

## Are Moles Held in Check by Blacksnakes?

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The following communication contains some very interesting observations on the relative numbers of blacksnakes and moles on a golf course in New Jersey, before and after the cutting away of the rough. A point of unusual interest is raised in this letter, namely, the relation of snakes to various animals frequenting golf courses. The letter is quoted in full for the benefit of those who are in charge of courses infested in like manner:

I appreciate very much the interest you have taken in my soil problems, and this confirms the importance I have from the beginning attached to your Committee.

As the relationship of snakes to the mole nuisance may be interesting, I am going to give you the facts as they have come under my observation.

The area is approximately 60 acres, perhaps a little more. It is bounded on the south by woodland. This area up to 1915 served as a 9-hole golf course for a small club with a membership of 25 to 40. The area, as a whole, was not closely cut. There was considerable rough, and also brush and tree growth.

Within this area there lived and bred a number of blacksnakes. Owing to the small membership, there was a limited use of boys, and this, coupled with the high rough, brush, and tree growth, gave the snakes protection. There was little or no trouble with moles. I live within the area, and have a lawn, and at no time did the presence of moles on the lawn attract my attention. I presume they were there, but not in sufficient numbers to attract my attention.

In 1915 the club was expanded. A great deal of the brush and tree growth was cut away. A good bit of the rough was also cut down to fairway length. The rough that remained was cut down to normal rough length. Protection to the snakes, due to this change, was reduced to a minimum. In 1915, however, I still noticed there was a very considerable number of snakes about. The improvement in the club brought to the course an increased number of boys, and in 1915 the snakes began to be killed. In 1915, however, there was still an absence of impressive effect due to the moles.

In 1916 the moles began to show and then first I began to be conscious of their work. In 1917 the course was reduced to 9 holes, as it stood in 1914, and these 9 holes were further cleaned up, *i. e.*, the rough was narrowed or cut away entirely, additional shrubbery was cut out, and again protection to the snakes was very substantially reduced. Also the reduction of the course to 9 holes resulted in much more intensive playing over this area, and this condition continued through 1918. Snakes were killed more or less regularly.

In 1919 the work of the moles began to attract the attention of all the members of the club, and especially of myself, because I live on the course. Through the season of 1919 I saw only a few snakes—a far less number than prior to that time. In 1920 I did not see a single snake but the depredations of the moles increased alarmingly. We used traps from the beginning of the summer to the end, without appreciable result.

In 1921 the mole-runs were all over the place, including the lawn. Not only that, but you can see them at work. In 1921 the moles were so abundant that the men carried spears to spear them when they noticed them at work. In 1921 I did not see a single snake.

Even as late as this date (December 23, 1921) the moles continue their depredations. Areas sometimes are crossed with runs so close together that the soil has the appearance of being plowed.

Within this area the increase of the moles bears a very direct relationship to the decrease of the snakes. Also the increase of the moles bears a direct relationship to the decrease of cover for snakes and their increased destruction. Except for the changes I name, there has been no modification in the area to which I can trace the increase of the moles; but it is certain that the number of moles now living within this area is many times that living within the same area in 1914. It is also beyond all question that the number of snakes living within this area, if any, is many times less than that of those living within the same area in 1914.

The writer suggests the following explanation for the situation as it exists:

The extended account of the physical surroundings contained in the letter explains in a large measure the disappearance of the blacksnakes and the increase in numbers of the moles. The blacksnake generally prefers rather dry and open districts, occurring most abundantly on the edges of meadows which are bordered with underbrush and bushes. A tangled underbrush of this sort affords ideal protection for the blacksnake, and in such surroundings it will thrive and multiply. It rarely enters underground passages or runways of the smaller mammals, such as moles and pine-mice (*Pitymys*). It does enter the burrows of the larger species of mammals for temporary refuge in emergencies. The blacksnake is mainly a terrestrial species, occasionally climbing trees in search of young birds and the like, and is capable of crawling rapidly over vines and thickly growing bushes. It is remarkably agile and captures most of its food in the open or in rocky places. Surface lists the stomach contents of the blacksnakes examined in his investigations, and gives a summary of the data obtained by other writers. No mention is made of the presence of moles in the stomachs of any of the snakes examined. Instead, field-mice, voles or meadow-mice, snakes, and insects were found to constitute the chief items of the food.

When the rough on the golf course was cut down the shelter for the blacksnake was reduced. As this process of removal of the rough continued, the blacksnakes were afforded even less protection. The natural consequence of this policy would be that the snakes would seek a nearby district which possessed their favored habitat. In such a situation blacksnakes will no doubt still be found in abundance, but they will not become abundant again on the golf course until the rough is allowed to grow up.

The care of the golf course, including the planting of grass, has increased the number of insects which thrive under such conditions. The insects and other creatures preferred as food by moles are partial to meadows and open fields. Examinations of stomachs of moles made in the Bureau of Biological Survey show that their food consists largely of animal life and comprises the following: earthworms, Scarabaeidae (May beetles and white grubs), Elateridae (click-beetles and wire-worms), Lampyridae (firefly larvæ), Curculionidae (weevils and grubs), ants, Orthoptera (grasshoppers and crickets, including their eggs), and Oniscidae (sowbugs). The removal of the brush and bushes also has opened up an area of rich, loose soil, extremely favorable for the workings of moles. Hence they now find an abundance of food and a soil suitable for burrowing. Similar results were observed by the writer on an estate in France. The workings of the European moles, especially those in certain parts of France, are extremely large and can be observed at some distance. On this estate referred to the brush and other undergrowth over several acres was cut down and tied in bundles for use in making fires in the homes. The ground was plowed and planted with small grain. In less than six months this entire plot was thickly infested with moles. What happened was that there was a rapid invasion of moles into this area from the surrounding fields. A similar thing has probably occurred on the golf course in New Jersey.

Snakes are not attractive animals and popular traditions throughout the historical period have encouraged their persecution by mankind. The

presence of poisonous snakes in many regions inhabited by man has inspired a dread for these creatures which has endured throughout all ages. Snakes are easily confused with one another; and as it is usual to regard all snakes as venomous, the burden of proof is on those believing in their innocence. During the summer of 1920 the Secretary of Agriculture approved a project by the Bureau of Biological Survey to investigate and disseminate the information obtained from a study of the economic relations of the reptiles and amphibians to agriculture, horticulture, and forestry. In pursuance of this policy, the Biological Survey is now making laboratory examinations of the stomach contents of various reptiles and amphibians. Reptiles have been persecuted in the United States chiefly because their habits and economic value have been unknown or misunderstood.

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**Splash board irrigation.**—It has been found that large areas can be economically and effectively irrigated by the use of a splash board, which consists only of a board say 16 inches wide and 4 feet to 5 feet long, upon one end of which a hose is fastened by staples or otherwise. The water runs down the board and on the ground without tearing up the turf. A board will supply water for quite a large area—as far as the water will flow. A good soaking once a week or so should suffice to keep a fairway or clubhouse lawn in good condition—probably better and at less expense than if sprinklers are used. An inch of rainfall in ten days is enough for an ordinary garden crop; so a soaking once a week should keep turf healthy.

**How to destroy land crabs.**—Land crabs are frequently troublesome and may be destroyed by dropping a piece of calcium carbide down the tunnel. The carbide unites with the water at the bottom of the hole, making a gas, which kills the crabs. It has been suggested that this be tried on some of the large grubs which work on putting greens. A few small pieces of carbide followed by a little water might possibly prove to be an easy means of killing grubs.

**Some monument.**—“A new golf course has been presented to the City of Glasgow by the Reid family—Sir John Reid, Mr. Hugh Reid, Mr. Andrew T. Reid, and Mr. Walter M. N. Reid. The course occupies a site just outside the city boundary, north of Stobhill Hospital. It is roughly of triangular outline and bounded on the north side by Auchernairn Road.”—*The Gardeners' Chronicle*, Nov. 26, 1921.

**Don't lay out your bunkers too soon.**—On a new golf course the fairways and greens should have first consideration. Bunkers can be added at any time later and actual play will indicate the best location for them.

**“The smallest worm will turn, being trodden on.” King Henry VI.**—Also if a little corrosive sublimate is put on his tail early in the morning. Do it before he gets too numerous.

**Rake the bunkers.**—It is just as important to keep traps and bunkers in good condition as it is to look after greens and fairways.