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Vertebrate Coactions With the Franklin Ground Squirrel

EMMETT POLDER

Abstract: Nearly 30 years of observation of Franklin ground squirrels in central and northeast Iowa indicates that they are of minor importance as prey for carnivorous birds, mammals, and reptiles. These ground squirrels are predators of some significance on eggs and young of ground-nesting birds and the helpless young of some small mammals. The Franklin squirrel burrows are of considerable importance as dens for long-tailed weasels and spotted skunks and are of seasonal value as retreats for young opossums, striped skunks, and mink during mid-summer dispersal. Amphibia use the dens as a moist daytime refuge during hot, dry weather and garter snakes sometimes use the burrows for winter hibernation. Damaged burrows are used by small rodents and insectivores and are utilized as nest sites by cottontails and ground-nesting birds.

INTRODUCTION

The Franklin ground squirrel (*Citellus franklinii* (Sabine)) is probably present in every county of Iowa. It is locally abundant in colonies of from 10 to more than 100 individuals in favored habitats such as hay fields, oat fields, weedy fence rows, and native prairie. It is rarely found on timber soils or in woodlands. In central and northern Iowa the highest populations tend to concentrate on heavy moderately wet soils of glacial origin. The border zone between low wet soils formed under *Spartina* and soils formed under *Andropogon* appears to be the optimum habitat both on native prairie and on cultivated lands. In years when Franklin squirrels are at a high cyclic population level they are commonly seen on high well-drained ground and on loess soils where they are scarce or absent during years of low population.

The writer began his observations on Franklin ground squirrels on a farm in Fairfield Township, Grundy County, in 1925, a very high population year. Field notes were kept on these animals and other vertebrates associated with them until 1955. Most of these records were taken in Grundy, Butler, and Blackhawk Counties between 1925 and 1937. Observations were also made in Story, Boone, Fayette, Linn, Delaware, Clayton, Allamakee, and Dubuque Counties from 1937 to 1955.

PREDATORS ON THE FRANKLIN GROUND SQUIRREL

As a prey species the Franklin ground squirrel is of minor importance when compared with the cottontail, thirteen-lined ground squirrel, and meadow mouse. Remains of these squirrels were found at the brood dens of red foxes, grey foxes, and coyotes. The scats of the spotted skunk, long-tailed weasel, badger, and striped skunk occasionally contained remains of these ground squirrels during summer and early fall. Of four species of hawks found nesting near Franklin ground squirrel habitat only the red-tailed hawk had remains of this mammal at its nest site. On one occasion a crow was seen eating a freshly killed Franklin squirrel. A pair of migrant shrikes was seen attacking and killing a small juvenile Franklin squirrel on a new mown hay field near Dike, Iowa, in late July 1929. Only three instances of snake predation were noted. Near Hartford and Cedar Falls two large bull snakes examined contained the partly digested remains of Franklin ground squirrels. A large timber rattlesnake killed at Randalia had a freshly swallowed Franklin squirrel in its stomach.

Although the Franklin ground squirrel is generally regarded as an herbivore it is to some extent predatory. On two occasions the writer witnessed attacks on very young chickens and it is likely that such attacks are made on young game birds as well. An adult Franklin squirrel was observed eating a young cottontail crushed by a grain binder and in another instance investigation of the squeaking of young *Microtus* resulted in the flushing of a Franklin squirrel from a torn up mouse nest which contained two naked live young and one partly eaten young mouse. The writer has had many opportunities to check on cannibalism both in the field and with confined specimens but has never observed it although it has been occasionally seen in the closely related thirteen-lined ground squirrel.

Nests and eggs of ground-nesting birds were sometimes destroyed by these ground squirrels. Complete clutches of eggs of Meadow larks, vesper sparrows, and bobolinks were eaten by these squirrels. Pheasant nests and quail nests were robbed of some of their eggs but total nest destruction was not observed.

In one instance an irate hen pheasant was seen beating her wings and pecking at a Franklin squirrel that had ventured close to her nest. A domesticated mallard nesting in a clover field lost 2 of her 14 eggs to a Franklin squirrel during incubation. No wild duck nests were watched during this investigation but according to Sowls (1948) Franklin ground squirrels were responsible for destruction of 19% of the duck nests, over a 3-year period, in the Canadian prairie region which he had under study. Numerous game managers have reported predation by this mammal on eggs of blue-winged teal and other river ducks as well as eggs of upland game birds. It is probable that destruction of eggs is the most significant depredation made on the vertebrate community.

BURROW COMMENSALISM

The importance of Franklin ground squirrel dens to other vertebrates became apparent to the writer during three cyclic population peaks that occurred in 1925, 1929, and 1934. In these years the over-winter population of long-tailed weasels was nearly double the population in areas intensively trapped in years of lower Franklin squirrel populations. Vertebrate populations in Fairfield Township, Grundy County, were under intensive observation between 1925 and 1936. Cover on Section 3 consisted of 20% native prairie grass, 20% legume hayland, and 20% oats during most of this 11-year period. In years of population peaks there were an estimated 500 ground squirrels present on this section following July oats harvest. Weasels were not trapped or censused in 1925 but they were frequently seen in the daytime in the summer and their tracks were unusually abundant in light snow during the following winter. In 1929 14 weasels were trapped on this section and at least four more were known to be present in this area. The 1930 late-summer Franklin squirrel population dropped to less than 80 on this section, and the total weasel population dropped to 8. During a peak population of ground squirrels in 1934 the weasel numbers rose to 16 on this section.

The elaborate burrow system of the Franklin squirrel situated in dense cover is ideal for weasel home sites and caches of food. Of 118 active weasel dens examined in eight counties by the writer 67 were in Franklin ground squirrel burrows. Winter food caches were located in other burrows within a 15-rod radius of the home dens of the weasels. The Franklin squirrel burrows were sufficiently large to accommodate the bodies of cottontails and bob-white quail.

In Dubuque County where Franklin squirrels are rarely seen, weasels utilize pocket gopher burrows and woodchuck dens but

in this county they rarely exceed a population of four per section under the best of cover conditions and average less than two per square mile over most of the county.

Spotted skunks, like the long-tailed weasels, show a decided preference for Franklin squirrel burrows. Slightly more than half, or 32 out of 60 of the dens were in old ground squirrel burrows. In Allamakee, Clayton, and Dubuque counties where the ground squirrels are scarce the spotted skunks usually resort to pocket gopher and woodchuck burrows and seldom exceed a population of eight skunks per section. In the good Franklin ground squirrel areas of nearby Linn, Delaware, and Fayette Counties spotted skunk populations of 12 to 14 per section are the rule.

Other mammals using these ground squirrel burrows for shelter and refuge from predatory enemies are young cottontails, thirteen-lined ground squirrels, young opossums, young striped skunks, white-footed mice, deer mice, Pennsylvania meadow mice, prairie meadow mice, least shrews (*Cryptotis*), cinereous shrews, short-tailed shrews, jumping mice, harvest mice, least weasels, and mink.

Between the years 1927 and 1938 the writer was aided in the field by a terrier trained to hunt furbearers. In addition the harvest of oats and second crop hay in late July and early August made possible complete coverage of large tracts of habitat on which the conspicuous Franklin squirrel mounds were left exposed after the removal of cover. With the aid of the dog, young opossums, skunks, and mink were discovered in a number of the exposed burrows. All young opossums found were of squirrel size. Several times groups of 3 to 5 opossums that apparently were litter mates were found in burrows short distances apart. In July and early August half-grown striped skunks were frequently cornered in ground squirrel burrows by the dog. By late August the skunks were too large to enter these burrows; however, an occasional individual was found using a shallow den 2 to 3 feet in length made by enlarging part of a former Franklin squirrel burrow. Mink scats were frequently found on ground squirrel mounds in July and August. Three mink captured alive from inhabited burrows were young animals. In two instances adult mink used Franklin squirrel dens near upland bogs throughout fall and winter. The foregoing observations indicate that Franklin squirrel burrows are of considerable value as temporary shelter for juvenile opossums, skunks, and mink during the critical period of dispersal when they are in search of permanent dens in an optimum environment.

Alterations of Franklin ground squirrel burrows by moles, pocket gophers, cows, or horses often makes them attractive to

other vertebrates. A reduced, caved in, or partially plugged burrow is often opened and reused by the thirteen-lined ground squirrel. Prairie white-footed mice may use it for a nesting and food storage over winter. The short-tailed shrew sometimes enters and devours the white-footed mice and takes over the nest, only to be driven out or killed by the least weasel. When the least weasel abandons the burrow meadow mice, harvest mice, bog lemmings, and little shorttailed shrews (*Cryptotis*) and cinereous shrews in turn take up residence in the remains of the burrow. On a number of occasions the caved in burrow entrances were found to contain nests of cottontail rabbits, pheasants, quail, meadow larks, horned larks, and vesper sparrows.

Cold-blooded vertebrates such as the tiger salamander and the common toad frequently seek shelter in the depths of the burrows during hot dry days. Garter snakes use these burrows for winter hibernation; the writer once found more than 30 of these snakes intertwined in a Franklin squirrel nest 40 inches below the surface of the ground when digging a post hole late in March. The investigation in late October or early November of a fresh heap of earth in the center of a weathered ground squirrel mound has revealed to the writer the presence of a common toad "digging in" for the winter.

The conspicuous mound of earth left at the burrow entrance has other incidental uses for vertebrates. Meadow songbirds, upland game birds, and the red fox frequently scratch into old mounds and use them for dust baths. Mink, weasels, foxes, and shrews use dry rain packed mounds as defecation sites. Such dry hard mounds in the midst of tall surrounding cover have a special attraction for jumping mice which come to them at sunset and perform acrobatic dances.

In reviewing 30 years of observation of these ground squirrels, the writer concludes that they are serious pests in newly planted cornfields in high population years. They are of minor significance as a prey species but can be serious predators on the eggs and possibly on the young of ground-nesting birds. Their burrows which are utilized directly or indirectly by a host of commensals for both major and minor activities are their most important influence on the biotic community.

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