

THE ANNUAL BLUEGRASS WEEVIL

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For many years the decline of annual bluegrass (*Poa annua*) in golf course tees, greens, and fairways has been attributed to hot, humid weather during the summer months. It is now believed that some of the loss was due to weevils. The feeding activity of the insects in conjunction with unfavorable weather has from time to time resulted in die-out of *Poa annua*. The purpose of this publication is to report recent studies on the biology and control of the two dominant species of bluegrass weevils in Connecticut.

Two Dominant Species in Connecticut

Two species of bluegrass weevils, *Hyperodes anthrosionus*¹ and *H. maculicollis*¹ Kby., have seriously injured annual bluegrass in Connecticut during the past several years. By 1969 the pests had destroyed *P. annua* on five golf courses in Fairfield County and one each in New Haven and Hartford counties.

Hyperodes anthrosionus was the dominant species in 1967 and *H. maculicollis* in 1969. There appears to be little difference in size between the two species. Both measure 3.5 to 4 mm in length with an occasional *H. anthrosionus* individual attaining 5 mm. They are dark brown to almost black. *H. anthrosionus* is distinguished by the narrow grayish longitudinal bands on the wing covers and a dense gray pile on its ventral surface. *H. maculicollis* has small irregularly placed gray spots and flecks on the dorsal surface of the wing covers. Three short narrow bands of gray scales are present on the thorax—one median and one on each lateral margin. The ventral surface has rather sparse, gray-brown pile.

Injury to Grass by *Hyperodes*

Poa annua is a low-growing, cool-weather grass. It seeds abundantly in late spring and early summer. When weather permits, some of the seeds germinate at this time. However, most of them lie dormant until late August and September when lower temperatures, moisture, and warm soil favor accelerated germination and fast growth of the seedlings. Seeds that do not germinate at this time may do so during early spring of the following year when *Poa annua* is at its maximum growing efficiency. In most seasons, *P. annua* does poorly during late June through early August when the weather is usually hot and dry.

¹ Identified by R. E. Warner, Agricultural Research Service, USDA.

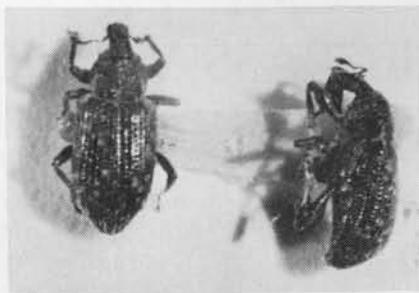


Fig. 1. Adult annual bluegrass weevils, *Hyperodes maculicollis*.

Presently the damage to the grass is more noticeable in golf course turf than in home lawns, parks, and recreational areas. This is partly due to the cultural methods practiced under golf course management where continuous close cutting (March to December) and frequent fertilization favor the perpetuation of the weevils.

Juvenile Development

There is one annual generation of *Hyperodes anthrosionus* in golf course fairways in Connecticut. The adults emerge during late June and July, they then enter reproductive diapause and remain so until April of the following year. Initial emergence in 1970 occurred on April 9.

The youngest weevil larvae were found on April 16 in 1969. Four very small individuals were observed in about 10 sq. ft. of fairway turf. An additional 2 sq. ft. of turf was examined on May 28. This area yielded 14 weevil larvae. They were located in dense annual bluegrass



Fig. 2. Soil has been removed to show annual bluegrass weevil larva (left), pupae (right), and adult in foreground.

roots at a depth of $\frac{1}{2}$ inch to 1 inch below the surface of the ground. They measured 1 to 3 mm in length.

In several additional areas of the golf course, examined on June 16, weevils averaged 45 per sq. ft. in a range of 7 to 84. Larvae, pupae, and adults were present. The latter were light in color, soft, and had not emerged to the surface of the ground.

A population study on June 18 indicated 9.5% larvae, 59.5% pupae, and 30.6% adults. On the 26th of June there were 7.5% larvae, 45% pupae, and 47.5% adults. Also on this date 50 of the 76 adults counted had emerged to the surface of the ground. The remaining 26 were still in the soil. Some of them were light in color and soft in texture. By comparison, those on the surface of the ground were dark brown to black in color and hard in texture.

A study made on June 30 showed the weevil population to be 90% adults, 10% pupae, and no larvae. By July 3, 93% of the individuals were adults, and on July 8 all of the weevils were in the adult stage and on the surface of the ground. None was found in the grass roots.

Development of weevils during the two previous seasons was similar to that observed in 1969.

Weevil counts made on June 29, 1967 in badly infested fairway areas ranged from 50 to 100 per sq. ft. At this time upward of 90% of the individuals were in the pupal stage. The remainder had transformed to the adult stage. All were found below the surface of the turf. Examinations of turf made on June 20, 1968, showed that 93% of the weevils were in the pupal stage, 7% were prepupae and adults. No adults were found on the surface of the ground nor in fairway grass.

Larvae, pupae, and adults were found at a depth of 1 to 2 inches below the surface of the fairways. It was clear that where hatch occurred (although sometimes quite shallow) all stages of the weevil were adjacent to its lower surface; none was found in the thatch.

Flight Activity

In order to obtain information on flight activity of adults during the summer and fall months of 1968, 12 x 8 x 0.5 inch ply boards were lacquered bright yellow and after drying, coated with a tanglefoot-like material. Traps were placed in the roughs adjacent to two fairways that had been heavily infested with weevils. The traps were examined 30 times between July 23 and November 5. On each occasion the number of trapped adult weevils was recorded. The traps were then cleaned, retreated, and replaced in the roughs. Eight adult weevils were counted; the first one on August 15 and the last two on October 21.

Traps were reset in 1969 on several fairways on June 11. At this time traps lacquered bright red, grass green, and yellow were used. Adult weevils were not found on the traps until June 20 when one individual was counted on a yellow one. Subsequently at 3 to 4 day intervals through July 25, 17 adults were trapped on the yellow traps, 4 on the red ones, and none on the green ones.

TABLE 1. Live insects hibernating in "rough" turf.
Observed August 28 through October 31, 1969

Grass species	No. sq. ft. examined	Adult weevils	Adult chinch bugs	Larvae of sod webworms	Predatory beetle (<i>Amara aenea</i>)
Creeping red fescue	10	4 ¹	1	5	6
Kentucky bluegrass, bent grass and weeds	2	0	0	0	1

¹ Parts of 3 others were found. These had probably been killed by predatory beetles.

Trapping of overwintering adult weevils was undertaken at one golf course in Fairfield County on April 7, 1969. Traps were examined at 2 to 4 day intervals until May 8. Only 8 adult weevils were caught on the traps.

Hibernation

An examination of "rough" turf, from August 28 through October 31, indicated the presence of adult weevils apparently preparing to go into winter hibernation. Although several varieties of grasses and weeds were examined, the weevils were found only in fescue turf (Table 1). At first they were on the surface of that thatch near the base of the grass plants. Later in the fall they were still present in the fescue and nowhere else. At this time, they had buried themselves to a depth of $\frac{1}{4}$ to $\frac{1}{2}$ inch below the surface of the thatch.

An examination of Table 1 indicates the probability of maximum hibernating conditions afforded insects in fescue thatch compared with other grasses and weeds.

Predator

One species of predatory beetle (*Amara aenea*) was observed in abundance where the weevil population was heavy. Very few occurred where *Hyperodes* infestation was sparse or absent. At one time a larvae of *Amara* was observed feeding on a larva of *Hyperodes*.

Chemical Control

Until 1969, chlorinated hydrocarbons were used as the sole insecticides to control bluegrass weevil. Experiments were undertaken in that year to evaluate less persistent compounds. Experiments were initiated on April 23. Insecticide granules of Cygon[®] and Sevin[®] were mixed with Milorganite[®] fertilizer as a diluent at the rate of 5 lbs. of 10G Cygon or 5 lbs. of 20G Sevin per 50 lbs. of Milorganite and applied to fairway turf with a tractor drawn "Easy-Flow" fertilizer spreader (Table 2).

The results of the tests assayed on June 13 indicated no live weevils in the Cygon treated turf, whereas in the Sevin treated areas there was

TABLE 2. Insecticides used to control the bluegrass weevil, *Hyperodes* in April 1969

Insecticide	Acreage treated	Lbs. insecticide formulation/acre	Lbs. active insecticides/acre
Cygon 10 G	7,200 sq. ft.	20	12
Sevin 20 G	1 acre	100	20
Sevin 20 G	1 acre	200	40

an average of 14 individuals per 1 sq. ft. In untreated fairways the average was 94 per sq. ft. in a range of 50 to 120.

An additional experiment was undertaken on April 29, 1969, as shown in Table 3.

Examinations made on May 2 and again on June 5 indicated that 100% control of the weevil had been attained with Di-Syston® and Lannate®. Infestation in treated areas was about 4 per sq. ft. prior to application of the insecticides.

On June 9, 100 lbs. of 10G Di-Syston was applied to one acre of fairway turf in which weevil larvae and pupae ranged from 32 to 80 or more per sq. ft. Examinations made on June 23 indicated 100% control of the weevils. Weevil counts in an untreated area (25 ft. from treatment) averaged 88 per sq. ft. No phytotoxicity was observed.

On June 16 Cygon 2 E was used at 2 gallons per acre and Diazinon® at 1 gallon per acre in an area where the weevils averaged 45 per sq. ft. Also chlordane 8 E was used at 1 gallon per acre on turf heavily infested with weevils (80 or more per sq. ft.). At the time of treatment 30% of the weevil population were in the adult stage.

Data were taken in the chlordane treated area on July 3 and again on July 8. At this time over 90% of the weevils were in the adult stage and were on the surface of the fairway. There were no larvae present. Numbers of live adults ranging from 36 to 40 per sq. ft. were found on the surface of the fairway. Dead adults averaged 11 per sq. ft. (22-24% control). No live adult weevils were present on July 17 in turf treated with Cygon and Diazinon.

In a concluding experiment undertaken on July 25, 65 E Di-Syston and 48 E Diazinon were each used at the rate of 1 gallon of formulation per one acre. The treatments were applied in 50 gallons of water per acre. All adult weevils were killed in 2 hours or less. There was an

TABLE 3. Additional pesticides used to control *Hyperodes* during the spring of 1969

Insecticide	Acreage treated	Lbs. insecticide formulation/acre	Lbs. active ingredient/acre
Di-Syston 10 G	1	50	5
Di-Syston 10 G	1	100	10
Lannate 5 G	1/4	10	0.5

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average of 32 dead adult weevils per 1 sq. ft. of turf in the Di-Syston area and 10 dead ones in the Diazinon area. There was slight singeing of the grass by Di-Syston. Subsequent mowing obliterated the condition.

Registration

None of the compounds mentioned in this report has been registered for the control of bluegrass weevils. Di-Syston, Lannate, Diazinon, Chlordane, Sevin, and Cygon were all used experimentally and may or may not be subsequently labelled for use against these insects.