

ANNUAL REPORT
OPERATION OF THE FOREST INSECT LABORATORY
SAULT STE. MARIE, ONTARIO
FISCAL YEAR 1955-1956

1956

Belyea, R.M.

1. GENERAL

Advances made by the Lac Seul spruce budworm infestation in northwestern Ontario in 1955 increased the total area affected to 25,500 square miles, carrying the infestation into Minnesota along a 70-mile front east of Fort Frances, into Manitoba along two fronts totalling 35 miles in width, and to the eastward about 20 miles along a broad front. Mortality of balsam fir varying from light to heavy had occurred by 1955 within about one-fifth of this area. In the Lake Nipigon area, heavy defoliation of balsam fir and spruce stands continued within an area of 900 square miles on Sibley and Black Bay Peninsulas and along the north shore of Lake Superior as far east as Rossport. Light to medium host-tree mortality had occurred by 1955 within 250 square miles on Sibley and Black Bay Peninsulas in addition to that in 11,000 square miles resulting from the original Lake Nipigon infestation of 1940-49. Coordinated population and parasite studies were continued in 1955 at the Black Sturgeon and Cedar Lake Field Stations, and in the districts affected by Forest Biology Rangers.

The changes observed in 1954 in larch sawfly infestations continued in 1955. Decreases in population intensity were again noted throughout northwestern Ontario, while increases in intensity and numbers of stands infested continued throughout the central and southeastern parts of the Province.

Forecasts of forest tent caterpillar infestation intensities in 1955, made in 1954 on the basis of egg-band surveys, proved largely correct, the total infestation area declining from 18,000 square miles in 1954 to 3,600 square miles in 1955. Active infestations remained only in the Swastika and North Bay districts.

In southern Ontario, the European pine shoot moth was once again the most serious pest. Following joint discussions between the Biological Control Unit, Entomology Division, and the Forest Biology Division in February, 1955, it was decided that field investigations of the establishment, spread, and effectiveness of newly introduced parasites, and of the biology and behaviour of the shoot moth, should be carried out jointly in one experimental area more or less central to the entire infestation. A temporary field establishment was therefore established within the Waterloo County Forest at Elmira, at which investigations of shoot moth behaviour, biology and population distribution were undertaken, along with initial studies of the establishment of selected introduced parasites conducted by representatives of the Entomology Laboratory, Belleville. The general parasitism survey throughout the range of the shoot moth in southern Ontario, commenced in 1954, was continued in 1955 and again revealed that parasitism was very low.

During the winter of 1955-56, undercooling point tests were continued on overwintering larvae of the shoot moth from four different temperature zones within the infestation in southern Ontario and from two in Michigan. No significant difference was found in the ability of larvae from the different zones to undercool, suggesting that, from the temperature-resistance point of view, all larvae tested came from the same population. It was found, however, that larvae are capable

of hardening to low temperatures, a zone of active hardening occurring at temperatures between 7.5 and -7.0°C. Future expansion of this work is planned.

Forest Biology Rangers, as well as research staff, again assisted in shoot moth chemical control trials conducted in the Northumberland County Forest by the Chemical Control Section.

Continuation of studies of the relationship of non-diapause in laboratory-reared selected stocks of the spruce budworm to photoperiod during 1955 cast considerable light on the understanding of this behaviour. The critical photoperiod has been found to be 15 hours per 24, and the critical period for exposure has been defined as a period of about two days starting 48 hours after hatching. A study of selected rearings strongly suggests that multiple genes, some of which are dominant under laboratory conditions, are responsible for the non-diapause. Non-diapause is not, however, sex linked, but may to some extent be sex-limited.

Continued surveys in 1955 revealed that the pine root collar weevil was present in a small plantation of Scots pine in the Sault Ste. Marie area in addition to Simcoe County in southern Ontario where it was first detected in 1953. Field investigations begun at Angus in 1955, showed that a complex of weevils, including two species other than the pine root collar weevil, is involved in infested pine plantations. These species can, however, be separated anatomically and their life history and habits are different, and only the pine root collar weevil actually infests living plantation trees. Chemical control trials conducted by the Chemical Control Section, and in which Laboratory officers assisted, gave promising results.

A study of the cytology has shown that the weevil, Pissodes approximatus Hopk. comprises three cytologically distinct forms with 32, 31 and 30 chromosomes due to centric fusion of two non-homologous chromosomes. Centric fusion has thus been demonstrated, for the first time, as contributing to the multiplicity of chromosome numbers in the Coleoptera. There appears to be selection against the fusion heterozygote, in contrast to evidence obtained from studies of Drosophila population genetics. It is expected that continuing investigation of chromosomal polymorphism of this type in terms of genetical dynamics of natural populations of the species will throw light on the role of natural selection under different environmental conditions and on the genetical evolution of geographic races of insects.

Cytological investigation has confirmed that the normal- and vestigial-winged forms of "Hypomolyx piceus" in Canada are distinct species - the former has 40 chromosomes and the latter 32. The former species is indistinguishable cytologically from the European Hylobius piceus, but the three are separable from all other North American and Scandinavian Hylobius species examined, which have only 22 chromosomes.

2. LABORATORY AND FIELD ACCOMMODATION

During the fiscal year, agreement was reached between the Laboratory and the Ontario Department of Lands and Forests on the construction of an addition to the Forest Insect Laboratory to provide additional laboratory and office-laboratory accommodation. Sketch plans of requirements

were accepted by the Department of Lands and Forests with the hope that detailed planning and construction might get underway in 1956. The addition will provide four laboratory rooms, 11 office-laboratory rooms, and additional wash rooms and store rooms, all urgently needed to relieve crowding in the existing building.

During the year, the large basement experimental laboratory was altered by partial partitions to provide two small offices and adequate bench and cupboard space. This laboratory is now well equipped for physiological and biochemical investigations.

No noteworthy changes were made in field station accommodation in 1955, with the exception of the installation of a new diesel power-generating plant at the Black Sturgeon Lake Field Station.

3. STAFF

In May 1955, Dr. J. R. Blais transferred from the Forest Insect Laboratory to the Forest Biology Laboratory, Quebec. Mr. A. H. Rose succeeded Dr. Blais as Officer-in-Charge, Cedar Lake Field Station.

During the winter of 1954-55, a decision was reached whereby Mr. L. A. Lyons of the Laboratory staff would undertake population studies of Swaine's jack pine sawfly in western Quebec as one phase of a broad investigation of this insect by the Forest Biology Laboratory, Quebec City. Mr. Lyons was accordingly located at Clova, Que., during the summer of 1955, in a temporary field establishment established by the Quebec Laboratory.

Mr. P. J. Pointing joined the staff in early April to undertake biological and population investigations of the European pine shoot moth in southern Ontario. Mr. Pointing was previously employed in the Timber Management Division, Ontario Department of Lands and Forests.

In March, 1956, Mr. H. D. Haswell resigned from the staff.

During the academic year 1955-56, eight members of the laboratory staff were granted educational leave to undertake postgraduate studies:

Educational Leave with Half Pay -

W. L. Sippell	-	University of Michigan
A. W. Ghent	-	University of Chicago
L. A. Lyons	-	University of Minnesota
C. S. Holling	-	University of British Columbia
K. J. Griffiths	-	University of British Columbia
R. J. Finnegan	-	University of British Columbia

Educational Leave without Pay -

G. R. Stairs	-	Macdonald College, McGill University
E. P. Smereka	-	University of Minnesota

R. M. Belyea.....Agr. Res. Off. 8
B. A. Pouppore.....Supervising Clerk
C. F. Linklater.....Clerk 3
D. R. Cartmill.....Storeman 1
J. P. Taylor.....Clerk 4
D. L. Richards.....Stenographer 2A
G. Prokopchuk.....Clerk 2A
F. C. Sinclair.....Stenographer 2B (resigned May 20, 1955)
A. J. Langdon.....Stenographer 2A (appointed April 18, 1955)
F. Newman.....Clerk 3 - Librarian

W. M. Ferguson.....Technical Officer 3..Chief Engineer
D. G. MacGillivray.....Technical Officer 1 (Engineer)
W. T. Eagle.....Technical Officer 1 (Engineer)
P. E. Daynard.....Technical Officer 1 (Engineer)
(on sick leave)
J. D. Grant.....Technical Officer 1 (Engineer)
W. Ross.....Technical Officer 1 (Engineer)
S. Allan,.....Technical Officer 1 (Engineer)
(temporary while Mr. Daynard on sick leave)
G. A. King.....Maintenance Craftsman 4

W. L. Sippell.....	Res. Off. (Agr.)	2
N. W. Watson.....	Res. Off. (Agr.)	1
D. R. Wallace.....	Res. Off. (Agr.)	1
J. L. Martin.....	Res. Off. (Agr.)	1
O. H. Lindquist.....	Technician	1
D. M. McNamee.....	Assistant Technician	2
M. F. Kelley.....	Assistant Technician	2
C. M. DuFresne.....	Assistant Technician	2
J. S. Stone.....	Assistant Technician	1
S. A. Rogers.....	Student Assistant	
S. D. Nelson.....	Student Assistant	
J. M. Gustafson.....	Student Assistant	
S. Cady.....	Assistant Technician (seasonal)	
H. R. McLeod.....	I.S.R.A.	
M. M. Gentile.....	I.S.R.A.	
E. Kuechmeister.....	I.S.R.A.	
A. A. Bell.....	I.S.R.A.	
R. Harvey.....	Labour (casual)	

H. D. Haswell.....Res. Off. (Agr.) 1 (resigned March 8, 1956)

J. E. MacDonald.....in Charge.....F.B.R. Supervisor 2
C. A. Barnes.....Gogama district.....F.B.R. 1
(appointed April 18, 1955)
R. L. Bowser.....Chapleau district.....F.B.R. 1
F. A. Bricault.....Cochrane district.....F.B.R. 2
P. E. Buchan.....Sioux Lookout district..F. B.R.1
E. O. Clinton.....Sudbury district.....F.B.R. 1
A. S. Danard.....Rideau and East Tweed district..F.B.R.1
H. R. Foster.....Sault Ste. Marie district...F.B.R.2
D. G. Grisdale.....Parry Sound district.....F.B.R.1
K. C. Hall.....Port Arthur district.....F.B.R.2
A. A. Harnden.....North Bay district.....F.B.R.2
M. J. Hildebrand.....Pembroke district.....F.B.R.1
L. G. Jago.....Lake Erie district.....F.B.R.1
D. F. Lynn.....Lake Huron district.....F.B.R.1
L. S. MacLeod.....Lindsay and West Tweed district
.....F.B.R.2
H. G. McPhee.....Lake Simcoe district.....F.B.R.2
J. R. McPhee.....Fort Frances district.....F.B.R.1
W. J. Miller.....Kenora district.....F.B.R.2
J. F. Robinson.....Kapuskasing district.....F.B.R.1
M. J. Thompson.....Swastika district.....F.B.R.1
G. J. Vaillancourt.....Geraldton district.....F.B.R.1
H. J. Weir.....White River district.....F.B.R.1

INVESTIGATIONS, SAULT STE. MARIE

FOREST INSECT LABORATORY

Cytogenetic Investigations of Forest Insects

S. G. Smith.....Agr. Res. Off. 10
G. W. Stehr.....Agr. Res. Off. 5
D. J. Kushner.....Res. Off. (Agr.) 1
I. M. Campbell.....Res. Off. (Agr.) 1
K. F. Bruce.....Assistant Technician 1
N. K. Collison.....Assistant Technician 1
(resigned September, 1955)
F. W. Elliott.....Student Assistant
P. D. Syme.....Student Assistant
M. J. Horwood.....Student Assistant
E. A. Cameron.....I. S. R. A.
D. M. Foster.....I. S. R. A.

Investigations of the Physiology of Forest Insects

G. T. Harvey.....Res. Off. (Agr.) 2
A. W. Hadden.....Assistant Technician 1

Investigations of Regeneration in Stands Devastated
by the Spruce Budworm (Field work at Cedar Lake,
Black Sturgeon Lake, and Laniel Field Stations)

A. W. Ghent.....Res. Off. (Agr.) 2
E. P. Baic.....Assistant Technician 1
D. F. Bracken.....Survey Assistant

INVESTIGATIONS, CHALK RIVER FIELD STATION

Bioclimatological and Ecological Investigations,
White Pine Weevil

C. R. Sullivan.....Res. Off. (Agr.) 2
D. I. West.....Assistant Technician 1 (part time)
 (resigned December 2, 1955)
L. W. P. Legault.....Assistant Technician (part time)
 (appointed March 1, 1956)

INVESTIGATIONS, LANIEL FIELD STATION

Studies of Cerambycid Wood Borers

L. M. Gardiner.....Res. Off. (Agr.) 2
P. Anderson.....Survey Assistant

INVESTIGATIONS, BLACK STURGEON LAKE FIELD STATION

Investigations of the Deterioration and Death of
White Spruce, and Studies of Immature Forms of
Eastern Canadian Bark Beetles*

J. B. Thomas.....Res. Off. (Agr.) 2

Investigations of Population and Natural Control of the Spruce Budworm, Lake Nipigon Area*

K. R. Elliott.....Res. Off. (Agr.) 1
G. R. Stairs.....Res. Off. (Agr.) 1

INVESTIGATIONS, CEDAR LAKE FIELD STATION

Phenological Investigations of Forest Insects and their Host Trees*

A. H. Rose.....Res. Off. (Agr.) 2

Investigations of Populations and Natural Control of the Spruce Budworm*

J. R. Blais.....Agr. Res. Off. 5
(transferred May, 1955)
K. R. Elliott.....Res. Off. (Agr.) 1
E. P. Smereka.....Res. Off. (Agr.) 1

* Stud. Assts. drawn from pool at Field Stations.

L. M. Gardiner.....(in charge.....Res. Off. (Agr.) 1
A. Denis.....Caretaker 2

Black Sturgeon Lake Field Station

J. B. Thomas (in charge).....Res. Off. (Agr.) 2
T. Johnston.....Clerk (seasonal labour)
E. Marsh.....Cook (seasonal labour)
G. N. Chant.....Survey Assistant
J. R. Reynolds.....Survey Assistant
J. A. Clark.....Survey Assistant
R. I. Carr.....Survey Assistant
W. Halibisky.....Maintenance (seasonal labour)
A. Watt.....Maintenance (seasonal labour)
P. Prokopchuk.....Maintenance (seasonal labour)

Cedar Lake Field Station

A. H. Rose (in charge).....Res. Off. (Agr.) 2
H. E. Black.....Clerk (seasonal labour)
R. Guay.....Cook (seasonal labour)
W. M. Graham.....Survey Assistant
B. A. Nordquist.....Survey Assistant
R. E. Wall.....Survey Assistant
J. D. Shiells.....Maintenance (seasonal labour)

4. CONFERENCES, ANNUAL MEETINGS, SPECIAL TRIPS AND ASSIGNMENTS

At the organization meeting of the Genetics Society of Canada, at Winnipeg, Manitoba, on February 15, 1956, at which he acted as Chairman, Dr. S. G. Smith was elected President of the Society for the ensuing year.

In mid-July, 1955, Dr. N. W. Y. Watson again gave a short course in forest entomology to the ranger class at the Provincial Forest Ranger School, Dorset.

Mr. K. R. Elliott again supervised the calibration of aircraft for the Spruce Budworm Aerial Spraying Project in New Brunswick during May, 1955.

Dr. S. G. Smith attended special meetings of the Canadian Finance Committee for the Xth International Genetics Congress at Ottawa and Montreal in June and December, and of the General Organizing Committee at East Lansing, Michigan, in September, 1955. He and Mr. D. R. Wallace took part in conferences on co-operative Neodiprion investigations at Ottawa and Windsor, Ont., on January 30 and February 2, 1956.

In January 1956, Dr. R. M. Belyea attended a meeting of Divisional officers in Quebec City to discuss plans for joint jack pine sawfly investigations in western Quebec during 1956.

During the fiscal year, staff members of the Laboratory attended conferences and meetings of professional and scientific societies, at which some presented papers. A listing of conferences attended follows:

Advisory Committee on Forestry and Forest Products
of the Research Council of Ontario

Maple, Ont., April 28-29, 1955

R. M. Belyea

Cochrane, Ont. September 28, 1955

R. M. Belyea

American Institute of Biological Sciences
East Lansing, Mich. September 6-8, 1955
S. G. Smith
A. W. Ghent

Canadian Institute of Forestry
Saskatoon, Sask. October 5-7, 1955
R. M. Belyea
J. B. Thomas

Canadian Society of Microbiology
Winnipeg, Man. June 15-17, 1955
D. J. Kushner

Central International Forest Insect and Disease Conference
East Lansing, Mich. November 17-19, 1955
R. M. Belyea
J. B. Thomas
G. W. Green
J. L. Martin

Entomological Society of America
Cincinnati, Ohio November 26-27, 1955
G. T. Harvey

Entomological Society of Canada
Fredericton, N. B. October 18-20, 1955
R. M. Belyea
L. M. Gardiner
S. G. Smith

Entomological Society of Ontario
Guelph, Ontario October 31-November 2, 1955
G. T. Harvey
K. R. Elliott
W. Y. Watson

Genetics Society of Canada
Winnipeg, Manitoba February 13-16, 1956
G.W.K. Stehr

Insect Physiologists Meeting
Belleville, Ontario October 24-25, 1955
D. J. Kushner
G. T. Harvey

Society of American Bacteriologists
New York, N. Y. May 8-12, 1955
D. J. Kushner

Symposium on Protein Structure
Oak Ridge, Tenn. April 4-6, 1955
D. J. Kushner

Tree Breeding Committee
Maple, Ontario February 29, 1956
C. R. Sullivan

5. THESES AND PUBLICATIONS

Research Contributions

Elliott, K. R. The Status of Spruce Budworm Infestations in the Western and Mid-Western Forest Regions of Ontario in 1955.

Can. Dept. Agr. Bi-Mo. Prog. Rept. 11, No. 5:1. 1955

Gardiner, L. M. Larval description of Acanthocinus pusillus Kby.
Can. Ent. 87:219-220. 1955

Ghent, A. W. Oviposition behaviour of the jack pine sawfly Neodiprion americanus banksianae Roh., as indicated by an analysis of egg clusters.
Can. Ent. 87:229-238.

Ghent, A. W. Linear increment in width of the head capsule of two species of sawflies. Can. Ent. 88:17-23. 1956.

Ghent, A. W. A guide for the re-alignment of off-center increment borings. For. Chron. 31:353-355. 1955.

Ghent, A. W. Light Reactions of Newly-Hatched Larvae of the Jack Pine Sawfly, Neodiprion americanus banksianae Roh.
Can. Dept. Agr. Bi-Mo. Prog. Rept. 11, No. 2:2. 1955.

Green, G. W. and de Freitas, A. S. Frass-drop studies of larvae of Neodiprion americanus banksianae Roh. and N. lecontei (Fitch). Can. Ent. 87:427-440. 1955.

Green, G. W. Temperature relations of ant-lion larvae.
Can. Ent. 87:441-459. 1955.

Lindquist, O. H. A technique for pinning and spreading small microlepidoptera.
Can. Ent. 88:24-25. 1956.

Lindquist, O. H. Leaf-mining sawflies on Birch in Ontario.
Can. Dept. Agr. Bi-Mo. Prog. Rept. 11, No. 5:1. 1955.

Lyons, L. A. The seed production capacity and efficiency of red pine cones (Pinus resinosa Ait.) Can. J. Bot. 34:27-36. 1956.

Martin, J. L. Tortricids on Pinus sylvestris.
Can. Dept. Agr. Bi-Mo. Prog. Rept. 12, No. 1:1. 1956.

Maxwell, D. E. The comparative internal larval anatomy of sawflies.
Can. Ent. 87, suppl. 1, 1955.

Smith, S. G. Cytogenetics and obligatory parthenogenesis.
Can. Ent. 87:131-135. 1955.

Smith, S. G. and Edgar, R. S. The sex-determining mechanism in some North American Cicindelidae (Coleoptera).
Rev. suisse de Zoologie. 61, No. 32:657-667. 1954.

Thomas, J. B. Notes on insects and other arthropods in red and white pine logging slash. Can. Ent. 87:338-344. 1955.

Watson, W. Y. Two gynadromorphic sawflies.
Can. Dept. Agr. Bi-Mo. Prog. Rept. 11, No. 3:1. 1955.

6. FINANCIAL STATEMENT

The Forest Insect Laboratory and the Laboratory of Insect Pathology operate under a joint accounting administration, and funds for both laboratories are therefore provided in the same estimates. The following statement itemizes expenditures by allotments for the fiscal year 1955-56:

GENERAL ALLOTMENTS

Travelling Expenses.....	40,604.23	
Freight, Express and Cartage.....	1,643.00	
Postage.....	1,651.69	
Telephone and Telegrams.....	2,454.60	
Supplies and Materials.....	28,171.93	
Repair and Upkeep,		
Buildings and Works.....	6,134.68	
Repair and Upkeep, Equipment.....	8,273.89	
Rental of Lands and		
Building Space.....	30.00	
Rental of Equipment.....	4,857.50	
Unemployment Insurance.....	85.71	
Miscellaneous.....	<u>2,674.47</u>	
Sub-Total.....		96,581.70

SPECIFIC ALLOTMENTS

Wages.....	7,211.63	
Acquisition of Equipment.....	26,025.42	
Acquisition of Buildings and		
Works....	<u>6,253.32</u>	
Sub-Total.....		<u>39,490.37</u>
TOTAL.....		<u><u>136,072.07</u></u>