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FACTORS IN NESTING LOSSES OF THE CALIFORNIA VALLEY QUAIL[1/]

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INTRODUCTION

To develop sound management practices for increasing the population of California valley quail, a cooperative study has been undertaken in California by the Forest Service, the College of Agriculture of the University of California, and the Bureau of Biological Survey. The west side of the Sierra foothills, which is representative of a large proportion of the State, was selected as the ecological type for this study.

Prior to the beginning of the project some preliminary observations on the area indicated that food, water, and cover were adequate to support a greater population of quail than existed there. Protection from hunting for 2 years had failed to bring about a marked increase. Lack of noticeable fluctuation in numbers indicated that the population of adult birds was below the saturation point. As the State became settled, agricultural practices had detrimental effects on the birds. Increased hunting and the progressive drought that ended in 1934 brought even greater concern for the perpetuation of the species.

[1/] Revised from a paper presented at the technical sessions of the Third North American Wildlife Conference, held in Baltimore, Md., in 1938.

Some biologists and sportsmen attributed the low numbers of valley quail to poisoning by bait distributed to control ground squirrels. Losses appeared greatest during the nesting period, and the abundance of ground squirrels on this 3,600-acre experimental range, together with past observations upon ground squirrel-quail relationships, led to studies as to causes of nest destruction. In seeking to correct the depletion in number of birds, numerous remedies were tried. Drives by sportsmen's organizations to reduce the abundance of crows, blue jays, hawks, bobcats, and all suspected predators became popular.

This leaflet is based upon information gathered in the cooperative study undertaken at the San Joaquin Experimental Range and other studies conducted in California. The cooperative project headquarters is near O'Neals, Madera County, where the resident biologist for the regional office of the Forest Service, Ben Glading, is stationed.

HABITAT

The valley quail of California (Lophortyx californica vallicola) and the closely related California quail (L. c. californica) are considered the most important and finest native upland game birds of California. The species is widely distributed throughout the State. The California quail is found in the narrow, humid coast belt from the Oregon line south to Monterey County, while the valley quail is generally distributed, joining the California quail along the coast belt and extending in the western part of its range from the Oregon line south to Cape San Lucas, Baja California. The valley quail extends to the desert east of the southern California coastal region. Eastward it reaches extreme western Nevada and in that part of its range occurs from Modoc County in northeastern California south along the east side of the Sierra Nevadas to Owens Valley and in the desert ranges toward Death Valley. It extends up into the east and west foothills of the Sierra Nevadas but is replaced by the somewhat larger mountain quail (Oreortyx picta palmeri) in the middle altitudes.

The valley quail has been transplanted into other parts of the world and in Oregon and Washington is so well established as to appear native. It demonstrates its adaptability by its wide distribution throughout four of the six major ecological subdivisions of highly diversified California. Greatly varied habitats and widely dissimilar climatic conditions, from subtropical to subalpine, are successfully inhabited. Its metropolis is in the Sacramento and San Joaquin Valleys and the foothills on either side. Here snow is rare, and wide differences occur in the vegetation available as food. The original vegetation over much of its range has been replaced by exotic annuals of high forage value.

FACTORS CAUSING DEPLETION

Hunting Pressure

When it is hunted, the actions of the California valley quail differ markedly from those of other quail. Unlike the bobwhite, it does not

lie well when hunted, especially with dogs. Its habit either of running before the dog and gunner or of freezing until one is almost upon it and then whirling away with explosive violence adds an element of uncertainty to its hunting that requires extreme alertness and quick handling of the gun. The experienced hunter, however, has no difficulty in following a covey without a dog.

Early accounts record an unbelievable abundance of these gamey birds. Flocks numbering into the thousands were described. T. S. Van Dyke (7)[2/] reports that, on the average, 10,000 quail a season were formerly shipped by each market hunter and that sportsmen shooting birds on the wing made daily bags of 200. Such abundance did not last, however, and the quail dwindled in numbers.

Throughout the long search for causes of quail paucity, it is amazing to note that no effort has been made to regulate the annual harvest of these birds. Irrespective of the hatch or of the adequacy of breeding stock, hunting goes on. So long as a hunter has hope of success, he may, legally, pursue a covey until the last bird is in the bag. All that present game laws require is a State license, adherence to the specified bag and possession limits, and permission to hunt on private property. Public domain is open to all. These requirements are correct, so far as they go, but they do not go far enough. Good management will determine what seasonal take can be allowed on specific areas and should see that the limit is observed, leaving an adequate breeding stock.

Population Fluctuations

The great increase of valley quail that has accompanied ground squirrel reduction on several large areas might lead to the conclusion that this step alone would assure an abundance of birds, provided rainfall was adequate, but natural fluctuations, whether cyclic or irregular, must also be considered. On the Quinto Ranch study area (see p. 5), a poor hatch occurred during 1937, and the adult population decreased considerably after the beginning of the breeding season. Some observers believe that the cold rains during the early nesting period destroyed many nests. The later part of the nesting period was not so hampered, and it is questionable whether the rains alone were responsible for the poor hatch. The loss of adult birds was abnormally great between May and the beginning of the hunting season in November. Food, water, and cover were as favorable as in the previous 2 years, and ground squirrels and other predators were in no greater numbers. In one check area, where no hunting had been done and there were more than 300 quail in April 1937, only 30 birds could be found in December 1937. The loss of adult birds had reduced the population to 10 percent of its peak. Grazing pressure had been no greater. In the fall of 1936 the birds had reached a point of high abundance, and by the fall of 1937 they were at a low point. The little-understood phenomenon of population fluctuation offers the only satisfactory explanation for the loss, and this indicates that the quail saturation point had been reached.

[2/] Numbers underscored in parenthesis refer to Literature Cited, page 7.

Management studies must include an evaluation of factors that might be involved in a downward fluctuation following saturation. Will prevention of saturation prevent violent fluctuation, or will fluctuation come anyway? Will it be cyclic or irregular? Does disease become prevalent under conditions of abundance of the birds? Satisfactory answers to these questions are necessary for a knowledge of sound methods of increasing the population of California valley quail.

Food Supply Fluctuations

Fluctuations in food supply caused by seasonal variation in precipitation, both in quantity and in time of occurrence, may be of much importance to valley quail. Late fall rains followed by poor growing temperatures may cause a lack of green food, with the result that the birds come to the breeding season in a weakened condition. Succulent foods throughout the nesting period also are essential, for Sumner has shown that such foods, which Grinnell (5) believes are necessary to survival of the chicks, are a satisfactory substitute for water.

Drought

Drought years are unfavorable to food conditions for valley quail and are characterized by reduced egg production (4, pp. 528-529). A. W. Anthony, quoted by Bendire (1), states that according to the testimony of Indians and Mexicans quail do not nest during drought, or do so only sparingly. Other writers make the same observations, and it is evident that there is a direct correlation between water supply and breeding. The remarkable quail increase in southeastern Santa Clara County during drought years, following removal of ground squirrels (see page 5), however, would indicate that squirrel predation is a more important factor than drought.

Natural Enemies

Glading studied 90 nests on the San Joaquin Experimental Range. Of these, 17 were successful, and 13 were abandoned before laying. Nests were destroyed by ground squirrels (30), feral house cats (5), coyotes (5), spotted skunks (4), cattle (3), bobcats (2), California jays (2), a gray fox (1), and undetermined predators (6); one also was destroyed by construction workers, and eggs were taken from another for experimental purposes. In this limited investigation it was found that ground squirrels destroyed as many nests as all other native predators combined.

GROUND SQUIRRELS AS PREDATORS

Nest Destruction

Preliminary examination of various areas throughout the State convinced the writer that the major losses of valley quail occurred during

the nesting period, as is the case with most birds. The adult population did not vary greatly over certain large areas. The number of juveniles, however, was far below the normal population that could be expected from the number of adults observed or the food, water, and cover available.

That the California ground squirrel (Citellus beecheyi beecheyi) and Douglas's ground squirrel (C. b. douglasii) of California and Oregon eat the eggs of ground-nesting birds has long been known. A valley quail nest under observation near Amity, Yamhill County, Oreg., in June 1922, was found empty, and the shell fragments were seen about the mounds of Douglas's ground squirrels nearby. One egg also was found in a cache made by the squirrels. In a report by Kellogg (6, p. 6), Frank E. Dunn, county forester of Santa Barbara County, Calif., states that late in April 1925 he and a forest guard noted a male squirrel carrying eggs from a quail nest in the Oso Canyon in the Santa Ynez District of Santa Barbara National Forest; they watched it take 6 eggs from a nest containing 19, and then shot it.

During May 1935, the writer observed a California ground squirrel robbing a mourning dove's nest (Zenaidura macroura marginella) in a low blue oak tree on the Quinto Ranch in Santa Clara County. One egg was eaten at the nest, and the other was carried to the squirrel's burrow. On this same ranch, several quail nests were found robbed, and shell fragments were seen at squirrels' mounds nearby. Another egg was located in a surface cache.

In May 1937, Emlen and Glading (3) observed a California ground squirrel in the act of robbing a quail nest.

Quail Food Consumption

Important valley quail foods, especially bur-clover and alfileria, are consumed in quantity by ground squirrels. Removal of squirrels resulted in an increase in these plants and other forage. Studies on the Quinto Ranch show that, on a 5-year average, six squirrels an acre take 48 percent of the potential forage.

Effect of Rodent Control

Late in the summer of 1928 and during 1929, the California Agricultural Commissioner's field force in Santa Clara County destroyed great numbers of ground squirrels on the Fifield Ranch of the Quinto Land and Cattle Company. A prior census of California ground squirrels showed 5 to 10 an acre on the upper sections of the hills and 20 to 25 in the canyons and draws. This is a moderately dense population. Only a few valley quail were on the range, and but few had been present for several years.

Strychnine and thallium were the poisons employed in squirrel-control operations. In 1930, young valley quail increased in numbers, and this increase continued despite the progressive drought that was broken

in 1934. After the 1934 nesting season, many canyons that had one or two pairs of quail in 1929 now had more than 100 birds. With greater precipitation in 1934 and the fine breeding nucleus available, the increase in numbers of quail was astounding. In 1936, 120 birds were shot in a half mile of one canyon, and more than 300 live quail were counted in this area on the last day of the hunting season. The increase occurred generally over the entire 77,000 acres of this ranch, and similar observations were made on large tracts in Monterey and Los Angeles Counties. A marked increase in quail followed reduction of the squirrels.

In May 1936, some 300 acres around headquarters on the San Joaquin Experimental Range were poisoned with strychnine-treated barley to remove the ground squirrels. Glading checked the area carefully and failed to find dead quail or any reduction in their numbers. In 1937, the area was poisoned again, and the same results were obtained. Valley quail census figures for 1936 show 90 birds on the poisoned area and, by coincidence, 90 on an unpoisoned check area adjacent. In February 1937, 229 quail were on the poisoned and 135 on the check area. In August 1937, following the second poisoning and the annual hatch, 420 quail were on the poisoned tract and 299 on the control area. Glading states that some birds migrated from the poisoned to the unpoisoned area.

From the observations described, it is evident that ground squirrels play a serious part in causing nesting losses of valley quail and that squirrel-control measures may be of value as a management tool.

That strychnine as available in squirrel poisoning operations is not detrimental to valley quail has been demonstrated by pen studies and field experience, which were reported by Garlough and Keyes in 1925 (2, pp. 1-8). That thallium is not destructive to quail is well demonstrated by results on the 77,000-acre Quinto Ranch in Santa Clara County and in 1,000 acres in Moraga Valley, Contra Costa County, where an experiment was conducted (6, p. 5)before thallium was recommended for more general use. When dead quail are found, ordinarily their death is attributed without proof to poison. The significant result is the beneficial effect of the poisoning campaign upon the breeding stock of quail. Ground squirrel control by hawks and other predators is hopelessly inadequate. Although such predators are numerous, there are still 10 California ground squirrels to the acre on large sections of the San Joaquin Experimental Range.

SUMMARY

1. California valley quail require sound management, including definite regulation of the kill, so that adequate breeding stocks will remain.

2. A violent fluctuation in quail occurred in at least one section of the State following a rapid increase to the saturation point in 1937.

3. Unseasonable rain during the nesting period caused some loss in parts of California, but it does not fully account for the scarcity of young birds.

4. Drought is reported to result in lack of breeding.

5. California ground squirrels are the most serious check upon quail breeding, robbing more nests than all other predators combined.

6. Great losses occur during the nesting period.

7. Removal of squirrels through poisoning operations has resulted in a marked increase of quail food and in the numbers of valley quail on several large areas and has not been detrimental to the birds.

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