

the nest in a single instance. For the most part they remained at a distance calling loudly, and only in one instance did I see a parent simulate a broken wing to lure the intruder away from the nest.

We found one brood of four young which had just hatched and had not left the nest. They are beautiful little striped creatures, and become very quick and active almost as soon as they are dry. They run with surprising speed, and the note even of the tiniest chicks is the exact counterpart of the parent's note, on a smaller scale. The nests, if they could be called such, showed little variation except as to location, but we found them equally common in damp marshy locations (although in all such cases the nesting sites were perfectly dry) and out amid the cactus and rabbit brush of the dry prairie.

The parent of one nest which we had under observation died upon her nest and during the week between our visits, a colony of Burying Beetles buried eggs and parent until only the tip of the tail and one wing showed above the surface of the ground.

The birds began to gather in flocks the last week in July but did not depart for the south until late in October.

THE PRESENT AND FUTURE STATUS OF THE CALIFORNIA VALLEY QUAIL

By HAROLD C. BRYANT

Fellow in Applied Zoology on the Fish and Game Commission Foundation in the University of California

WITH MAP AND DIAGRAM

DURING the past year several circulars have been issued by the Bureau of Biological Survey of the United States Department of Agriculture calling attention to the fact that certain of our native birds, and especially the game birds, appear to be diminishing in numbers. In the annual report of the Chief of the Biological Survey for 1911 this statement is made: "The quail and prairie chicken are favorite and legitimate objects of pursuit by sportsmen, but they have been so ruthlessly pursued that they are now generally scarce and in many localities practically extinct."

With the present agitation in regard to the conservation of our national resources, it naturally follows that sportsmen as well as others are becoming deeply interested in the conservation of game. California has been so well supplied with game that she has been rather slow to wake up to the fact that she must needs look to the future in this regard. The past two decades have seen the practical extinction of such big game as the grizzly bear, elk, and pronghorn antelope. Sharp-tailed grouse have not been seen in the state for many years, and the grouse and sage-hen have been greatly reduced in numbers in many parts of the state.

In line with this rise of interest in game conservation has followed much discussion as to the present status of the California valley quail. The general opinion is that these birds have greatly decreased in numbers. It is the purpose of this paper to present what knowledge we have as to the present status of this quail in California, to discuss the factors governing the increase or

decrease of birds in general and of these birds in particular, and to offer, if possible, some suggestions as to ways and means of conserving this valuable game bird.

The sincere thanks of the writer are due Professor C. A. Kofoid, Professor J. C. Merriam, Professor W. E. Ritter, and Mr. Joseph Grinnell, of the University of California, for their helpful criticism and suggestions during the preparation of the present paper.

Three different species of quail are found within the confines of the State of California, the mountain quail (*Oreortyx picta*), the California valley quail (*Lophortyx californica*), and the Gambel or desert quail (*Lophortyx gambeli*). The first is distinctly a high mountain bird and is seldom found below 3000 feet elevation. The Gambel quail is known only in the southeastern part of the state, where it replaces the valley quail on the desert. The California valley quail is by far the most abundant of the species. Three geographical races, or sub-species of this species, varying slightly in color, are recognized. As these races do not differ in habits they are not distinguished in this paper.

It is always a difficult matter to obtain any adequate idea of the numbers of any species of bird because, as a rule, little reliance can be placed on the opinions of different observers. What might seem a large number to one observer might seem a very small number to another. In order that some idea of the numbers of quail at the present time, compared with the numbers of several years ago, might be obtained, the Fish and Game Commission sent out lists of questions to its deputies throughout the state. By plotting the reports of the deputies on the map of the state, it is easily seen that the two places where there is a consensus of opinion that quail have decreased, are southern California and the upper part of the San Joaquin Valley. (See map, fig. 57.)

The reason for the decrease in these particular localities can easily be traced to the hunter. Southern California is well populated and has at least a due proportion of hunters, as is shown by the sale of hunting licenses, over 12,500 being sold in 1910. The hunting grounds easily accessible from the bay cities naturally show a decrease also. The intensive cultivation in these same localities causes a destruction of food and cover, essential to the maintenance of quail. The answers also show that whereas in some localities there has been a decided decrease, in other localities the birds have either held their own or have increased. Since many of the deputies have only been acquainted with their particular locality for ten years, the records, in most cases, give an idea of the status for this length of time only.

When descriptions of the numbers of quail existing twenty years ago are compared with present conditions, it must be admitted that there are many less quail at the present time. Mr. T. S. Van Dyke, writing in *Outing* in 1890, says: "The statement may seem extravagant, but for many years it was a simple matter for a good shot to bag 200 in a day, all at single shots on the wing. For several years market shooters shipped an average of 10,000 apiece for the season. This hoggish work, with the number crippled and finally killed, has greatly reduced their numbers."

Mr. C. H. Shinn, writing in the same year, in giving the records of two hunters at San Diego, says: "In eighteen consecutive hunts the smallest bag consisted of forty-seven quail and five rabbits; one of the largest bags comprised 187 quail, 8 doves, and 1 rabbit, and no less than six bags ran far above a

hundred quail. A Coronado gentleman shot on the wing twelve dozen quail, and a friend with him, six dozen. The best bag that this first gentleman has made in San Diego County consisted of twenty-two dozen. They go in flocks

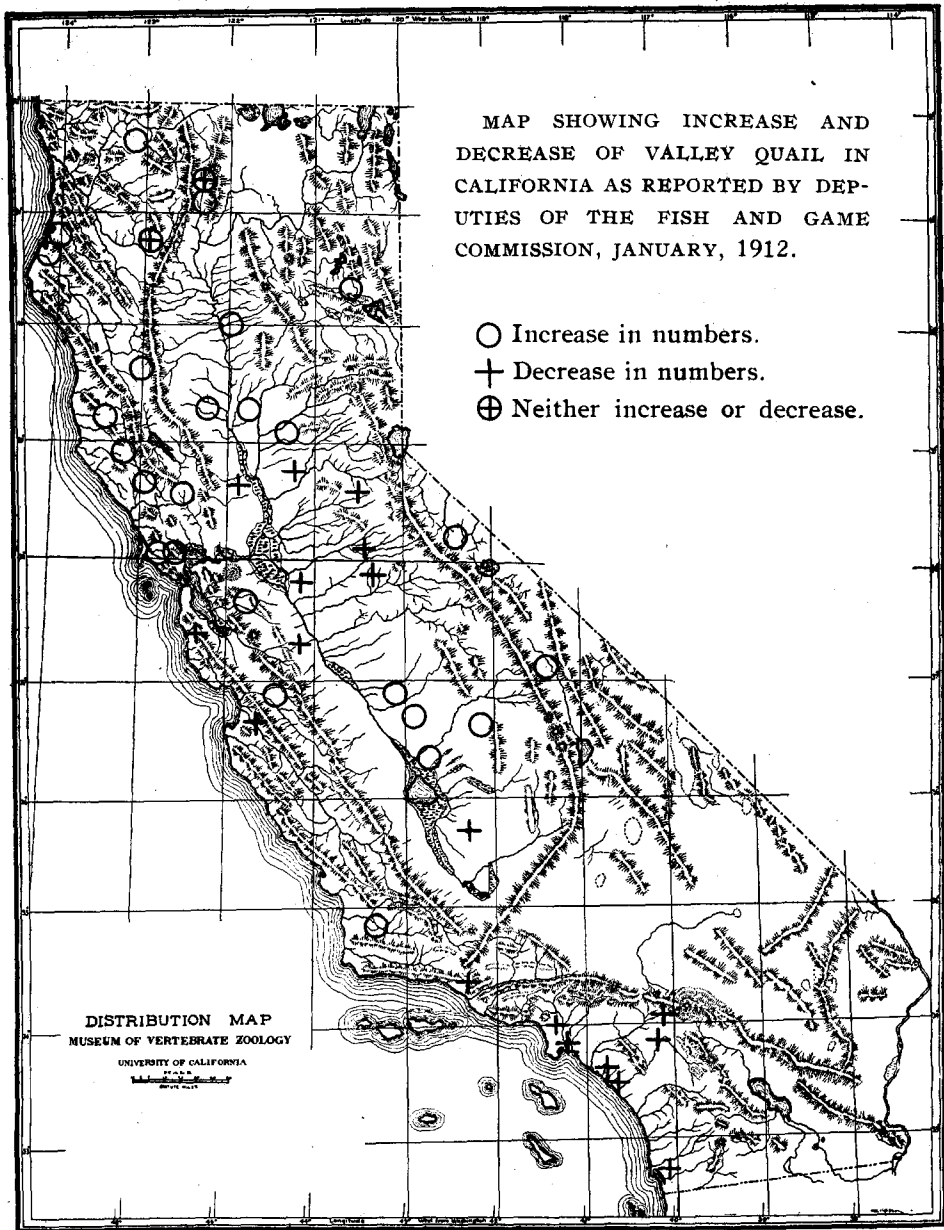


Fig. 57

of 50 to 800 and when a sportsman has studied the lay of the ground and knows the habits of the bird, he can invariably follow up the same flock with little trouble, until he has flushed and shot the greater number. There is no

danger of exterminating the quail on these dry ridges, where there is so much prickly pear cactus, in which they take refuge; and as long as the breeding season is protected no diminution in the autumn and winter quail shooting will ever be observed. I find that even on the valley farms of Alameda County the quail breed in the willows, and flocks of from 50 to 100 maintain themselves in many of the orchards, and have done so ever since the occupation of the region by Americans, though, of course, shot down to a mere handful each winter."

In his report on the "Birds of the Death Valley Expedition," Fisher says of the valley quail: "Throughout the San Joaquin Valley Mr. Nelson found it common about ranches, along water courses, or near springs. It was especially abundant at some of the springs in the hills about the Temploa Mountains and Carizo Plain. In the week following the expiration of the closed season two men, pot-hunting for the market, were reported to have killed 8400 quail at a solitary spring in the Temploa Mountains. The men built a brush blind near the spring, which was the only water within a distance of twenty miles, and as evening approached, the quail came to it by thousands. One of Mr. Nelson's informants who saw the birds at this place, stated that the ground all about the water was covered by a compact body of quails so that the hunters mowed them down by the score at every discharge." This was in 1893. Last summer and in April of this year parties from the Museum of Vertebrate Zoology of the University of California visited the same general locality, reporting that either none or but very few were to be seen at the watering places.

These quotations give a fair idea of the point of view of competent men twenty years ago. It is needless to call attention to the fact that in the very places mentioned by these men, conditions have changed and that quail are not nearly as numerous as they were twenty years ago. In many places in the state, nevertheless, where there is little intensive cultivation, the protection afforded them the past few years has allowed them to hold their own and in some places to increase.

Having now pointed out the fact that quail have greatly decreased in numbers in some parts of the state and have apparently increased in numbers in other parts, let us pass on to a discussion of the factors governing the increase and decrease of birds in general and of quail in particular. Professor S. A. Forbes was one of the first to point out the importance of studying the natural order as a whole, and understanding the disturbances to which it is subject. In a paper entitled "On Some Interactions of Organisms," he says: "While the natural order is directed to the mere maintenance of the species, the necessities of man usually require much more. They require that the plant or animal should be urged to superfluous growth and increase, and that all the surplus, variously and widely distributed in nature, should now be appropriated to the supply of human wants. From the consequent human interferences with the established order of things numerous disturbances arise,—many of them full of danger, others fruitful of positive evil. To avoid or mitigate the evils likely to arise, and to adapt the life of his region more exactly to his purposes, man must study the natural order as a whole and must understand the disturbances to which it has been subject. Especially he must know the forces which tend to the reduction of these disturbances and those which tend to perpetuate or aggravate them, in order that he may reinforce the first and divert the second."

There are at least six factors that have a direct influence on the numbers of any species of animal, the importance of each varying greatly according to

locality. They are as follows: Food supply, cover, predatory animals and birds, disease, weather conditions, and the hunter.

There is an old biological law which states that birds and animals under natural conditions will increase up to the limit of their food supply. On any given area there is food and protection for a certain population of plant and animal life. Just as soon, therefore, as the food or protection or both are diminished the given area will support less numbers of individuals and vice versa. This law is one of the most fundamental of all natural laws and most of the fluctuations of numbers of a given species can be traced either directly or indirectly to the working out of this law. Such factors as disease, predatory animals and birds, and climatic conditions are usually minor external factors. If it can be shown, then, that the food supply or cover of the California valley quail has greatly decreased in the last twenty years, we should naturally expect a decrease in the numbers of quail. If, on the other hand, it can be shown that the food supply and cover, or both, has not decreased, or has increased, we should naturally expect to find the quail holding their own or increasing in numbers; that is, barring other factors such as disease, an increase of predatory mammals and birds, or hunting. Outside disturbances in the balance, such as the hunter, may or may not have a decided influence on numbers, depending upon the extent of the destruction. A certain small amount of destruction probably would have little or no effect on the numbers, as this depletion would simply leave more room for others and a larger percent of the birds hatched would live.

Under natural conditions, therefore, the food supply of a bird probably has more to do with the numbers than any other thing. The cultivation of land, which is becoming more and more general each year, causes the destruction of the natural food of many of our birds. In a few instances certain birds are profiting by a new supply of food furnished by the crops raised; but in most instances the intensive cultivation of land brings a diminution in the numbers of birds very largely due to a destruction of their natural food. It is pleasing to note that the quail are among the birds which have, to some extent at least, adapted themselves to the new conditions. It has been stated that no birds flourish under so many varied conditions as do the California valley quail; for they can be found from sea level to a mile above the sea, and from the humid coast belt to the desert. They have been found breeding in tules, in vineyards, in the weeds along fences, in orchards, and even in suburban gardens. Vineyards furnish them not only acceptable food but good cover. The quail being largely a seed eater, will turn to grain, grapes, and other cultivated products when its natural food is not available. In spite of this fact, however, the cultivation of great tracts of wild land accompanied with the destruction of such plants as the burr clover, alfalfa, lupine, tarweed, pigweed, and mustard, has diminished the food supply of the quail to such an extent that doubtless it has had a considerable effect on the numbers.

The habits of the quail show them to be closely dependent on cover. There are many places in the state where it could be definitely shown that the destruction of cover has been the primary factor in the diminishing of the numbers of quail. Not only is that cover, destroyed in the clearing of land, of importance, but also the large areas destroyed by fire each year. As the land becomes cultivated, but a small amount of cover is furnished in place of that destroyed. The weeds and shrubs growing along the fences, and the vineyards, probably furnish the best of the new cover.

In some parts of the state the pasturing of sheep is having a direct influence on the quail. Belding, in his "Birds of the Pacific District," written in 1890, speaks of the valley quail as follows: "Rather rare at Red Bluff where much of the country is used for pasturing sheep. Formerly very abundant in the Marysville Buttes but now rare for the same reason. Not only do sheep destroy nests by treading on them, but they prevent the growth of cover, and this timid bird deserts her nest where there is the least cause for so doing." The pasturing of cattle is doubtless a menace to quail in many parts of the state also.

A certain number of quail are claimed each year by predatory mammals and birds. The wildcat, coyote, fox, and skunk are probably the worst offenders among the mammals, and the Cooper, sharp-shinned, and duck hawks, the worst among the predatory birds. The blue jays, the roadrunner, and the gopher snake are reputed to destroy eggs and young. Under natural conditions these predatory mammals and birds were far more numerous than they are at present so that they cannot be considered a very serious factor in the decrease. It seems reasonable to believe that the slaughter of these mammals and birds has kept up with the destruction of the quail so that there is certainly no larger a toll now than formerly. In fact, there is probably a less toll taken by predacious mammals and birds at the present.

Quail appear to be little subject to disease. As far as can be ascertained there is no reference in literature to an epidemic appearing among California valley quail. Certain parasites are not uncommon in these birds, however. Mr. Joseph Mailliard gives his experience with parasites in valley quail in the following words: "In Marin County and, if my memory is correct, in San Benito County also, these birds are frequently found with what appear to be small tapeworms, or with numbers of round, rather blunt worms about half an inch long closely resembling those sometimes found in domestic poultry. Besides I have often found a group of exceedingly small parasites of a bright vermilion color, suggesting fungoid growth, around the vent, but have never examined these with a microscope." Chas. S. Thompson has also called attention to the fact that he has found tapeworms in quail. He says: "At least one-third had tapeworms two and one-half to four inches long in the intestines." The presence of such intestinal parasites is not as a rule very detrimental to the health of the animal, practically all mammals and birds and even man being attacked to a greater or less degree.

In 1906-7 large numbers of bobwhite quail kept in captivity died with what was called quail disease, a disease singularly like the grouse disease of England. At that time post-mortem examination showed the presence of quail disease in the common bobwhite, the California quail, the Gambel quail, the scaled quail, the mountain quail, and the sharp-tailed grouse. The prominent symptoms were first dullness, and then emaciation. Only birds kept in confinement were found infected.

Bobwhite quail kept in captivity have been found infected with coccidiosis, a disease which sometimes attacks poultry. This disease seems to be a common one among birds, for it has been found in grouse, pheasants, pigeons, and is quite a common disease among domestic fowls, especially turkeys here in California. The Committee on Grouse Disease in England, in an elaborate report this past year, shows that one of the diseases which has destroyed such large numbers of grouse in England and Scotland is coccidiosis. Another disease

caused by threadworms (Nematodes), called strongylosis, has also been instrumental in destroying large numbers of these birds. Coccidiosis is a serious disease, the birds attacked by it usually dying from the effects. Whether California valley quail under natural conditions have ever been known to contract the disease I have not been able to ascertain. Such a protozoan disease as this, if it should attack our quail, would doubtless prove a serious menace; but fortunately there seems to be no immediate danger. At the present time, therefore, disease cannot be considered an important factor.

Weather conditions perhaps have more effect on birds which nest on the ground and on birds with the habits of the quail than on other birds. T. S. Van Dyke says on this point: "Extreme drouth is the only natural thing that reduces them. They increase enough to supply the hawks, foxes, wild cats, and owls, and can stand even a reasonable amount of shooting. But when the winter rains fail to make seed enough for its ravenous appetite, this quail knows well before too late. It then declines to mate and remains all summer in the big armies of the preceding year." That quail are able to foretell weather conditions and shortage of food is doubtful; but the fact that quail sometimes remain in flocks during the breeding season has been noted by other observers. Even here we see that the weather conditions are only concerned because they effect food supply.

Inbreeding is sometimes put forth as a reason for decrease, but it can hardly be substantiated by fact. Chickens are often known to inbreed for long periods of time without any apparent diminution in vitality or productiveness. Besides, the quail wander over large enough areas so that there is little danger of effective inbreeding. Then, too, there is no good reason why there should be very much more inbreeding now than there was twenty years ago when every one admitted that quail were in a thriving condition. The fact that quail, even in places where there were small numbers, have greatly increased under sufficient protection, seems in a measure to disprove this theory. Quail being non-migratory, isolation caused by the cultivation of large tracts of land would bring about favorable conditions for inbreeding. The extent to which such isolation could be brought about by intensive cultivation is problematical. The question awaits future development, and so further consideration at this time is not pertinent.

Last, but not least, comes hunting as a factor in the increase or decrease of birds. In many places this has been the most important factor in causing a decrease in numbers. With the increased traveling facilities, and the increased efficiency of firearms, this aspect of the question is yearly becoming more and more important. Twenty years ago hunting involved not only considerable time but considerable inconvenience; today, with the automobile and the increased transportation facilities, a hunt involves but little time and almost no inconvenience. The comparative destruction possible with a muzzle-loader or even with a single-barreled breech-loading shotgun, and an automatic, brings forcibly to mind one of the causes for the decrease in game birds during the last few years. Shooting from automobiles, a practice of the present day, is an easy way of filling the game bag but is a dangerous practice when viewed from the standpoint of conservation. Most game birds, on account of their prolificness, can withstand a certain amount of shooting; but the wholesale slaughter, now made possible by improved methods, undoubtedly oversteps the danger point.

The geometrical ratio of reproduction of plants and animals is large enough to necessitate an increase in numbers were it not for adverse circumstances. For example: The female of each pair of quail, judging from records, lays an average of twelve to fifteen eggs. Various dangers, however, probably prevent the hatching of more than an average of ten young. If all of these young should survive and reproduce, at the end of the second year there would be 132 quail for every original pair. But we know that this is not the case, but that there is usually about the same number each year. This means that the death rate must equal the birth rate, and, in the case of the California valley quail, the death rate must be some five times as great as the normal minimum population. Or, in other words, the life rate, or rate of survival, must be only 2 out of every 130 quail.

Taking a covey of 100 quail, probably at least 40 of that number would

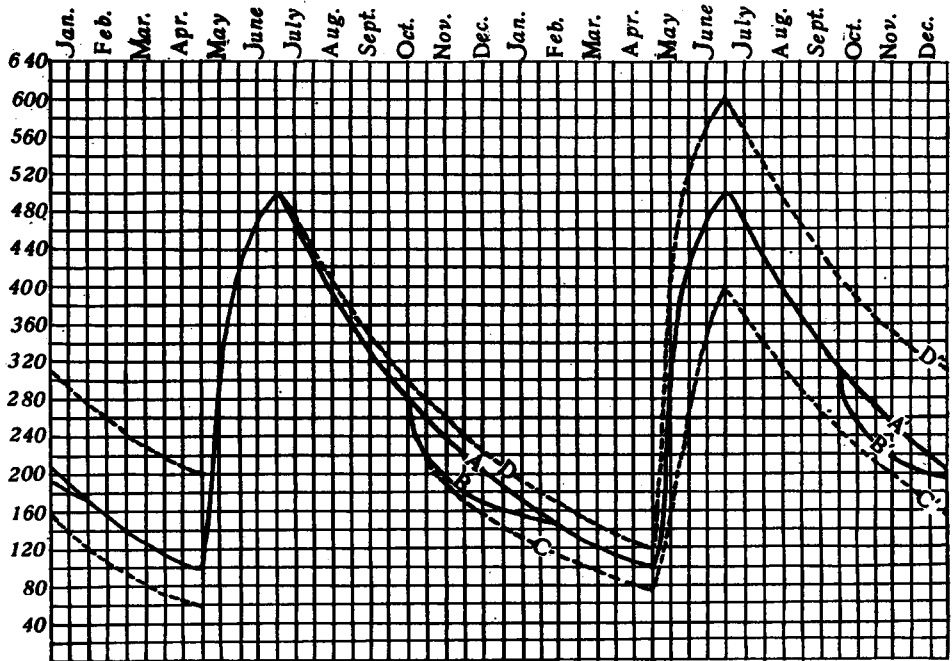


Fig. 58

average a brood of ten young each year. This would mean that just after the hatching season, there would be something like 500 quail where there had been 100. At the opening of the next breeding season this covey, under natural conditions, would have been reduced to the 100 again. Evidently therefore, there would have been a mortality of about 400. There are a great many factors to account for this immense mortality, chief among them being, under natural conditions, lack of food supply and destruction by predatory mammals and birds.

If we make a hypothetical curve, the points to be brought out are made intelligible. If along the left-hand side of the graph are plotted the numbers of individuals, and along the bottom, the months of the year, the maximum and minimum numbers would form a curve such as is seen in A. The minimum numbers can reasonably be expected to exist just before the eggs are hatched,

say early in May. Let this minimum number be represented by 100. By the end of June, just after the hatching season, the maximum numbers would naturally be found. From this time on there is to be expected a decrease in numbers until the minimum of 100 is again reached. The weaker members of the flock will be killed first, and those which can survive till the later part of the winter have then a far better chance of surviving till the breeding season. Hence, the curve drops quickly until February is reached, thus showing a greater mortality during the fall months. At the end of hatching, if forty percent produced an average of ten young, we find the numbers of quail increased from 100 to 500. At the beginning of the hatching season the next year, however, this number has again been reduced to the minimum number of 100. It can be seen then, that, under natural conditions, we are to expect, with a covey of 100 quail, that nearly 400 could be destroyed each year and yet equilibrium would be maintained and the birds would not decrease in numbers.

Suppose that we introduce a new element, shooting. A certain number of birds would still be claimed by the natural forces at work; but if the shooting occurred during the open season, October 15 to February 15, a certain proportion of the birds shot would be birds which would later have died from other causes, and just so long as that particular percentage was not greater than the death rate for that period of time there would be no decrease in numbers (curve B).

Of course a certain number of those vigorous birds destined to survive and breed would be claimed by the hunter. Under proper regulations these might be but a small percent, however, and even the killing of these might make the struggle for existence of less vigorous individuals so much less that their chances of surviving would become greater. Let the number shot bring down the numbers of birds to 75 instead of 100 at the time of minimum numbers, however, and a decrease would necessarily follow in the next year's crop of young (curve C). It seems probable, moreover, that with the hunter, just as with predaceous animals, the least vigorous prey is most easily obtained; so that no selective deterioration of the quail stock can be attributed to the hunter.

The dotted line C on the graph represents the conditions to be expected from an excessive amount of shooting. If the death rate could be lessened, the condition represented by D would exist, that is, there would be an increase in the numbers of quail. Such an increase could not exist for long, however, for the struggle for existence would also be increased to such an extent that a norm would soon be established. This same type of reasoning has been applied to nearly all forms of life and has been found to hold true.

Summing up, then, we can say that *a certain amount* of shooting might in no way effect the numbers of quail; for in the shooting we might be simply making use of numbers of quail that would have perished in some other way. It should be kept in mind, however, that there is a danger point and that when the number killed approaches near to or exceeds the normal death rate, there must follow a decrease. Another point to be remembered is that this reasoning applies to ideal conditions and does not mean that 400 out of every 500 quail can be killed each year. In shooting, many birds are killed that would have survived till the breeding season; and herein lies an error in the computation that must be taken into account. Probably the number that it would be safe to kill would be very far under the 400 mark; but even then the number might be large enough to allow considerable hunting. It is safe to say that quail can withstand a certain amount of shooting without showing a decrease in mini-

mum numbers, the exact amount being dependent largely on the death rate and consequently on the locality. The great danger of exterminating the quail by hunting lies in the excessive amount of shooting which is seen in certain parts of the state brought about by the use of improved firearms and the augmented number of sportsmen.

As can be seen by studying the graph, the open season should come during the winter months,—after the young have become full grown, and at the time when the natural mortality is large. A lengthening of the season to include too many of the late winter months would result in the destruction of those birds most necessary for the retention of normal numbers. Fall shooting would allow the killing of half-grown birds. Winter shooting, *if kept within bounds*, will permit the quail not only to hold their own but to increase. The months of November and December seem best fitted for the open season. A shortening of the season to these two months would doubtless improve conditions in many localities.

The present bag limit may be too large in some parts of the state, especially in those parts where the quail are known to be on the decrease. The closing of the season for a few years, or the creation of a weekly bag limit, might be sufficient to improve the status of the quail in these particular localities. Shortening the season too much only concentrates the shooting and seldom improves conditions. The creation of a weekly bag limit, or the closing of the season for a brief period of years would effectively cut down the toll taken by the hunter. Where there is a marked depletion in numbers the closing of the open season seems the most sensible way of meeting the situation.

The suggestion that new blood is needed is hardly borne out by the facts already brought out. Our native stock is apparently in good health and only depleted in numbers.

A study of local conditions affording a knowledge of the death rate seems the most scientific way of dealing with the problem, and this method will doubtless be the method used in the future. When the amount of shooting is regulated by the natural death rate there will be no diminution in numbers of the California valley quail on account of the hunter. It should be remembered that the hunter is probably one of the most important of many factors governing numbers, and that the only way to quickly increase numbers is to cut down the toll claimed by the hunter.

SUMMARY

California valley quail have been greatly reduced in numbers in some parts of the state. In other parts these birds have increased in numbers during the last ten years, whereas in still other parts their numbers have neither decreased or increased.

Many factors govern the increase or decrease of birds, chief of which are: Food supply, cover, predatory mammals and birds, disease, and the hunter.

Food supply is probably, in the last analysis, the most important of the factors governing numbers under natural conditions, for it is a well-recognized fact that both animals and plants will increase up to the limit of their food supply.

Predatory mammals and birds act as a check on the numbers of quail and

their destruction allows of an increase, but this factor having conditioned the quail population for so long a time is of less consequence than other factors.

As there are no records of an epidemic of disease among California valley quail, there seems to be little immediate danger from this direction. "Quail disease" and "coccidiosis," well-known diseases of other members of the quail family, present a grave danger, however. A knowledge of the extent to which valley quail are immune to these diseases would throw valuable light on this subject.

The average hunter, although almost a negligible quantity twenty years ago, on account of the improved facilities for transportation and the improved firearms, has become a very important factor. A study of the laws of nature governing the numbers of quail shows that this bird might be able to withstand a small amount of destruction during the winter open season without danger of impairing the average numbers from year to year. It is when the destruction during the year nearly equals or exceeds the annual crop, thereby destroying the productive brood stock for another year, that the danger point is reached. A regulation of the amount of shooting based on the scientific determination of the normal death rate of the young and adults will eliminate all danger of the extermination of this bird by the hunter. A serious danger also, doubtless lies in the modification and destruction of the food and cover of this bird contingent upon the settlement of the country.

The present status of the California valley quail calls for conservative action governed by a knowledge of those factors causing a disturbance of the balance. In other words, strengthen those factors which cause an increase in numbers and weaken or destroy those factors which cause a decrease in numbers, and the quail will become subservient to our interests. The furnishing of plenty of food and cover, either by artificial feeding and planting, or by game preserves, the destruction of predatory mammals and birds, prevention of disease, and careful regulation of the amount of hunting to permit of the survival of a sufficient number of the productive brood stock to insure an undiminished annual crop, are factors within our control and on these depend the future of the California valley quail.

BIBLIOGRAPHY

- Belding, L.
1890. Land birds of the Pacific district. *Occ. Papers Cal. Acad. Sci.*, 2, pp. 1-274.
- Committee on inquiry of grouse disease.
1911. The grouse in health and in disease (Smith, Elder & Co., London), 1, pp. xxiii+512, 59 pls., 31 figs. in text.
- Cooper, J. G.
1870a. Geological survey of California. Ornithology (State Printing Office, Sacramento), 1, pp. xi+592, many figs. in text.
1870b. The fauna of California and its geographical distribution. *Proc. Cal. Acad. Sci.*, 4, pp. 61-81.
- Coues, E.
1874. Birds of the northwest. *U. S. Geol. Surv. Misc. Publ.*, no. 3, pp. 1-791.
- Fisher, A. K.
1893. Birds of the Death Valley expedition. *U. S. Dept. Agric., Div. Biol. Surv., N. A. Fauna*, no. 7, pp. 1-158.
- Forbes, S. A.
1903. On some interactions of organisms. *Bull. Ill. State Lab. Nat. Hist.*, 1, no. 3, pp. 1-18.

- Herrick, F. H.
1911. Natural history of the American lobster. Bull. U. S. Bureau of Fisheries, 29, pp. 149-408, 47 pls., 42 figs. in text.
- Jones, T. R.
1873. Cassell's book of birds (Cassell, Petter & Galpin, London), 3, pp. vi+312, many figs. in text.
- Judd, S. D.
1905. The bobwhite and other quails of the United States in their economic relations. U. S. Dept. Agric., Div. Biol. Surv., Bull. 21, pp. 1-66, 2 pls., 10 figs. in text.
- Mailliard, J.
1902. The parasite question again. Condor, 4, p. 19.
- Morse, G. B.
1907. Quail disease in the United States. U. S. Dept. Agric., Bureau Animal Industry, Circ. 109, pp. 1-11.
- Shinn, C. H.
1890. Shooting in California. Outing, 15, p. 464.
- Shufeldt, R. W.
1910. Quail or no quail? That's the question. Overland, 55, pp. 353-356.
- Thompson, Chas. S.
1901. Further tapeworm observations. Condor, 3, p. 15.
- Van Dyke, T. S.
1886. Southern California (Fords, Howard & Hulburt, New York), pp. xii+233. The Valley Quail, pp. 90-99.
1890. The quails of California. Outing, 15, pp. 460-464.
1908. Liveliest of the birds. Outing, 531, pp. 375-381.
- [Anon.]
1857. California quail—male and female. Hutchings Cal. Mag., 2, pp. 241-242, 2 figs. in text.
1899. Quails: An international question. Living Age, 220, pp. 465-468.

A JOURNEY TO THE STAR LAKE COUNTRY AND OTHER NOTES FROM THE TAHOE REGION

By MILTON S. RAY

WITH THREE PHOTOS

THE spring of 1910 at Lake Tahoe was remarkable for being one of the earliest known to old settlers. At a time when usually grass in the meadows is just springing up and willows and aspens budding out, the meadow grass then (May 20) was already fast becoming dry, the willows and aspens were fully leaved, the roads were dusty and the weather sultry, giving one the impression of late June. Thus, when I encountered young-of-the-year Juncos on the day after my arrival (May 21) I was not greatly surprised; but I soon learned that the earliness of the season had not affected all species equally, and this, with the usual wide variation in Sierran nesting dates, made the effect of the early spring much less marked than it would have been otherwise.

My first day afield resulted in finding some very strange-looking eggs of the Redwing Blackbird (*Agelaius phoeniceus*, subsp?). Instead of the usual blackish scrawls about the larger ends these specimens are mottled, in some cases over the entire surface, with various shades of brown and pale purplish, which I hope to describe and illustrate more fully in some future paper. Among other finds were two nests of the Sierra Junco (*Junco hyemalis thurberi*), each with four fresh eggs. One of the nests was placed beneath a log in a