	C. Dubuc
02	R. Laguë	15	G. Lebel
03	J.G. Perras	16	J.P. Duchesne
04	L. Marcotte	17	Y. Grenier
05	G. Maltais	18	J. Bibeau
06	J. McLeod	19	R. Couture
07	P. Price	20	D. Morand
08	W. Tostowaryk	21	M. St-Laurent
09	A. Marchand	22	M. Toussignant
10	D. Marchand	23	J. Lampron
11	M. Périgny	24	G. Laroche
12	B. Côté	25	Y. Geoffrion
13	B. Boufeldja		