



United States
Department of
Agriculture

Forest
Service

Northeastern Forest
Experiment Station

Concord-Mast Road
P.O. Box 640
Durham, NH 03824

Reply to: 3440

Date: October 13, 1983

Mr. Carroll Schell
Resource Management Specialist
Acadia National Park
RFD #1, Box 1
Bar Harbor, ME 04609

Dear Carroll:

Here is the report of our aerial survey and ground check on insect and disease conditions on the Park. The aerial survey was completed August 1 and ground checked August 17-18.

Several important pests were found on the Park during my visit. They were:

<u>Common Name of Pest</u>	<u>Location on Map</u>
A. Pine needle miner on pitch pine	1
B. Twig prune borer on red oak	2
C. A disease on white pine	3
D. Spruce budworm on spruce and balsam fir	4
E. Oak leafrollers	5
F. A sawfly on red oak	6
G. Alder flea beetle on alders	7

Pine needle miner, Exoteleia pinifoliella, defoliated pitch pines in two areas on the Park. About 12 acres were severely defoliated by the insect on Ocean Drive, near Enoch Mt. and about 2 acres were moderately defoliated on Ocean Drive, near Jackson Laboratory (see map). An examination of 100 infested shoots indicated that the needles have been infested for about two years. This was evident by old mines in the needles and broken tips of older needles. The damage was more noticeable this year than in 1982 because the population was higher. According to several references, control measures are seldom necessary and none has been developed to control the pine needles miner. There are about nineteen parasites that keep the population down. Of these, 3 are common and widespread in the population. They are Derostenus silvia, Achrysocharis sp. and Dicladocerus sp., hymenopterous wasps (chalcids) (Eulophidae: Hymenoptera). To determine parasites in the population, 500 currently infested needles were incubated to rear parasites. From the 500 needles, 475 hymenopterous parasitic wasps (chalcids) emerged. These were identified as chalcid wasps (Eulophidae). Identification to genus and species will be made by the Beltsville Identification Laboratory in Maryland.



Out of twenty infested needles examined, the miners in seven were parasitized by these chalcids. The literature indicates that parasites, unfavorable oviposition sites, strong winds and rains, and other environmental factors will reduce the population in 1984 (refer to R. J. Finnegan's publication on pine needle miner in Quebec which I sent you).

The larvae that were girdling branches, causing noticeable damage to red oak trees on Ocean Drive and on Oak Hill Road in Somesville, were tentatively identified as twig prune borer, Elaphidion probably villosus. These borers mine the center of the stem, then sever them by several cuts from the center outward, to but not including the bark. These attacked branches, measuring from 1/4" to 3" in diameter, break and fall to the ground with borers in them. Pupation occurs in broken branches on the ground. Since damage was quite noticeable this year, these borers may be a problem in 1984. Collecting and burning the branches on the ground may be useful in controlling the population. This should be done before the adults emerge in April. Cutting the broken branches in the crowns of the trees would be impracticable.

The foliage of 8-10 white pines in Gilmore Meadow was injured in 1983. Only the needles on younger pines are affected; older pines appear to be healthy. Our pathologists examined the branches samples collected and stated that the injury is probably due to an abiotic agent, such as ozone. However, it could be something else, and one of the pathologist will try to have a look at it soon.

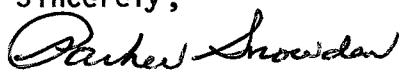
Spruce and balsam fir trees were lightly defoliated by spruce budworm on Uncle Dick Hill and Whales Back areas off Route 233. Also, egg mass populations in both areas were light - about 1 EM/100 ft² of foliage. No defoliation was detected and no egg masses were found in Bass Harbor and Pretty Marsh picnic area. In 1980 and 1981 these two areas were lightly defoliated by the insect.

Red oak trees along Route 233, near the high school, were lightly defoliated by two species of lepidopterous larvae and one hymenopterous larva. Larvae collected from the foliage were identified as oak leaf-rollers (Gelechiidae and Tortricidae: Lepidoptera) and a sawfly, Periclista sp. (Cephidae: Hymenoptera). These insects usually cause little or no tree damage unless the population is very high.

For the second consecutive year, alder flea beetle, Altica ambiens alni caused severe skeletonization of alders on the Park. This was also noticed throughout Mt. Desert Island as far north as Ellsworth. Infestations usually lasts for 2 or 3 years before the population collapses. Various reports indicate that no tree damage is caused by insect.

If you have any question or need any assistance, please feel free to call or write.

Sincerely,



PARKER SNOWDEN
Entomologist
Forest Pest Management

cc: Joe Wadland, w/enc.
Clark Granger, w/enc.

ACADIA NATIONAL PARK

SCALE 1:62500

PARK AREA

HULL'S COVE
PARK ENTRANCE
& HQS.

BAR ISLAND

SHEEP PORCUPINE IS.

BALD PORCUPINE IS.

BAR HARBOR

OTTER CREEK

NORTHEAST HARBOR

SOUTHWEST HARBOR

WEST TREMONT

HARRIET

RANGER STATION

GREAT CRANBERRY IS.

BAKER IS.

ISLE AU HAUT

SCHOODIC PENINSULA

RANGER STATION

LITTLE MOOSE IS.

BLUE HILL BAY

SEAL COVE

SEAL COVE POND

MURDOCK POND

ROUND POND

SONES POND

DOG LANE

DUNN LN

PARBLE LAKE

DESERET NARROWS

FRENCHMAN BAY

Key Map - 1983 Survey Map of Pests on Acadia National Park,
Mount Desert Island, Maine

Key Map - 1983 Survey Map of Pests on Acadia National Park,
Mount Desert Island, Maine

MGO

CASE INCIDENT RECORD

1. ORGANIZATION CODE 1 1700		2. ORGANIZATION (PARK) NAME Acadia National Park		3. LOCATION CODE 0100		4. CASE/INCIDENT NO.	
5. LOCATION OF INCIDENT Tarn Parking Lot (north)		6. WHEN DID IT OCCUR? MO. DAY YR. 08 23 83		24 HOUR TIME 0930		7. DAY OF WEEK 3	
8. OFFENSE/INCIDENT CODE 429390		9. NATURE OF INCIDENT Animals - Wildlife (Insects)		10. ☒ DISPATCHED ☐ SELF INITIATED			
11. VEHICLE MAKE: N/A		12. VEH. LIC. NO. N/A		13. STATE N/A		14. 15. 16 N/A	
17. INVESTIGATED BY Arsenault, Arsenault		18. OFFICER/RANGER NO. 0344		19. WHEN INVESTIGATED DATE TIME 8/23/83 0930		DISPOSITION 20.	
21. INVOLVED PERSON N/A		22. ADDRESS N/A		23. PHONE N/A		24. 25. 26. SEX RACE AGE N/A N/A N/A	
27. DATE OF BIRTH		28. DETAILS OF INCIDENT While investigating a call at the north end of the Tarn Ranger Arsenault (352) discovered some larvae on a pitch pine. A sample was taken to C. Schell who IDed them as pine sawflies. Resource Dept. was shown infected area to take more samples					
INVESTIGATED BY (Signature and Date) M. Arsenault, 8/24/83				APPROVED BY (Signature and Date) RB			



United States
Department of
Agriculture

Agricultural
Research
Service

Northeastern Region
United States
National Arboretum

Washington, D.C.
20002

August 23, 1983

gjs
Mr. Carroll Schell
Acadia National Park
P. O. Box 177
Bar Harbor, Maine 04609

Dear Mr. Schell:

I want to let you know how much we appreciated your help and cooperation last week during our visit to Acadia National Park. Since all went as planned, in a short time we were able to adequately collect, and photograph many infected trees.

Please extend my thanks to Kyle and Holly; they were both very helpful.

With any luck, we will soon shed some light on this unusual and perplexing disorder.

Thanks again.

Sincerely,

Alice J. McArdle Spruce tumor

ALICE J. McARDLE
Horticulturist



United States
Department of
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Forest
Service

Northeastern Forest
Experiment Station
(603)868-5719

Concord-Mast Road
P.O. Box 640
Durham, NH 03824

Reply to: 3440

Date: June 17, 1983

c/s
Mr. Carroll Schell
Resource Management Specialist
Acadia National Park
RFD #1, Box 1
Bar Harbor, ME 04609

Dear Carroll:

As I stated in our telephone conversation, the insect that is causing serious damage to pitch pine needles on Ocean Drive was identified as Exoteleia pinifoliella pine needle miner. I have enclosed three references which describes the life cycle, tree damage, and natural control of the insect.

Since we plan to conduct an aerial and ground survey of the Park in July, we will determine the extent and severity of the infestation, and potential defoliation in 1984.

Also, mailed under separate cover are 12 copies of "A Guide to Common Insects and Diseases of Forest Trees in the Northeastern United States" which you requested.

If we can be of any further assistance, please feel free to call or write.

Sincerely,

Parker Snowden

PARKER SNOWDEN
Entomologist
Forest Pest Management

Enclosures (3)

Norm F NF
Kyle KJ
John
Hattie KBB
To Insects letter box



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*Reference not seen in original.

(Received 14 August 1964)

The Pine Needle Miner, *Exoteleia pinifoliella* (Chamb.) (Lepidoptera: Gelechiidae), in Quebec¹

By R. J. FINNEGAN

Forest Research Laboratory, P.O. Box 35, Sillery, Quebec 6, P.Q.

Abstract

Canad. Ent. 97: 744-750 (1965)

In recent years the pine needle miner, *Exoteleia pinifoliella* (Chamb.), has occurred in large numbers in jack pine plantations in southern Quebec. The female lays its eggs in late June and early July, and larvae, after moulting to the fourth instar, overwinter in the second needle mined. The following spring the larvae continue mining the needles in which they overwintered, moult for a fourth time, and attack a third needle, wherein they pupate. A description of all stages is given, and the habits and controlling factors of the insect are discussed.

Introduction

Exoteleia pinifoliella (Chamb.) is a native insect common in eastern North America from Ontario and Quebec in the north, to Georgia and Texas in the south. In the United States it occasionally becomes epidemic on pitch pine, *Pinus rigida* Mill., which is considered its primary host, but in Quebec it is more important on jack pine, *P. banksiana* Lamb.

¹Contribution No. 1085, Forest Entomology and Pathology Branch, Department of Forestry, Ottawa, Canada.

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The literature on the pine needle miner is rather limited. Bennett (1954a) wrote a comprehensive paper on the relationship between the needle structure of various pines and the degree of attack by the pine needle miner. He stated that there is a correlation between the internal structure of a pine needle and its susceptibility to injury by the insect, and that this is affected by the number, position, and size, of the resin canals within the needle, and possibly by the vigour of the tree. In two other short papers, Bennett (1954b, c) discussed the pupal morphology and the metamorphosis of the insect. Schaffner (1959) listed 19 parasitic species of the pine needle miner, which had been reared from field collections made in the northeastern States. Lindquist and Harnden (1963) reported that one of these, *Derostenus silvia* (Grlt.), caused 22% mortality in a sample collected in southern Ontario in 1962. They also described briefly the summer and fall mining habits of the insect.

The present investigation was undertaken after several heavy outbreaks of the insect occurred in southern Quebec (Finnegan 1961), to increase our knowledge of its biology and to determine the main factors limiting its abundance in jack pine plantations. Studies were carried out in heavily infested, privately owned, jack pine plantations near St. Edouard de Lotbinière and St. Hyacinthe, during 1961, 1962, and 1963. The trees varied from 10 to 15 years of age, and were spaced at 6 × 6-foot intervals. In both localities red pine, *P. resinosa* Ait., and Scots pine, *P. sylvestris* L., occurred either as scattered trees within the jack pine plantations, or in adjacent blocks, but both these tree species showed no sign of attack. The bionomics of the insect were determined by making regular collections of infested foliage throughout the growing seasons. Some of the collected insects were reared and some were dissected to observe the development of the immature stages. The apparatus used for obtaining emerging adults is described in a previous paper (Finnegan 1964).

Hosts and Epidemiology

Bennett (1954a) and others reported the following pines as hosts of *E. pini-foliella*: jack pine, red pine, pitch pine, Scots pine, Virginia pine (*P. virginiana* Mill.), shortleaf pine (*P. echinata* Mill.), longleaf pine (*P. palustris* Mill.), table mountain pine (*P. pungens* Lamb.), ponderosa pine (*P. ponderosa* Dougl.), and lodgepole pine (*P. contorta* Dougl.).

During the summer of 1961 several jack pine plantations along the St. Lawrence River between Quebec City and Montreal were found to be heavily infested with the pine needle miner (Finnegan 1961). The plantations most heavily attacked were those in the vicinity of Lotbinière Village, Drummondville, St. Hyacinthe, and Three Rivers, and in general the oldest plantations exhibited the heaviest populations. In the extensive 25-year-old jack pine plantations located at the northern city limits of Three Rivers, dead trees were found that had apparently been killed by a continuous, severe attack of the needle miner over a period of years. However, on the southern shore of the St. Lawrence River, where the oldest jack pine stands are about 15 years old, no mortality was observed, although some stands have apparently been heavily defoliated for several years.

The larvae mine needles during most of the growing season. The first needles mined are attacked at the base (Fig. 1A) and within two or three weeks turn yellow and die. These needles are generally of the current year's foliage. Usually only one of each needle pair is attacked and the other healthy needle may hold the dead one in place until late the following year. In subsequently mined needles (current year and old foliage), the larvae normally attack the apical half, killing the needles only as far back as the entrance hole (Fig. 1A, B). The

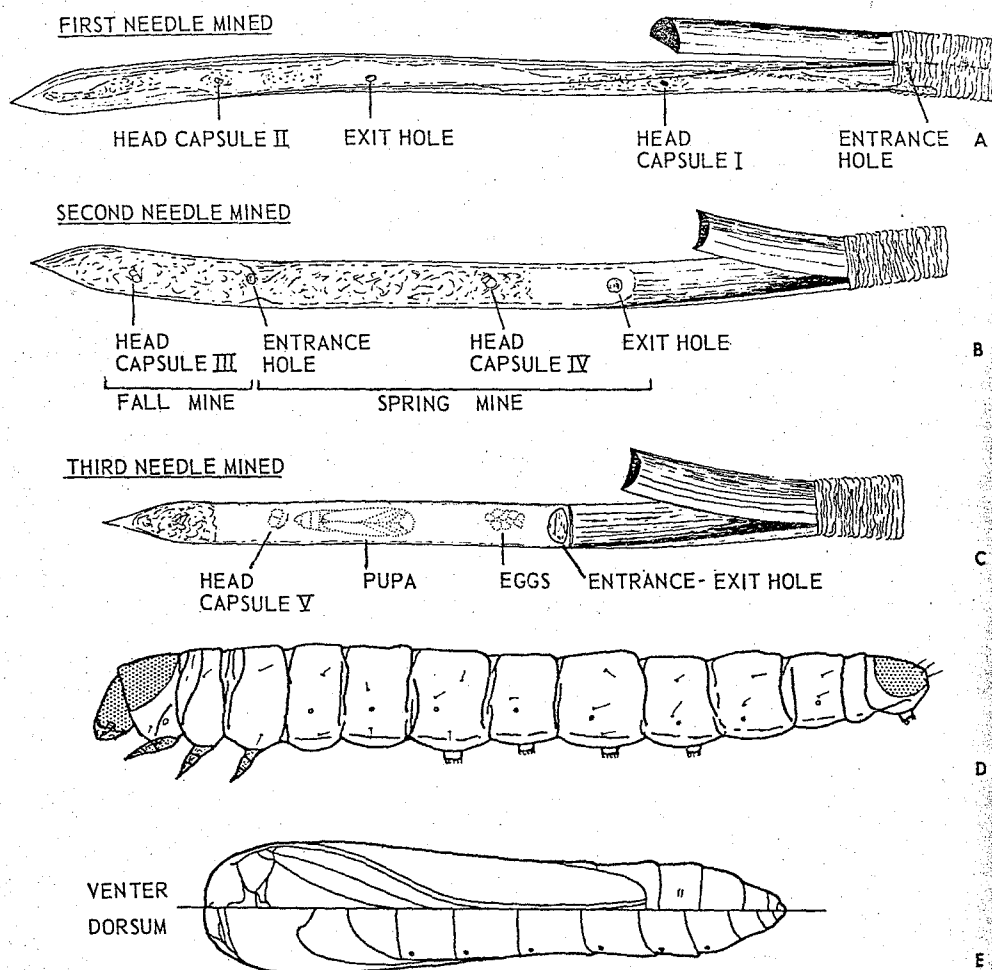


Fig. 1. Immature stages of *Exoteleia pinifoliella*, and larval damage to jack pine foliage. A, B, C—First, second, and third jack pine needle attacked; D—larva; E—pupa.

following year these needles often break at the entrance hole and, in heavily infested trees, this gives the twigs a ragged, discolored, easily recognized appearance.

Description of Stages

ADULT. The head is white and the thorax gray (Fig. 2). Narrow grayish bands divide the reddish- to golden-brown forewing into four more or less equal parts from the base to the tip. The wingspread measures about 9 mm. The hind wing is fuscous and wider than the forewing. The antennae are fine and about as long as the body.

EGG. The egg (Fig. 1C) is ellipsoidal and measures about 0.43 mm. in length by 0.25 mm. in diameter. It is smooth and creamy-white in color.

LARVA. The fully grown larva (Fig. 1D) is elongate-cylindrical and measures about 5.8 mm. in length and 0.75 mm. in diameter. The sclerotized region of the head, dorsal prothoracic shield, thoracic legs, and anal plate are dark brown in color. The body of the larva is without secondary setae and pinkish brown. The ventral prolegs have about 10 uniordinal crochets each, arranged in a single

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Fig. 2. Adult of *Exoteleia pinifoliella*.

series. The anal prolegs each have four rudimentary crochets. The overwintering larva (fourth instar) is uniformly dark chocolate-brown. The larval stage consists of five instars with well-defined head capsule measurements (Fig. 3).

PUPA. The pupa (Fig. 1E) measures about 4.5 mm. in length and 0.90 mm. in width. The body is cylindrical and dark reddish brown throughout.

Life History and Habits

In southern Quebec, *E. pinifoliella* adults emerge about the third week in June. Mating and oviposition takes place during the flight period which lasts until mid-July. The eggs hatch during the latter part of July and the larvae moult for the first time about mid-August, followed by a second moult in early September and a third moult in mid-October. The larvae overwinter and then moult a fourth time about the middle of May to pupate in late May and early June. This is in agreement with Bennett (1954a), who reported that the insect overwinters as a fourth-instar larva, pupates in early May and emerges in late June.

Young adults tend to mate and oviposit on the branches of trees from which they emerged. The newly mated females search for recently vacated, mined needles and lay their eggs in clusters of a few to a dozen by inserting their abdomens one or two millimeters into the exit holes (Fig. 1C).

After hatching, the young larvae vacate the old mined needles in search of healthy current year's foliage. Each larva then crawls between the two needles of a fascicle and enters one of the needles by cutting a hole, about 0.16 mm. in diameter, through the epidermis of the needle (Fig. 1A). This entrance hole soon becomes plugged with resin and is difficult to find. At first the young

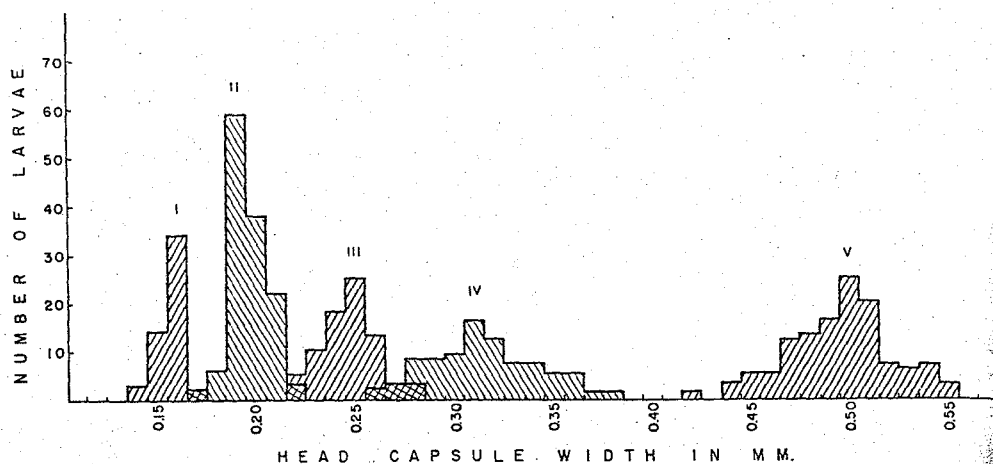


Fig. 3. Distribution of head capsule measurements of *Exoteleia pinifoliella* larvae collected in the field.

larvae feed only on the mesophyll of the needles, but shortly after being established, they cut one or more deep gouges through the stellar region and resin canals. This effectively disrupts the food supply to the needle, which a few days later turns yellow, then brown. After the needle has died, the larvae consume most of the interior tissues. They abandon their first needle shortly after the second moult.

The second needle (Fig. 1B) is entered about one third of its length from the apical end, on the inner, flat surface. The entrance hole is more or less round, measures about 0.28 mm. in diameter, and is closed with silk. Immediately upon entering the needle the larva severs all the internal conducting tissues, thereby interrupting the flow of nutrients to the tip of the needle. The larva may mine this needle in both directions from the entrance hole, but usually confines its activity to the distal part. Only the mesophyll of the needle is consumed, although the stellar region is occasionally invaded. The frass is packed loosely in the tip of the needle. Shortly before going into hibernation (about mid-October), the larva lines the inside of the needle with silk and constructs a cocoon-like chamber of loose silken threads in which it orients itself with its head toward the exit hole, then moults for the third time.

In the spring, fourth-instar larvae continue to mine the needles in which they overwintered, they consume all of the internal tissues including the stellar region, and pack the frass pellets tightly in the apical end. At this time the larva is mining toward the base of the needle, and feeds on living tissue. During this period the larva moults into its fifth and last instar. When it has mined the needle to about one third of its length from the base, it cuts a hole through the inner surface and emerges to attack a third needle. This needle is also entered on the inner surface (Fig. 1C). The entrance hole is usually slightly less than halfway along the needle from the base. It is roughly oval in shape and measures about 0.7 mm. by 0.8 mm. The needle is completely mined from the entrance hole to the apex, and is kept clean except for a few frass pellets packed in the tip. The larva then lines the mine and seals the entrance hole with silk. The webbing over the hole is spun separately from the lining of the needle, and is attached firmly around the edges of the hole. This arrangement makes it possible for the newly formed adult to emerge from the needle by applying pressure to the webbing over the hole and tearing it free at the edges.

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The larva pupates about halfway along the mine with its head pointing toward the hole and its ventral surface along the flat side of the needle. By means of a cremaster on the tenth abdominal segment the pupa is held firmly in the silk lining of the mine.

The adult, when it has emerged, forces the pupal skin to split along the epinotal and epicranial sutures and emerges from the pupal skin with the headpiece (helmet-like frons) of the pupa on its head. The adult then crawls to the hole in the needle and forces an opening in the silk webbing with the help of a mouth-like structure on the pupal headpiece, as described by Bennett (1954c).

Natural Control

Parasites

Based both on mass rearing and individual rearing of larvae in 1962, it was found that three parasites of the pine needle miner were common and widespread. *Achrysocharis* sp. caused about 8% mortality, while *Copidosoma* sp. and *Dicladocerus* sp. each caused about 3% mortality based on emergence of adult parasites. Although *Copidosoma* sp. has been previously reported attacking *E. pinifoliella* (Schaffner 1959), the author is not aware of previous records of *Achrysocharis* sp. and *Dicladocerus* sp.

Oviposition Site

Although the foliage and twigs of many branches were examined under a dissecting microscope, eggs were found only in empty mines made by larvae of the previous generation. This fact is probably of considerable importance in influencing the distribution of the insect in forest stands. Previously infested trees, offering a large number of oviposition sites, are likely to become even more infested the following year, while nearby healthy trees, although frequented by gravid females, do not afford oviposition sites and remain relatively uninfested. The spread of the insect to uninfested foliage is brought about either by young larvae migrating in search of healthy needles, or through wind-dissemination of dead mined needles containing eggs. This explains, in part at least, why infestations in plantations and dense natural stands of jack pine, where overlapping branches are common, are usually very uniform, while in mixed stands and open-grown trees the infestations occur year after year on the same isolated trees but not on others.

Climate

Although wind is a beneficial factor in aiding the insect to spread from one tree to another, it is also important in controlling the insect. Strong winds in May and early June often toss the foliage of infested trees so vigorously that a large portion of the mined needles, containing larvae or pupae, are bent at the entrance-exit hole. Usually, only a small deformation of the needle is sufficient at this point to prevent the adult from emerging. During the flight, mating, and oviposition period, strong winds and rains are also capable of reducing insect numbers greatly, as was observed in the field during the summer of 1963.

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(Received 16 March 1965)

A Nearctic Species of *Parablastothrix* Mercet (Hymenoptera: Encyrtidae)

By C. D. F. MILLER

Entomology Research Institute, Research Branch,
Canada Department of Agriculture, Ottawa, Ontario

Abstract

Canad. Ent. 97: 750-753 (1965)

Parablastothrix Mercet, which has been known only from the Palearctic, is represented in the Nearctic by *Parablastothrix nearctica* new species, which is described and figured. The type and allotype of *P. nearcticus* were reared from a species of *Coptodisca* Walshm. (Lepidoptera) mining leaves of *Vaccinium arboreum* Marsh. at Jackson, Mississippi. One paratype was reared from *Obrussa* sp. (Lepidoptera) at Morgantown, West Virginia, and the other collected in Livingston Co., Michigan.

Mercet (1917) described the genus *Parablastothrix* for the Palearctic species *Parablastothrix vespertinus* Mercet. Subsequently, Mercet (1921, 1932) redefined the genus, including it, in 1932, among the genera of Encyrtidae having branched antennae in the male. Ferrière (1953) recognized the genus in his revision of the Palearctic genera of Encyrtidae. Erdös (1955) described two new Palearctic species, *Parablastothrix montana* Erdös and *Parablastothrix metatibialis* Erdös, and moved *Litomastix unguicularis* Thoms. into *Parablastothrix*. Erdös and Novicky (1955) included the genus in their revision of the Palearctic genera of Encyrtidae. Hoffer (1960) suggested that the genus *Matrella* Erdös based on *Matrella ramicornis* Erdös is a synonym of *Parablastothrix*. Graham (1961) disagreed with Erdös, who had transferred *L. unguicularis* to *Parablastothrix*, and placed *L. unguicularis* in *Secticlava* Hoffer as a synonym of *Secticlava cleone* (Walker).

Parablastothrix is closely related to the Holarctic genus *Tetracnemus* Westw. type-species *Tetracnemus diversicornis* Westw. In the male of *Tetracnemus* the antenna is eight-segmented with five funicles. The mandibles are bidentate and the axillae widely separated. The antenna of the male of *Parablastothrix* is nine-segmented with six funicles. The mandibles are tridentate and the axillae narrowly united.

In 1963 and 1965, Dr. T. N. Freeman of this Institute reared three parasites, two males and a female, from a species of *Coptodisca* Walshm. mining leaves of *Vaccinium arboreum* Marsh at Jackson, Mississippi. I tentatively determined the earlier specimens as a new species of *Parablastothrix*. In April, 1963, during my visit at the United States National Museum, Dr. B. D. Burks confirmed my determination and loaned me two additional females of the same species, which I include in the type series.



EASTERN FOREST INSECTS

U.S. DEPARTMENT
OF AGRICULTURE•
FOREST SERVICE

MISCELLANEOUS
PUBLICATION NO. 1175

they bore in the woody part of the tree, making a labyrinth of crossing and recrossing tunnels. The third winter is spent in the pupal stage in the tunnel. This species attacks all parts of the tree over 1 inch in diameter, and trees infested continuously become badly honeycombed. Fortunately, infestations are usually very local.

FAMILY COSMOPTERYGIDAE

Chrysoclista linneella (Clerck), an introduced European species, was first reported in this country in 1928 when it was found infesting linden trees near New York City. Other infestations were later found in surrounding parts of New York and New Jersey, and near Boston, Massachusetts. Its current distribution is not known. Full-grown larvae are whitish, with light brown heads and are about 6 mm. long. Adults are present from late May to mid-June and are thought to lay their eggs on the branches of their host. The larvae bore into and tunnel the bark. Winter is spent in the larval stage, and pupation occurs in the spring in cells formed in the galleries close to the surface of the bark.

The **palm leaf skeletonizer**, *Homaledra sabalella* (Chamb.), feeds on many varieties of palms, particularly Canary Island date palm and sabal palmetto, in the Southern States. It is often quite injurious in Florida. The larvae feed in groups of 35 to 100 larvae each under webs of silk on both the upper and lower surfaces of the leaf (173). Eggs are usually laid in masses on the interleaf husks. There are no hibernation stages and there may be up to five generations a year. Cutting out and burning of all interleaf husks and infested fronds is helpful in control.

FAMILY WALSHIIDAE

Aenea ostryaealla Chmb., a leaf miner of ironwood, has been recorded from New York, Kentucky, Ohio, and southern Ontario. Its eggs are laid on the undersurface of leaves, near the midrib. The larvae feed in the tissues of the leaf between two lateral veins, and form blotch-type mines. Full-grown larvae vacate the mines in the fall and drop to the ground where they spin thin, loosely woven silken cocoons in the litter. Winter is spent in the pupal stage (458).

FAMILY GELECHIIDAE

WAX MOTHS

Wax moths are small and have narrow forewings. The outer margins of the hindwings are usually concave. The larvae of some feed in folded or rolled leaves webbed together; others feed as leaf miners; still others feed in buds, seeds and cones, and roots. A few species are quite destructive.

Coleotechnites (= *Recurvaria*) *apicitripunctella* (Clem.) occurs in Quebec and in the Northeastern States. Its known hosts are hemlock and cypress. The adult is buff yellow to whitish and has

a wingspread of 1.5 to 2.0 inches. The spots and lines are greenish, sometimes yellowish. The body is long. Adults are present from late May to mid-June and feed for three to four days and web the leaves. The leaves contain silken tunnels in the winter. Feeding occurs in late spring. Local outbreaks occur.

Coleotechnites *apicitripunctella* (Clem.) New Jersey, New York, and in Canada. The larvae are creamy white with light brown bands, a narrow brown line on the region of the head. In early August the larvae bore into the foliage to form a mine, and the mine is usually found in the vitae and subvitae.

Coleotechnites *apicitripunctella* (Clem.) commonly found from New York to Alberta. The larvae are cream-colored, with a pale yellowish-brown band on the base, and dark gray spots. The head is brown. The abdomen is brown. The grown larvae are 1.5 to 2.0 inches long.

Adults are present from late May to mid-June. The larvae feed on two or three leaves in insect-damaged areas. The larvae deposited in the sound cones and needles and flowers, and the flowers are frosted (458). The generation is one. The larvae may be in the pupal stage in the fall.

Other species of *Coleotechnites* are common in the Northeastern States (Zell.) which feed on the leaves and have killed trees in Ohio.

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a wingspread of 12 mm. The forewings are marked with blackish spots and dots, and the hindwings are fringed. The larva is greenish, sometimes with a brownish tinge, and is about 6 mm. long. Adults are present from early June to mid-July. The larvae feed for the rest of the summer and fall. They mine the leaves and web them together, forming broad, flat nests. A nest may contain six or eight mined leaves where the larvae spend the winter. Feeding is resumed in the spring, and pupation occurs in late spring or early summer. There is one generation per year. Local outbreaks occur occasionally.

Coleotechnites (= *Recurvaria*) *thujaella* (Kft.), occurs from New Jersey to New Brunswick and westward to Saskatchewan, in Canada. The larvae are leaf miners on arborvitae. The adult is creamy white with heavy dustings of black and brown scales and has a wingspread of about 9 mm. There are three oblique blackish bands, a number of costal and terminal dots, and a shaded apical region on each forewing. Eggs are deposited from late June to early August between scale-like leaves on growing tips. The larvae bore into the tips and mine along the twigs, causing the foliage to turn brown. Winter is spent in the larval stage in a mine, and there is one generation per year. Ornamental arborvitae is subject to serious injury.

Coleotechnites (= *Recurvaria*) *piceaella* (Kft.) occurs commonly from Maine to Colorado and from the Maritime Provinces to Alberta in Canada. Its hosts are white, Colorado blue, Engelmann, Norway, red, and black spruces. The adult is light gray and has a wingspread of 10 to 13 mm. The head and thorax are pale yellow to whitish. The forewings are buff or ochreous near the base, shading to fuscous at the apex, and are marked with dark gray, diagonal crossbands and a few conspicuous black spots. The hindwings are broad and gray with a silvery sheen; the abdomen and legs are ochreous, sprinkled with gray. Full-grown larvae are reddish to cinnamon brown and about 8 mm. long.

Adults are active from June to late July, depending somewhat on season and locality. Eggs are laid singly or, rarely, in groups of two or three either between the axils of current year's needles, in insect-damaged or mechanically-damaged needles, in insect-damaged cones, or in spent staminate flowers. Some also may be deposited at the base of needles or inserted between the scales of sound cones. The larvae feed as miners in healthy needles, in needles and cones damaged by other insects, in spent staminate flowers, and in dead needles on shoots damaged by late spring frosts (494). Winter is spent in the larval stage, and there is one generation per year. Damage is usually not very injurious, but may be important on ornamentals.

Other eastern species in the genus *Coleotechnites* include *C. juniperella* (Kft.) which mines the needles of red cedar and common juniper in the Northeastern States; *C. dorsovittella* (Zell.) which feeds on sweetgum; and *C. variella* (Chambers) which feeds on cypress. Heavy infestations of the latter species have killed the top 2 or 3 feet of cypresses up to 20 feet tall in Ohio.

The pine needle miner, *Exoteleia pinifoliella* (Chambers), occurs in southeastern Canada and south to Georgia and Texas.

Jack, pitch, and shortleaf pines are preferred hosts, but it has also been observed feeding on Virginia, Scotch, scrub, longleaf, loblolly, and red pines. The adult has a wingspread of about 9 mm. The forewing is reddish to golden brown and is marked by four narrow, grayish bands. The hindwings are wider than the forewings. Full-grown larvae are pinkish and about 6 mm. long.

Females deposit their eggs in recently vacated, mined needles from May to July, depending on location. Young larvae vacate the old mined needles and bore into the bases of current year needles, killing them within 2 or 3 weeks. Older larvae mine in both old and new needles, killing the apical portions beyond the entrance holes. Winter is spent in the larval stage, and there may be two or more generations per year (248). Forest-grown trees are occasionally infested heavily, but are seldom injured seriously. On the other hand, heavy infestations on ornamentals or in plantations may be serious. The mite, *Pediculoides ventricosus*, appears to be an effective predator in some areas. It is reported to have destroyed over 75 percent of late instar larvae in infestations in North Carolina (40).

Exotelleia dodecella (L.), the pine bud moth, was discovered in the Niagara Peninsula, Ontario, in 1928 and now occurs throughout southern Ontario. So far as known, it has not yet crossed the border into the United States. Its preferred hosts appear to be Scotch and mugho pines, but several other pines such as eastern white, red, jack, and Austrian may be attacked in heavily infested areas. Old Scotch pines, particularly those growing along roadsides, are highly subject to attack. Infestations on such open-grown trees may persist for years. Heavy infestations cause a thickening or browning of the needles, followed by branch malformation. Eventually, the needles thin out. A high proportion of the buds on young trees may be killed.

Eggs are laid on current-year and 1-year-old shoots in late July or early August. The larvae feed on the needles during the first season; the following spring they feed on the buds. Winter is spent in the third instar in mined needles (504).

Exoteleia chillcotti Freeman is a common needle miner of longleaf pine in Louisiana. Bennett (60) discussed the morphology of the pupa.

Exoteleia nepheos Freeman, first recorded in southern Canada in 1958, is also known to occur in Ohio. Its known hosts are red and Scotch pines and, rarely, Mugho pine. The adult is small and inconspicuous and has a wingspread of less than 12 mm. Mature larvae are pale yellow with a reddish hue and are about 6.5 mm. long. Winter is spent in the larval stage.

Adults are present from early July to early August in Ontario (in Ohio they may appear as early as June 1). Eggs are laid singly, or, rarely, in clusters of two to four, on the sheaths of previous year's needles or, occasionally, under loose bark scales of twigs. Newly-hatched larvae bore into the tips of the needles. The remainder of the summer is spent mining the needle, and winter is spent in the tunnel. In the spring, the larvae vacate their tunnels and either re-enter the same needles, adjacent needles, or swelling buds. Larval growth is completed in May, and pupation

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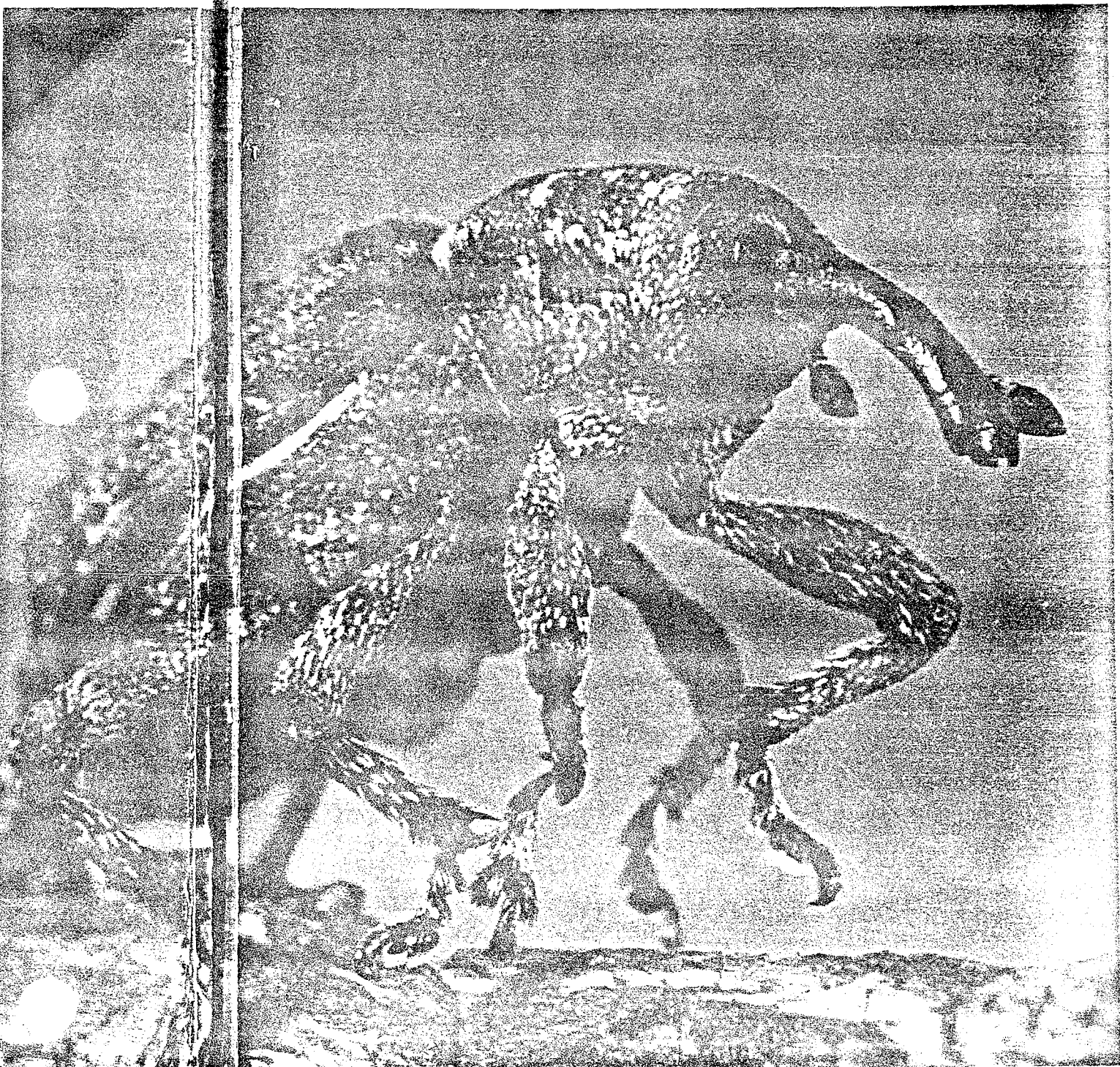
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A.M. Rose and
O.H. Lindquist

Insects of Eastern Pines



Needle miners

At least six kinds of larvae bore into and mine the needles of pine during all or part of their feeding stage but rarely do they attract attention. The most common one is the pine needle miner, *Exoteleia pinifoliella* (Chambers), which occurs primarily on jack pine, and occasionally on Scots and red pine in Ontario and Quebec. The tiny moths fly in June and early July and lay their eggs on the needles. On hatching the larvae construct a mine at the base of the needle inside the sheath. This kills the needle which turns yellow by late July. In the fall the larvae mine the tips of new needles and overwinter there. Feeding resumes in the early spring and three to seven more needles are mined by the dark brown larvae which attain a length of about 6 mm before they pupate in the mine about mid-May. At this time the mined portion of the needle is brown and conspicuous □. Although this miner has been occasionally abundant, control measures have not been developed and are probably not necessary.



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Other less common needle miners can be identified as follows:

On Jack Pine

(a) Pale green or straw-coloured hollow needles containing 8 mm long banded red and cream larvae in the fall banded jack pine needle miner, *Eucordylea canusella* Freeman.

(b) Two to four cream to brown needles tied together with silk with one or two of the needles eaten out from one side, in the fall jack pine tube moth, *Argyrotaenia tabulana* Freeman (see also page 72).

On Red Pine

(a) Brownish hollow needle associated with bundles of needles tied with silk needle mining tube moth, *Ocnerosoma* species (see also page 72).

Ipomoea

(b) Brownish hollow needle containing 9 mm long red-brown larva and with no associated bundles of tied needles red pine needle miner, *Eucordylea resinosae* Freeman.

Cecididae

On Scots and Mugho Pine

(a) Tips of needles only mined by young larvae before they enter the buds in early spring in south and southeastern Ontario pine bud moth, *Exoteleia dodecella* Linnaeus (see also page 38).



United States
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Agricultural
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Northeastern Region
United States
National Arboretum

Washington, D. C.
20002

May 27, 1983

Mr. Joe Abrell
Acadia National Park
P. O. Box 177
Bar Harbor, Maine 04609

Dear Mr. Abrell:

Enclosed are xerox copies of some articles pertaining to the tumors on white spruce. As I mentioned on the phone, we have been working with cankers and tumors in other genera and believe we have found a rather unusual causal agent for such growths.

For preliminary studies, we would like to obtain 3 tumors of various sizes (say, from golf ball to softball). Just sever the branch or trunk above and below each tumor, enclose the whole thing in a sealed plastic bag, and ship airmail.

If early studies are negative, you may not hear from me again. However, if they are positive, one of us may be forced to visit your beautiful park for further collections and observations.

Sincerely,

FRANK S. SANTAMOUR, JR.
Research Geneticist

Enclosures

*Joe,
we sent two samples
prior to receiving this
as per your instruction.
Will wait until they respond
~~here to~~ from us for anything
else. JS*

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(two of them) were sent out
parcel post last week.*

*-k/b
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Herbicides for Landscape Maintenance: Friend or Foe?

Albert P. Nordheden, ASLA

Herbicides have been used for years to control undesirable plants in lawns and field crops. They are now also a proven labor-saver in the maintenance of the public landscape.

Herbicides are available in many types and formulations for both specific and general use. Some are contact materials with little or no residual effect, and others may persist for a year or more as complete sterilents.

Let us look at two types of chemicals used for weed control. The first is soil fumigants, which are preplant materials applied to the soil prior to plant installation. They are generally volatile and must be contained with a covering of plastic or a water seal. In addition to herbicidal properties that kill weed seeds, rhizomes, and other plant parts, these fumigants may control insects, fungi, and nematodes. Examples are Dowfume MC-2 and Vapam or VPM. Use of these materials is limited to specific problems warranting their expense and the time-consuming labor of application. Usage is reserved for preparation of soils for planter boxes, greenhouse or nursery stock in containers, top dressing lawn materials, and choice planting beds having a specific problem that cannot be solved any other way.

The author is Director, Grounds & Landscaping, Oakland University, Rochester, MI 48063.

The second type is herbicides, weed-killing chemicals which are the most useful to the grounds manager. A weed is here defined as a plant growing where it is not desired or a plant out of place, including volunteer vines, trees, and shrubs. Herbicides are of three types according to their effect on plants: contact, growth-regulators, and soil sterilents. All three are useful to the grounds manager.

Contact herbicides kill the plant parts that are covered with the chemical and may be selective or nonselective. The latter are toxic to all plants, whereas the former kill or stunt some plants with little or no injury to others.

Growth regulators are also known as growth modifiers, growth substances, and translocated or systemic herbicides. They are absorbed by some plant part (leaves, stems, or roots) and are translocated throughout the plant's system, causing it to die or become less competitive with the desired plants around it.

Soil sterilents prevent the growth of green plants when present in the soil for a certain period. The length of time that toxicity persists is an important factor in their use. The residual life of a herbicide is highly variable depending on the chemical used and changes from year to year. Residual life is affected by rate of application, environmental fac-

tors, and organic or clay content of soil. It should be borne in mind that contact and systemic herbicides have a residual life in soil that can influence when reseeding and/or replanting can proceed.

In formulating a herbicide program, the way in which the chemical works is an important factor. If its site of action is in the soil, then it affects germinating seeds, with or without an effect on existing plants. A contact herbicide burns off foliage on existing weeds, resulting in death of most annual types, but regrowth frequently occurs on established perennials. As noted earlier, systemic herbicides are carried throughout the plant after foliar application.

Any plan of attack should include in the arsenal products used in the following ways. (1) Preplanting treatments can be done before plant installation or seeding. An example is Treflan. (2) Pre-emergence treatments kill the undesirable plants as the seeds sprout and can be used around established plants immediately after cultivation. Examples are Dacthal, Enide or Dymid, Princep, and Surflan. (3) Post-emergence treatments are made to the foliage after the undesirable plants have established themselves from seeds or other plant parts. In this category there are many chemicals available in both contact and systemic form. An example of a contact type is Paraquat CL; examples of systemic types are 2,4-D, Banvel, and Roundup.

There are two methods of application: broadcast blanket, which is the uniform distribution of the chemical over an entire area, and spot or directed spray treatment, which is application to a specific area where the chemical may or may not come in contact with desirable plants. The technique chosen should be influenced by whether the chemical being used is selective or nonselective.

Herbicide usage in landscape maintenance has been both praised and damned because of poor results, plant injury, or embarrassments. These are caused by many factors, but the most important are improper application, environmental conditions, equipment failure, and human error.

Improper application includes a multitude of sins: the wrong concentration, poor distribution of chemical and/or omitted areas, target plants in the wrong stage of development, incorrect choice of chemical for the target, poor retention of the herbicide on plant surfaces, nearby desirable plants in a growth stage susceptible to chemical injury, the wrong plant part is treated, or chemical incompatibility when more than one herbicide is used.

Environmental conditions also can produce failure: temperature, rainfall shortly after application, soil moisture, soil type, wind, and surface runoff.

Equipment may have leaky valves and fittings, clogged nozzles, or be set to so fine a droplet size that spray drifts onto desirable plants.

Human error has been known to include walk-

ing through a sprayed area and tracking a nonselective chemical across a lawn, chemical spills, as well as improper disposal of rinse water when cleaning equipment.

Only top of the line equipment should be considered. My preference in compression tank sprayers is stainless steel of a three-gallon capacity, with a fill capacity of two gallons. These should be rated for industrial or heavy-duty use. Knapsack sprayers of larger capacity are available, which may seem an advantage until you carry one around all day. The stainless steel sprayers will outlast all others by many years and are easily cleaned. My second choice would be fiberglass or polyethylene tank sprayers. Last would be galvanized containers, and it should be noted that some herbicides cannot be used in these sprayers.

✦ Another application tool which is indispensable for specific areas, to minimize danger to desirable plants, is an applicator pad on the end of a handle. This is used to wipe the chemical directly onto the target plant. There are several kinds on the market, but especially good are those with a built-in supply reservoir and a protective shield above the pad that keeps the chemical from touching overhanging shrub foliage.

The only other equipment required is a portable source of water (a five-gallon plastic water can will do nicely), and measuring spoons and cups. When spraying, protective clothing should consist of unlined rubber gloves (linings can absorb chemicals) and rubberized boots or overshoes. Coveralls are optional but usually are not necessary if the chemicals are properly applied. For safety, a bar of soap can be carried for washing up in the field prior to drinking, eating, or smoking.

As always when handling chemicals, follow recommended safety precautions on the manufacturer's label and then add some common sense. Treat all chemicals as if one drop could kill you. Some safety pointers are given below.

- Avoid mixing chemicals in confined areas or where food is present or eaten.
- Avoid skin contact. In case of spills on clothing, change and wash immediately.
- Do not inhale fumes or airborne particles.
- Wear the necessary protective clothing.
- Do not eat, drink, or smoke when handling the materials.
- Do not haul chemicals in the passenger compartment of a vehicle.
- Keep chemicals protected from the weather, and keep measuring tools secured so they cannot be tampered with. A locked cabinet or box on the truck is not an unnecessary precaution.
- Destroy empty containers according to recommended procedures.