Ecological Observations on the More Common Insects Associated with Black Knot of Cherry, Dibotryon morbosum (Schw.) Theiss and Syd. (Ascomycetes: Dothideaceae) in the Forested Areas of Manitoba and Saskatchewan.

by

J.C.E. Melvin, B.B. McLeod and H.R. Wong

FOREST RESEARCH LABORATORY

WINNIPEG, MANITOBA

INTERNAL REPORT MS-59

DEPARTMENT OF FORESTRY AND RURAL DEVELOPMENT

MAY 1967

Ecological Observations on the More Common Insects Associated with Black Knot of Cherry, Dibotryon morbosum (Schw.) Theiss and Syd. (Ascomycetes: Dothideaceae) in the Forested Areas of Manitoba and Saskatchewan.

by

J.C.E. Melvin, B.B. McLeod and H.R. Wong

INTRODUCTION

Dibotryon morbosum (Schw.) Theiss and Syd, commonly knows as black knot of cherry, is usually associated with choke cherry, Prunus virginiana L. and pin cherry, Prunus pensylvanica L.f. in the forested areas of Canada, (Fig. 1).

Only two insects have been recorded feeding in black knot of cherry in Canada and these are Grapholitha prunivora Walsh., MacKay (1959), and Synanthedon pictipes G. & R., Prentice (1965), Hesler and Wetzel (1929), Heald (1943) and Anderson (1956) reported that insects fed in black knot but did not indicate the insects present. Thirteen species of insects and mites associated with black knot were noted by Wong and Melvin (1965) and an additional 54 insects were observed by Melvin, Wong and McLeod (1967) feeding on or inhabiting this fungus.

From 1963 to 1966 the ecological life history of twelve of the more common insects was studied and is presented here.

Many species of insects emerged from black knot incubated at the Winnipeg laboratory. The twelve most abundant were identified by taxonomic specialists of the Entomology Research Institute in Ottawa, as follows: Telphusa sp., Carposina sp. nr. comonana Kft., Grapholitha prunivora Walsh., Synanthedon pictipes G. & R., Thamnosphecia poss. scitula (Harr.), Conotrachelus nenuphar (Hbst.), Canifa pallipes Melsh., Gaurax apicalis Mallock, Gaurax festivus Loew., Gaurax poss. montanus Coq., Oscinella catalpae (Mallock) and Oscinella sp. Other insects are associated with black knot but will not be discussed.

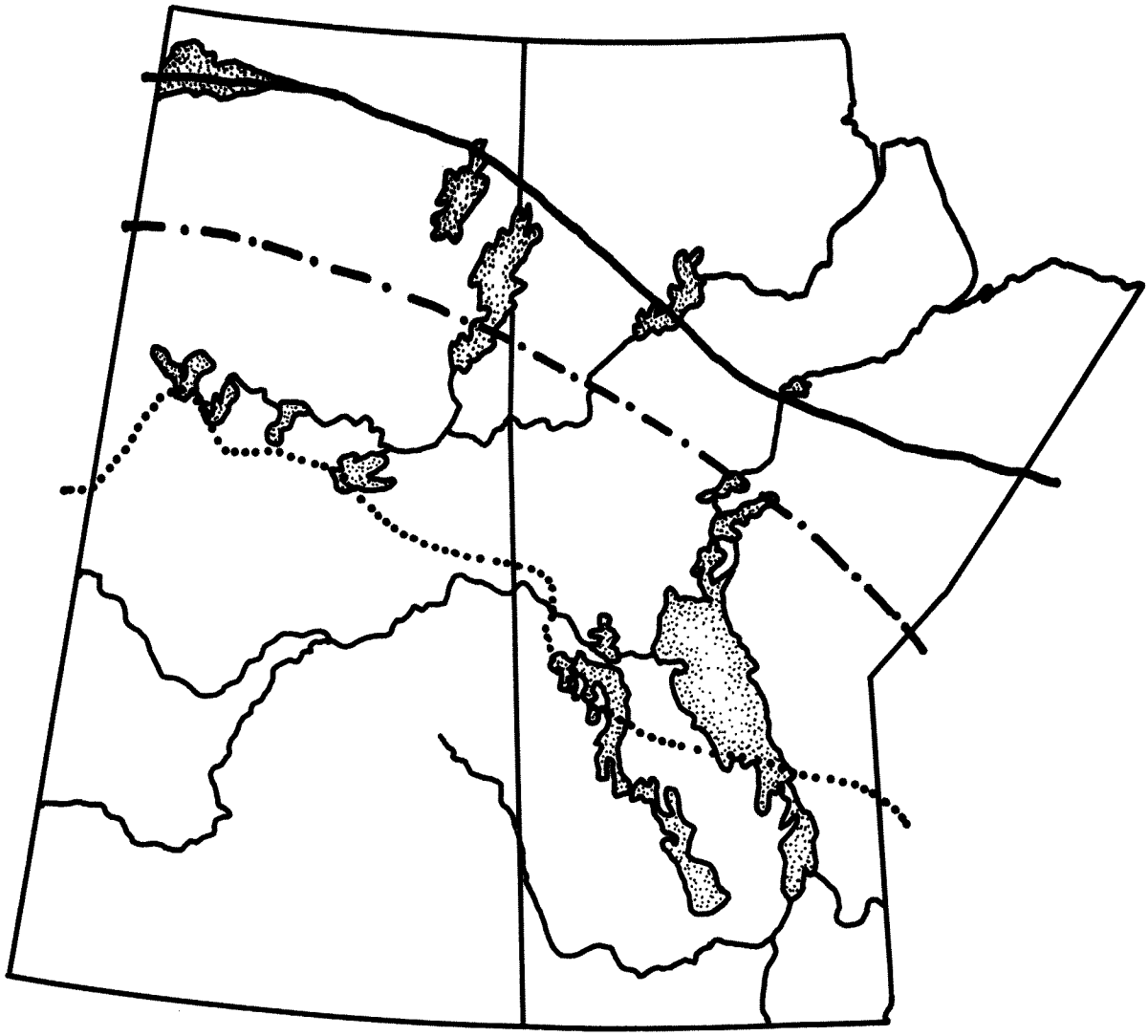

FIGURE 1

KNOWN NORTHERN DISTRIBUTION OF

——— Prunus pensylvanica L.f.

—·—·— Prunus virginiana L.

····· Dibotryon morbosum (Schw.) T.&S.

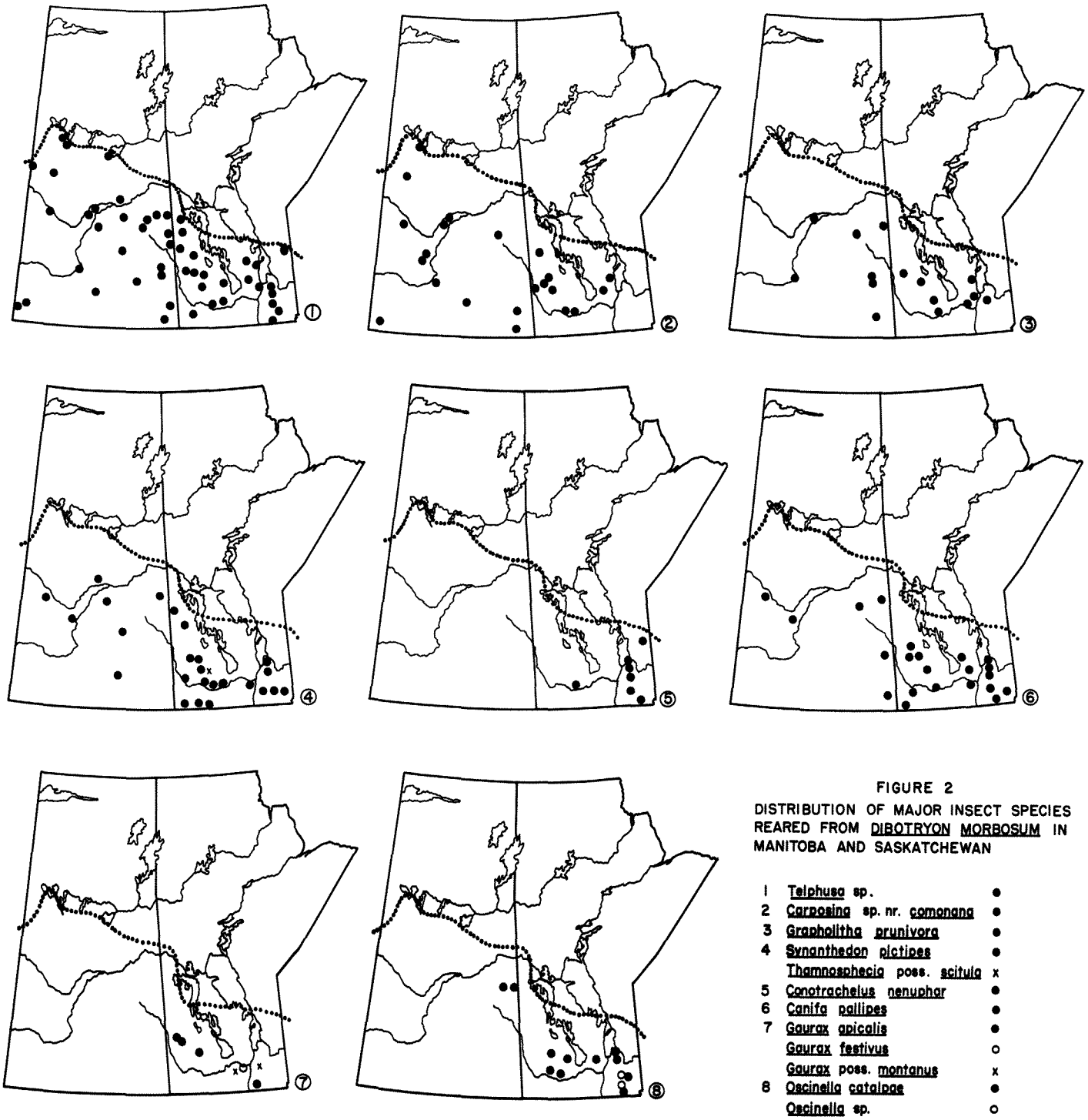

FIGURE 2

DISTRIBUTION OF MAJOR INSECT SPECIES REARED FROM DIBOTRYON MORBOSUM IN MANITOBA AND SASKATCHEWAN

1	Telphusa sp.	●
2	Carposina sp. nr. comonana	●
3	Grapholitha prunivora	●
4	Synanthedon pictipes	●
	Thamnosphecia poss. scitula	x
5	Conotrachelus nenuphar	●
6	Canifa pallipes	●
7	Gaurax apicalis	●
	Gaurax festivus	o
	Gaurax poss. montanus	x
8	Oscinella cataipae	●
	Oscinella sp.	o

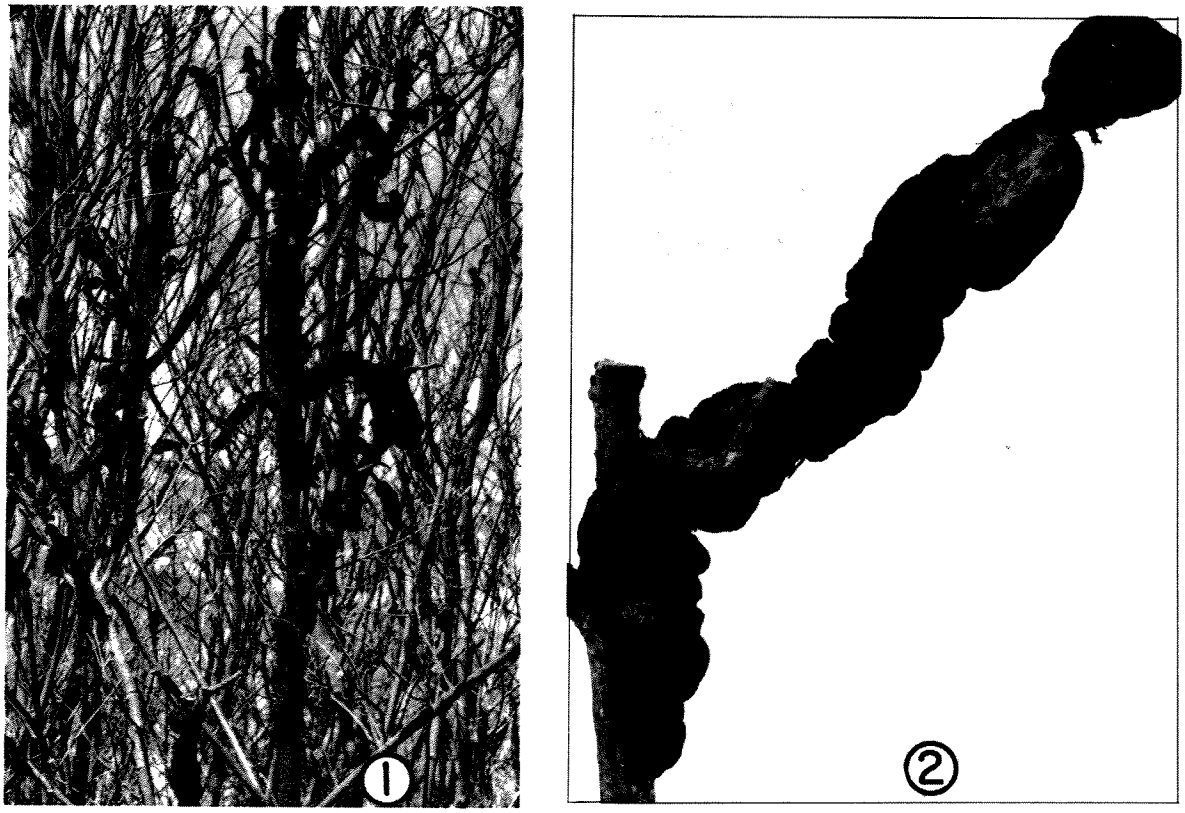

FIGURE 3

DIBOTRYON MORBOSUM (Schw.) T. & S.

1 Severely infected Prunus pensylvanica

2 Close-up of a D. morbosum ascocarp

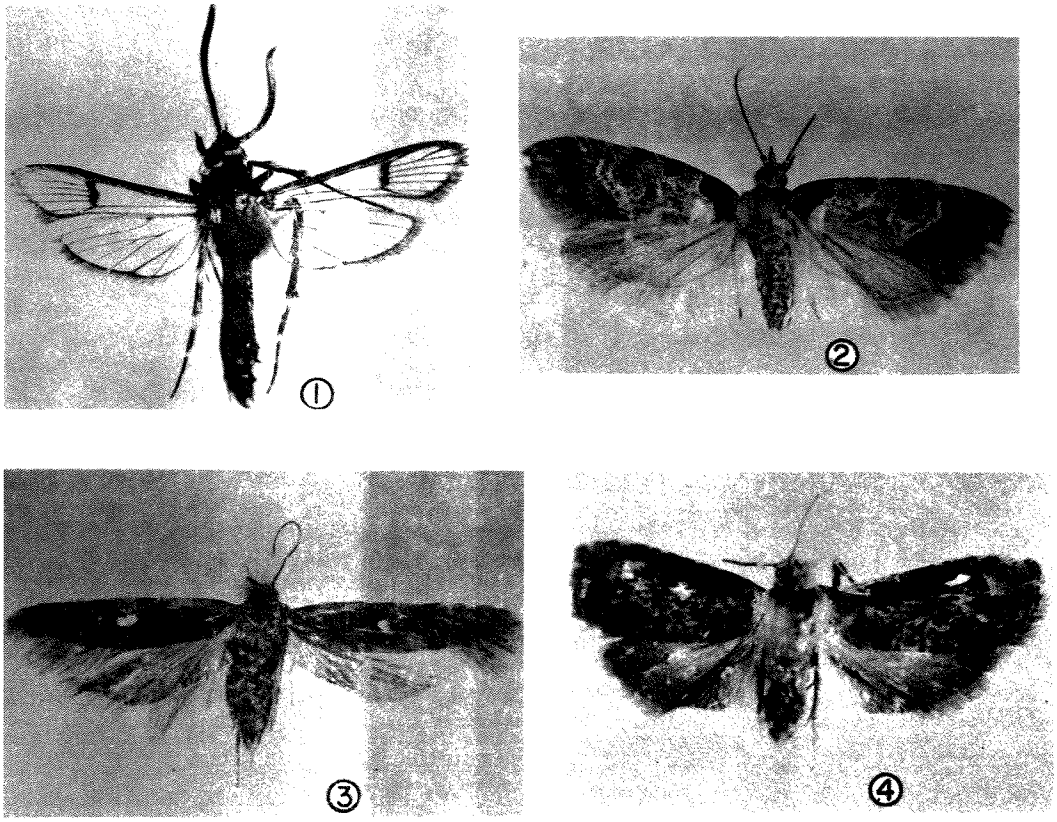

FIGURE 4

ADULTS OF 4 MAJOR INSECT SPECIES REARED FROM DIBOTRYON MORBOSUM

1 Synanthedon pictipes
2 Carposina sp. nr. comonana
3 Telphusa sp.
4 Grapholitha prunivora

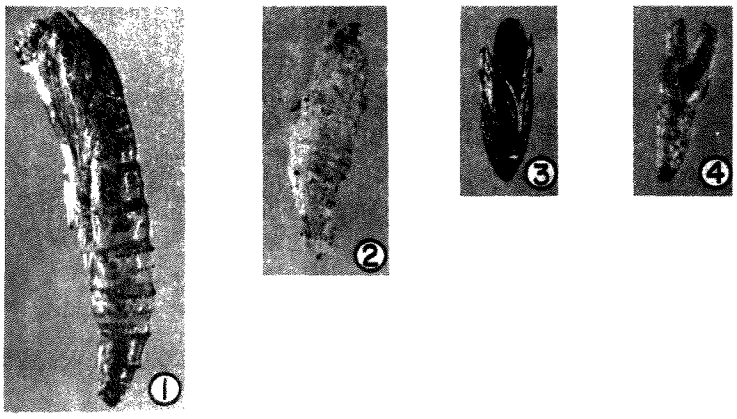

FIGURE 5

PUPAE OF 4 MAJOR INSECT SPECIES REARED FROM DIBOTRYON MORBOSUM

1 Synanthedon pictipes
2 Carposina sp. nr. comonana
3 Telphusa sp.
4 Grapholitha prunivora

METHODS

Collections were made by the forest research technicians and other collectors throughout Manitoba and Saskatchewan. Old and new ascocarps on cherry were collected in May for the overwintering and immature feeding insects, in July for the insects that actually feed on the stromatic tissue, and in October for the inquiline and overwintering larvae. The ascocarps were sent to the laboratory and incubated in large rearing jars or polyethylene crispers for ten months. The incubating containers were examined daily and emerging adults collected.

Telphusa sp.

This widely distributed gelechiid has one generation a year and overwinters in the pupal stage. Identification was made by G.G. Lewis, Entomology Research Institute, Ottawa, who stated that this species was not represented in the Ottawa collection. Five hundred and sixty specimens of *Telphusa* sp. were recovered from black knot on choke cherry and pin cherry (Fig. 2).

The moth has blackish forewings and grey hind wings with a wing span of 5/8 inch (Fig. 4). Adults appear in mid-May when new black knot infections are forming on the trees. The eggs are round, bright yellow in color and laid singly on the outer surface of the stroma. They hatch in 7 to 10 days and the small whitish larvae bore down into the stromatic tissue. Newly hatched larvae are creamy white and turn pink in the later instars. Head, shield, thoracic legs, setal pinacula and anal plate are tan in color and become dark brown in later instars. Fully grown larvae are 6 to 9 mm. in length and 1 mm. in width.

The stromatic tissue is completely hollowed out when more than one larva infests a stroma and only the outer surface of the black knot is left intact. The rusty frass pellets are evacuated through cracks in the stroma. In late June or early July larvae vacate the black knot, drop to the ground and form a dark brown pupa measuring 1 mm. in width and 5 mm. in length (Fig. 5).

The following hymenopterous parasites were recovered from *Telphusa* sp. during this study:

Hymenoptera
- Braconidae
  - *Bracon variabilis* (Prov.)
- Eulophidae
  - *Euderus* sp.
  - *Hyssopus sannoideae* Girault
  - *Tetrastichus* poss. *fumipennis* (Girault)
- Pteromalidae
  - *Habrocytus* poss. *phycidis* Ashm.

Carposina nr. comonana Kft.

This insect has one generation a year and overwinters in the pupal stage. It was identified by G.G. Lewis and was not represented in the Ottawa collection and was sent to Dr. D.R. Davis of the United States National Museum in Washington for further study. C. sp. nr. comonana was widely distributed in the Manitoba Lowlands and Prairie Regions of Manitoba (Fig. 2). One hundred and forty-nine specimens were reared from black knot of cherry.

The adults of C. sp. nr. comonana appear in late June or early July when black knot is well formed on the trees. The adult is a powdery grey moth with a black bar or patch on the outer edge of the wing, middle of wing shaded with white and a black bar on the inner edge of the wing. The hind wing is pale grey. The adult measures 16 to 18 mm. from wing tip to wing tip (Fig. 4). The larvae were found in scattered collections from July to mid-September in Manitoba and Saskatchewan. Early instar larvae are creamy white in color but turn pinkish in later instars. The head and thoracic legs are light tan in color. Fully grown larvae measure 1 mm. in width and 6 to 7 mm. in length. More than one larva usually feed in the stromatic tissue of a single ascocarp and they completely hollow it out leaving only the outer shell of the stroma. In late August larvae vacate the black knot, drop to the ground and form a yellow pupa in an earthen pupal chamber. The pupa measures 1.5 mm. in length (Fig. 5).

The following hymenopterous parasites were recovered from C. sp. nr. comonana during this investigation:

Hymenoptera
- Braconidae
  - Bracon variabilis (Prov.)
- Eulophidae
  - Tetrastichus poss. fumipennis (Girault)
- Ichneumonidae
  - Devorgilla sp.
- Pteromalidae
  - Habrocytus poss. phycidis Ashm.

Grapholitha prunivora Walsh.

G. prunivora, the lesser apple worm, is a common pest of fruit trees in various locations throughout Canada. Adults are reddish brown in color and have a wing span of 1/4 inch (Fig. 4). They appear in mid-July after black knot is well established. MacKay (1959) reported this insect feeding in black knot fungus, and on

apple, plum, cherry, serviceberry, and hawthorne. Prentice (1965) reported this insect feeding on black knot on pin cherry in mid-July in the vicinity of Kenora, Ontario. Larval description of this insect coincides with that of M. MacKay except the larvae from Manitoba and Saskatchewan are slightly smaller in size. Larvae were collected from early July to early November in the aspen and aspen-oak sections of Manitoba and Saskatchewan (Fig. 2). Some larvae apparently overwinter in this stage but the majority leave the fungus from late July to late September, drop to the ground and form dark brown pupae measuring 1 mm. in width and 4 mm. in length (Fig. 4).

Only one species of hymenopterous parasite was recovered from G. prunivora in this study:

Hymenoptera
Braconidae
Bracon variabilis (Prov.)

Synanthedon pictipes G. & R.

The lesser peach borer, S. pictipes, according to Peairs and Davidson (1956) and Herrick (1935) is an important insect pest of peach, plum and cherry. Engelhardt (1946) reported that this insect is found chiefly in the eastern half of North America and the larvae have been observed feeding in black knot on wild cherry and plum. Prentice (1965) reported the larvae of this insect had been found in Newfoundland in late July and in Ontario in mid-September.

The adult has been adequately described by Engelhardt (1946). In Manitoba and Saskatchewan, adults emerged from June to October and 57 specimens were reared in this study (Fig. 4).

S. pictipes has been collected mainly from the Southeastern Lowlands of Manitoba with a few scattered collections from Saskatchewan (Fig. 2). Larva measured 2 mm. in width and 13 mm. in length and have a cream colored body, reddish-brown head, shield and thoracic legs. Posterior border of the shield is darker brown. Larvae were found boring in the black knot and along the cambiam in various stages of development during the summer and winter. Larvae prefer black knot on larger branches but have been found in fewer numbers in smaller ascocarps. Pupation takes place in the larval gallery.

The following hymenopterous parasites were recovered from S. pictipes during this study:

Hymenoptera
Braconidae
Brachistes sp.
Bracon sanninoideae (Gahan)
Bracon variabilis (Prov.)
Macrocentrus marginator (Nees)
Meteorus n. sp. nr. pinifolii Mason

Ichneumonidae
Dolichomites messor perlongus (Cr.)
Scambus poss. tecumseh Vier

Thamnosphecia poss. scitula (Harr.)

According to Engelhardt (1946) T. scitula adults emerge in the spring and early summer and pupate in a larval gallery. Only one larva of this insect was found in black knot, this was collected in March from the vicinity of Minnedosa, Manitoba (Fig. 2). It was identified by M.R. MacKay, Entomology Research Institute, Ottawa. The larva measured 2 mm. in width and 8 mm. in length. The body was creamy white with tan colored head, shield, thoracic legs and anal plate. The larva was observed boring within the black knot along the cambian similar to the boring habits of S. pictipes.

Conotrachelus nenuphar (Hbst.)

The plum curculio, Conotrachelus nenuphar (Hbst.) has been found in most areas east of Rocky Mountains where deciduous fruits are grown (Armstrong 1958). In the Niagara Peninsula, it is a major enemy attacking apricot, nectarine, plum, peach, sweet and sour cherries, apple, pear and gooseberry. In Manitoba, Fletcher (1905) reported that Criddle collected the insect at Awene in 1904, and it caused considerable damage to plums at Morden in 1954 MacNay, 1955). In Manitoba, it has been reported attacking black knot on choke cherry (Wong and Melvin 1965). With the exception of a single collection in the Spruce Woods Provincial Forest, all collections were taken from the Eastern Lowlands of Manitoba (Fig. 2).

Overwintering curculios apparently emerge at the same time in Manitoba as those in the Niagara Peninsula of Ontario (early June to early August).

Larvae were collected in black knot from early June to early July. More than one larva was usually found in each ascocarp infested. The larvae were cream colored with dark brown heads and the full grown larvae measured 6 to 8 mm. in length and 2 mm. in width.

Only one species of parasite was recovered from C. nenuphar in this study:

Hymenoptera
Braconidae
Bracon variabilis (Prov.)

Canifa pallipes (Melsh.)

The adult has been adequately described Dillon (1961). It is a flat, dark brown beetle and appears in June when black knot infections are forming on the trees. Collections were made in black knot from the Manitoba Lowlands, and from the Aspen Grove and Aspen Oak sections of Manitoba and Saskatchewan and a single collection from the Greenwater Provincial Park, (Fig. 2). Seventy specimens have been reared in this study.

C. pallipes overwinter as a larva and is found feeding in black knot from June to October. The larva is creamy white with light brown head. More than one larva can be found feeding in a single ascocarp.

Gaurax apicalis Mallock, Gaurax festivus and Gaurax poss. montanus Coq.

The only collections of these dipterous insects in black knot were collected in Manitoba (Fig. 2). Adults emerged from black knot in June and July. They are small flies measuring 2 to 3 mm. in length. According to J.G.T. Chillicott, specimens of Gaurax are quite rare.

Comstock (1936) reported larvae of this family infesting stems of wheat, rye, oats, clover and grasses. Larvae live in the burrows and cavities in plants made by other insects and some species of Gaurax develop in the egg sac of spiders. Larvae are saprophagus and measured 1 to 2 mm. in width and 9 to 10 mm. in length. More than one species of this fly was found inhabiting the same ascocarp of black knot of cherry. The winter is passed in larval stage. G. festivus was collected from Charleswood, and Beausejour. G. apicalis was the most common and was collected from Riding Mountain National Park, Tolstoi, and Eden.

Oscinella catalpae (Mallock) and Oscinella sp.

These small flies emerged from black knot in Manitoba and Saskatchewan in June and July. They measured 2 to 3 mm. in length.

Comstock (1936) recorded larvae of this family feeding in some of the cereal crops, clover and grasses and others living in burrows and cavities of plants made by other insects. The larvae are saprophagus and measured 1 to 2 mm. in width and 9 to 10 mm. in length. Oscinella larvae were found feeding on the stromatic tissue of black knot with the larvae of Gaurax. Winter was passed in the larval stage. Collections of O. catalpae were made from well distributed points in the southern areas of Manitoba and at Erwood and Armit in Saskatchewan (Fig. 2). Two collections of Oscinella sp. were made in Manitoba at Marchand and Beausejour.

DISCUSSION

The most common insect and damage in black knot of cherry was caused by a gelechiid, Telphusa sp. and next in order of prominence were Carposina sp. nr. comonana, Grapholitha prunivora, Synanthedon pictipes, Oscinella spp., Gaurax spp., Canotrachelus nenuphar and Thamnosphecia poss. scitula. The aegeriids S. pictipes and T. poss. scitula were found feeding on a combination of stomatic tissue and cambiam. The remaining insects discussed in this paper were found feeding solely on stromatic tissue. Apparently there is a succession of insects feeding on the stromatic tissue of Dibotryon morbosum throughout the whole season starting when the new black knot is soft and pulpy and continuing until it is fully mature. Usually more than one species can be found feeding in black knot at the same time.

It was of interest to note only hymenopterous parasites in the families Braconidae, Eulophidae, Pteromalidae and Ichneumonidae were recovered, the majority of the parasites from lepidopterous hosts. More species of parasites were obtained from S. pictipes (7 spp.) than the most common insect Telphusa sp. (5 spp.) followed by Carposina nr. comonana (4 spp.), G. prunivora and C. nenuphar (1 sp.). The braconid parasite, Bracon variabilis (Prov.) was the most common in all the collections of this complex in black knot of cherry. The pteromalid parasite, Habrocytus poss. phycidis and the eulophid parasite, Tetrastichus poss. fumipennis were both found parasitizing Telphusa sp. and Carposina nr. comonana.

ACKNOWLEDGEMENT

We wish to thank the officers of the Entomology Research Institute, Canada Department of Agriculture, Ottawa for the authoritative identifications.

REFERENCES

Anderson, H.W. 1956. Diseases of fruit crops. McGraw-Hill Book Co. Inc., New York.

Armstrong, T. 1958. Life history and ecology of the plum curculio, Conotrachelus nenuphar (Hbst.) (Coleoptera: Curculionidae) in the Niagara Peninsula, Ontario. Can. Ent. 90:8-17.

Comstock, J.H. 1936. An introduction to entomology. Comstock Publishing Co. Inc., New York.

Dillon, E.S. and L.S. Dillon. 1961. A manual of common beetles of eastern North America. Row, Peterson and Co., New York.

Engelhardt, G.B. 1946. North American clear-wing moths of family Aegeriidae. U.S. Government Bulletin 190. Printing Office, Washington.

Fletcher, J. 1905. Entomological records, 1904. 35th Annual Report, Ent. Soc. Ontario, 1904, 56-78.

Heald, F.D. 1943. Introduction to plant pathology. McGraw-Hill Book Co. Inc., New York.

Herrick, G.W. 1935. Insect enemies of shade trees. Comstock Publishing Co. Inc., New York.

Hesler, L.R. and H.H. Wetzel. 1929. Manual of fruit diseases. The MacMillan Co., New York.

MacKay, M.R. 1959. Larvae of the North American Olethreutidae (Lepidoptera) Can. Ent. Suppl. 10:71-72.

MacNay, C.G. 1955. Summary of important insect infestations, occurrences, and damage in Canada 1954. 85th Ann. Rept. Ent. Soc., Ontario, 1954, 56-78.

Melvin, J.C.E., H.R. Wong and B.B. McLeod. 1967. The fauna of black knot of cherry, Dibotryon morbosum (Schw.) Theiss and Syd. (Ascomycetes: Dothideaceae) in Manitoba and Saskatchewan. Internal Rept. MS-58, Can. Dept. of Forest.

Peairs, L.M. and R.W. Davidson. 1956. Insect pests of farm, garden and orchard. 5 Edition. John Wiley and Sons. Inc., New York.

Prentice, R.M. (Comp.). 1965. Forest lepidoptera of Canada. Vol. 4. Microlepidoptera. Recorded by Forest Insect Survey. Dept. of Forestry, Canada.

Wong, H.R. and J.C.E. Melvin. 1965. Insects and mites associated with black knot, Dibotryon morbosum (Schw.) Theiss and Syd. Bi-monthly Prog. Rept., Can. Dept. of Forest., 21(4):3.

Native Trees of Canada 1963. Bull. 61. Can. Dept. of Forest.