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CONTROL OF RACCOONS WITH RODENTICIDES

A Field Test

by

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ABSTRACT

A field test to evaluate anticoagulant rodenticides as a method of controlling raccoon populations was carried out on the Cape Romain National Wildlife Refuge, South Carolina. Fumarin mixed with corn was dispensed at ten permanent feeding stations over a six-week period. A marked decline in the number of raccoons was noted on the study area as a result of the experiment. Feeders for the study were developed by refuge personnel and proved to be relatively bird and mouse proof, but easily accessible to raccoons. In addition to the field study, observations were made of six caged raccoons fed varying amounts of rodenticide to determine lethal dosage and the length of time required to bring death.

OBJECTIVES

This study was designed to control raccoons *(Procyon lotor)* on the Cape Romain National Wildlife Refuge, South Carolina, by the use of permanent feeding stations using an anticoagulant rodenticide. The study was conducted during the summer of 1967. Caged raccoons were observed at the same time as the field study to determine actual bait intake and length of time that an animal must feed on anticoagulant before death occurs.

Raccoons prey heavily on the nests of shorebirds and the Atlantic loggerhead turtle *(Caretta caretta caretta)* on the Cape Romain National Wildlife Refuge. The use of quick-killing, non-selective poisons to control raccoons was ruled out as potentially too detrimental to non-target species on the refuge. The anticoagulant rodenticide Fumarin was used throughout the study.

ACKNOWLEDGEMENTS

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STUDY AREA

The study area was Cape Island. Cape Island is a nearly treeless, 2,000-acre

barrier island located seven miles from the mainland. There are seven miles of ocean beach, one 200-acre brackish water impoundment and a pine forest of approximately 50 acres on the island. The remainder of the upland portion of the island consists of a cover of southern waxmyrtle *(Myrica cerifera),* sea oats *(Uniola paniculata),* Spanish bayonet *(Yucca gloriosa),* sea ox-eye, *(Borichia frutescens),* and meadow salt cordgrass *(Spartina patens).* The marshes which border the island on the bay side are primarily salt marsh cordgrass *(Spartina alterniflora).* For the most part raccoons depend on fish, crabs, and other marine life as their major food on Cape Island.

The island is criss-crossed with jeep roads, facilitating observation of raccoon trails and activities.

The caged raccoon study was carried out inside a small building to keep disturbance by people and dogs to a minimum.

METHODS AND MATERIALS

Feeders: Prerequisite to baiting the study area was the development of a bait dispenser that would be light-weight, inexpensive, easy to carry, and easily set up. No commercial feeders were available to meet these needs. Bait containers were constructed by making three cuts down the side of a one-gallon tin can. The cuts were made from the open end of the can for about three inches. Two of the pieces of tin were then folded into the center of the open end and soldered to form a holder for the bait. The third piece of tin served as a canopy to prevent rain from collecting in the bait container. The feeders were fastened to a two-foot wooden pole by nailing through the unopened end. The feeder created could be easily erected, was waterproof, and relatively ant, bird, and mouse proof. (See Figure 1).

The same type feeders were used in the caged animal study and in the field. When feeders were placed too low raccoons pulled the bait from the feeders. When the feeder was placed 10-12 inches above the cage floor, raccoons would stand on their hind legs and feed by placing their heads through the open end. Animals readily eat from this type of feeder, both in the cages, and in the field.

Baits: Feeding tests with untreated baits, in the field and in cages, showed that shelled corn was the most desirable bait of those treated. Other baits tested included blackberries and a flour-meat ball combination. Neither of the latter two foods were stable enough to last over a day or two. Shelled corn seemed to be most preferred by raccoons, and maintained its appeal for as long as ten days.

The anticoagulant Fumarin was used during the studies on Cape Island and on the caged animals. Fumarin, 3-(alpha-acetonylfuryl)-4-hydroxycoumarin, is sold in commercial concentration of 0.5%. The poison was mixed with corn at three times the rate recommended for rats and mice or 1 part Fumarin to 15 parts of shelled corn. This ratio of Fumarin to corn was used throughout the field study.

During the first two weeks of the study on Cape Island, a mixture of 22 pounds of shelled corn, 3-¾ pounds of Fumarin rodenticide, one quart of vegetable oil, and one-half pound of sugar was used. During the last four weeks of the field study, water was used in place of the sugar and vegetable oil mixture.

Ten bait stations were placed on Cape Island on May 15, 1967. Feeders were located in or adjacent to well-used raccoon trails and were placed 8-10 inches off the ground. Ten ounces of treated bait were placed in each feeder. The bait was replaced as it was removed by the raccoons. Feeders were checked at least every three days and more frequently as time permitted.

Caged Animal Study: Since many questions needed to be answered from close observation of the raccoon, six individuals were live-trapped in the vicinity of the study area. The animals were placed in separate cages and grouped by two's.

FIGURE 1. Self-feeder for dispensing treated baits on Cape Island.

The caged animals were given different dosages of Fumarin commencing on June 27, 1967. Group 1 received one part of the Fumarin concentrate to five parts corn; Group 2 received one part Fumarin to 15 parts corn; and the two animals in Group 3 were held as controls and fed equal amounts of untreated bait. Varying amounts of bait were given the caged animals until it was found that two ounces of treated bait could be eaten each day with little waste. This amount was given each animal for the remainder of the study. Untreated corn was also made available to each animal but there was no preference shown for the untreated bait over the treated.

Raccoons readily began taking treated bait from the feeders. Both the caged animals and animals in the field soon fed daily from the feeders. On July 5, eight days after the anticoagulant bait was given, one of the raccoons in Group 1 died. On July 8, or after 11 days, one of the animals in Group 2 died. Neither of the surviving raccoons succumbed to the rodenticide.

Field Study: The 10 feeding stations were placed in operation in the field on May 15, 1967. On May 16, raccoon tracks were observed at all but two feeders. By May 22, bait had been taken from five of the 10 feeders. Following that date half of the stations were visited almost daily by raccoons. Table 1 gives the use by days and amount of bait taken during the period. No noticeable preference was noted between the two types of bait mixtures. Sugar, vegetable oil, rodenticide, and corn were used until May 31. Beginning on June 1, water, rodenticide, and corn were used. The water mixture tended to ferment quicker than the vegetable oil mixture. Fermentation did not cause the bait to lose its appeal, and at many stations the fermented bait seemed to appeal to the raccoons even more than a fresh bait mixture.

FINDINGS

From this study it can be concluded that (1) the raccoon is responsive to a permanent feeding station, (2) the feeders developed for the study at Cape Romain are handy for carrying into isolated areas, are easily erected, and are very inexpensive to make, (3) Fumarin-treated baits have a potential for controlling raccoons.

The feeders used during the study proved to be excellent in a number of ways. When placed 8 to 10 inches off the ground, the feeders could not be reached by field mice and rats. The overhang on the feeders and the small opening discouraged doves and blackbirds that were present on the study area from taking the bait. Birds were never seen inside a feeder but occasionally were seen picking up grains of corn which were dropped by the raccoons.

Other conclusions that were apparent from the caged animal study, and substantiated in the field, are that the raccoon will eat Fumarin-treated corn daily even when untreated foods are available. The two concentrations tested during this study showed that a substantially higher concentration of the anticoagulant might not greatly reduce the time required to kill an animal. Additional cage studies involving more animals are needed, however, before the most effective anticoagulant to food ratio can be determined.

The actual effect of this study on the raccoon population on Cape Island cannot be stated in terms of animals killed. One of the characteristics of the rodenticide used is that it is slow killing and the victim is rarely seen. It can be stated, however, that raccoon signs such as tracks and droppings were less numerous two weeks after the study began. Prior to the study the roads and trails on the island were traveled heavily by raccoons, but after two weeks of treatment, field observations indicated that these trails were used much less by raccoons. Frequent sightings of raccoons both during the daylight and at night were not unusual prior to the control program. After the first two weeks of the control study, sight recordings of raccoons were almost nonexistent.

Evidence that the rodenticide had a drastic effect on the amount of predation by raccoons on Loggerhead turtle nests is encouraging. Records on total number of Loggerhead nests and numbers taken by raccoons for the five-year period prior to the study point out very clearly the decrease in predation during the summer of 1967. For instance, in 1963 when no raccoon control was carried out on the island, nearly 80 percent of the turtle nests were destroyed by raccoons. In 1964 and 1965, after limited trapping, 40 percent of the Loggerhead nests were destroyed, and in 1966, 75 out of a total of 578 (13%) were taken by raccoons. In 1967, the year of the study only 15 nests (2%) out of 950 were dug into by raccoons. The effects of this control program were also seen on the ground nesting shorebirds on the study area, Willets *(Catoptrophorus semipalmatus)* and Wilson's plovers *(Charadrios wilsonia wilsonia)* produced more young on Cape Island in 1967 than in a number of recent years. Refuge records show that 300 willets and 75 Wilson's plovers were produced on Cape Island in the summer of 1967. In 1966, 1965, and 1964 no nesting success was reported for Wilson's plovers, and only 150 willets were produced during these years on the island.

DISCUSSION

This study was limited to Cape Island where natural foods, except marine life, are scarce. Response of raccoons to permanent feeding stations was excellent. Further investigation into the raccoon's response to such baiting methods is needed on areas where other foods are plentiful.

The caged raccoon study indicated that the raccoon will use anticoagulant treated corn from elevated feeders even when other foods are available. The caged raccoon study also indicated that daily intake of treated bait does not

have to be great to bring death in some raccoons. The field test study showed that (1) it takes about one week for the raccoons to become accustomed to the bait stations (Table 1), (2) bait intake reaches a peak about the third or fourth week, and (3) after a six-week period, if there is no great influx of raccoons from other areas, the bait intake declines greatly and the raccoon population is noticeably lower.

The use of anticoagulant rodenticides has merit, particularly in areas where birds or other animals might be affected by non-selective poisons. Permanent bait dispensers are definitely less expensive to maintain than traps. Such stations require little effort to keep baited over long periods of time where a continuing raccoon control program is needed.

It must be pointed out that this control program was a pilot study. The results indicate that the study was a worthwhile effort but further testing of materials and methods is needed before concrete conclusions can be reached. Testing of two concentrations on six caged animals is not sufficient to conclude that the concentrations used in this test are the most effective. The testing of other anticoagulants at various mixes is also needed.

ADDENDUM

Since 1967 various individuals have continued to experiment with the control of raccoons as described in this paper. Very little new information has been developed, however. A caged raccoon study by the Division of Wildlife Services, Bureau of Sport Fisheries and Wildlife, Houma, Louisiana, established dosage rates and the lethal effects of the anticoagulants on raccoons. This station also is presently experimenting with various self-feeders so that intake in the field can be scientifically verified. Additional field tests are being planned for 1970 to further evaluate this new field of raccoon control.

Table 1. Daily intake of treated corn by raccoons from ten bait stations, May 15 - July 14, 1967, Cape Island, South Carolina.

	Station Numbers										
Date	1	2	3	4	5	6	7	8	9	10	Daily Total
	(Ounces of treated bait taken)										
May 15											
May 16				1	1						2
May 18				5				5			10
May 20				8				5			13
May 22	2	2	2	10				2			18
May 26		10	10								20
May 29		10	10	3	10					8	41
May 31	2		10	5	8			5	1	10	41
June 1				10	5			5		1	21
June 5	10	10	10	10	10			10		10	70
June 7	2		2	10	10			2			26
June 8			8	5	3			4			20
June 12	1	1	1	1	10			5	1	1	21
June 14	1		5	8	10			5			29
June 16	1	1	10	10	10			8			40
June 19	1		10	10	10			5			36
June 21	1	2	1	10	10		1	8			33
June 26	1	1	1	10	10		1	2	1		27
June 30	1	1	1	1	1			1	1		7
July 3			1	1				1	1		4
June 6			1		1				1		3
July 14											0

USE OF THE CANNON-NET FOR CAPTURING FALLOW DEER

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ABSTRACT

The cannon-net technique for trapping deer was used to capture 130 wild fallow deer *(Dama dama)* in western Kentucky. The net proved dependable as deer were captured on 25 of 27 times it was fired. The average catch was 4.8 per attempt and up to 11 animals were captured at one time. Mortality was 3.1%. Acepromazine maleate was used with satisfactory results for tranquilizing captured deer.

INTRODUCTION

The cannon-net technique was adapted for capturing deer by Hawkins et al. (1968). We used the technique in the winters of 1968 through 1970 to capture wild fallow deer *(Dama dama)* for stocking and for marking to study movements. Four white-tailed deer were also caught but efforts were primarily directed to fallow deer. The purpose here is to report on the success of the cannon-net procedure.

The work was conducted in Land Between the Lakes, a 170,000-acre area in western Kentucky and Tennessee being developed by the Tennessee Valley Authority as a demonstration in outdoor recreation and conservation education. Approximately 20 fallow deer were introduced into the northern portion of the area in the early 1920's. The herd has increased to 500-1,000 animals on about 60,000 acres that was formerly the Kentucky Woodlands National Wildlife Refuge.

MATERIALS AND METHODS

Materials and methods were generally the same as reported by Hawkins et al. (1968). The net used in 1968 was made of No. 504 knotless nylon and had a 4-inch-square mesh. It was 60 x 40 ft with a 3 ft fringe along the periphery and was propelled by three recoilless cannons. In 1969, a 60 x 40 ft net made of No. 72 knotless nylon with a 6-inch-square mesh and no fringe was substituted following communication with R. E. Hawkins, Cooperative Wildlife Research Laboratory, Southern Illinois University. The latter net, propelled by four cannons, was much more predictable and efficient than the lighter net because it did not tear and the heads of does and fawns easily slipped through the larger mesh thus trapping the animals immediately. Deer escaped from this net on only two occasions.

The trap was fired manually from a blind by completing an electrical circuit from a 12-volt battery. The blind, which was 75 to 150 yards from the bait site, was usually entered about an hour before sunset. The net was not usually fired unless at least four deer were on the bait and no attempt was made to capture groups containing more than two large bucks.

Trap sites were located in open fields and were baited with shelled field corn and loose salt. Sites were prebaited 2 to 3 weeks prior to setup of the capture equipment. In addition, a "dummy" trap was placed at the site a few days before setup of the equipment. The latter reduced the problem of deer spooking away from the site for the first few days after the cannon-net was installed.