

RELATIONSHIPS BETWEEN BIRDS AND DEER

By THANE RINEY

The purpose of this paper is to discuss the relationships that exist between birds and the mule deer (*Odocoileus hemionus*). From July, 1947, until January, 1950, I had the good fortune to live with a population of migratory deer in the central Sierra Nevada of California between Yosemite National Park and the Sonora Pass Road. This population, wintering on Jawbone Ridge, is known as the Jawbone herd. Most of the field observations mentioned were made within the yearly range of this group of deer. For critical reading of the manuscript I am indebted to S. B. Benson, A. S. Leopold, and A. H. Miller. The work was conducted under the auspices of Pittman-Robertson Project 28-R.

INFLUENCES OF DEER ON BIRDS

Prey-predator relations.—The Golden Eagle (*Aquila chrysaetos*) is the only bird in the vicinity of the Jawbone population known to prey on deer. One incident should make this relationship clear. Mr. V. Burandt, a trapper, was quail hunting with a companion on the ridge adjacent to the Jawbone study area on November 2, 1948. Both heard a whistling sound and saw an eagle descend in a steep dive to grasp a fawn five to six months old, sinking its talons into the fawn's back. After the trapper fired at it, the eagle released its hold on the fawn and rose circling over the area. In less than 15 minutes they saw it dive again and strike the fawn, knocking it over a cliff. Mr. Burandt fired a second time at the bird which again rose and circled. Inspection of the fawn revealed a freshly broken left hind leg and the two men decided to leave it for the eagle. As they left the area, the eagle was seen again diving toward the spot where they had left the crippled fawn.

Published records of eagles preying on deer are not numerous but serve further to define the character of this relationship. For example, attacks on fawns by eagles have been reported by Boyer (1948), Clawson (1948) and McLean (1925) in California, and by Brown and Couey (MS, 1950) and Couey (1944) in Montana. In a current study of several pairs of nesting Golden Eagles in Santa Clara and Alameda counties, California, Mr. S. Kent Carnie (unpublished data) found that in only one nest out of ten which he examined, did fawn remains constitute a prominent part of the food brought to the nestlings. In this area, Carnie concludes that only occasionally does an eagle learn the trick of catching fawns.

Observations of eagles attacking adult deer have been made in Montana (Brown and Couey, MS, 1950), and in the Teton Mountains near Moose, Wyoming, by Frank and John Craighead (letter dated June 2, 1950). Both Boyer (1948) and the Craigheads have witnessed adult deer standing on their hind feet and striking at attacking eagles.

In the winter of 1948-1949, at least 30 per cent of the Jawbone population was calculated to have died from starvation or from causes related to malnutrition. About half of these dead deer were fawns. Any factor which continues operating to reduce numbers of deer in overpopulated deer range is of long term value to the range as well as to the deer population. The eagle thus performs a small service.

Carrion feeders.—Golden Eagles, Bald Eagles (*Haliaeetus leucocephalus*), and Red-tailed Hawks (*Buteo jamaicensis*) have been observed feeding on deer carcasses on the Jawbone winter range. A Swainson Hawk (*Buteo swainsoni*) was seen leaving the vicinity of a carcass on which it was thought to have been feeding. Turkey Vultures (*Cathartes aura*) have been seen feeding on deer carcasses on the summer range. Deer constitute one of the favorite foods of the California Condor (*Gymnogyps californianus*) but the

carcasses are utilized infrequently, for they commonly occur in canyon bottoms or in brush, sites difficult for condors to reach (Carl Koford, letter, January 11, 1951). According to Koford, deer are rated below squirrels and domestic stock in importance as food items for condors under present conditions. Koford once observed 28 condors feed on a deer carcass; they cleaned it up in about one-half hour, after having been kept from the carcass for several hours by Golden Eagles.

Birds often reach the carcass very soon after the deer dies. For example, on November 14, 1949, a Golden Eagle was seen feeding on an illegally-taken buck which must have been freshly killed, for it was still warm and blood was dripping from a bullet wound in the neck.

Carrion feeding, then, is one way in which certain birds profit by the presence of dead deer.

Deer hair as nest material.—The nest collection of the Museum of Vertebrate Zoology was examined to learn if birds used deer hair as nesting material. The total number of nests examined was 794. Six hundred and twenty-two nests (78 per cent) contained some kind of hair and of these only 13 (2 per cent) contained deer hair. Nests of 46 species contained hair of some kind and 11 of the 46 species used deer hair in some part of the nest, usually the lining. Data on kinds of nests which contained deer hair are shown in table 1.

Table 1
Species Using Deer Hair in Nest Construction

Species	Number nests examined	Number nests with deer hair
Gray Flycatcher (<i>Empidonax griseus</i>)	5	1
Western Flycatcher (<i>Empidonax difficilis</i>)	11	1
Bush-tit (<i>Psaltriparus minimus</i>)	20	1
Hermit Thrush (<i>Hylocichla guttata</i>)	10	2
Swainson Thrush (<i>Hylocichla ustulata</i>)	14	1
Hermit Warbler (<i>Dendroica occidentalis</i>)	1	1
Pileolated Warbler (<i>Wilsonia pusilla</i>)	4	1
Lazuli Bunting (<i>Passerina amoena</i>)	7	1
<i>Junco</i> sp.	21	2
White-crowned Sparrow (<i>Zonotrichia leucophrys</i>)	24	1
Fox Sparrow (<i>Passerella iliaca</i>)	15	1

This collection of nests probably shows a smaller proportional use of deer hair than would be expected in a collection of nests taken exclusively from environments removed from urban influences. This nest sample is weighted to some undetermined extent in favor of nests picked up in the vicinity of towns.

Birds feeding on ectoparasites of deer.—I have seen Scrub Jays (*Aphelocoma coerulescens*) standing, walking, and picking at the backs of deer in Tuolumne County, California. This relationship has been noted by Richard Taber in Lake County, California, and by Raymond Dasmann, in Sequoia National Park. The following observation was extracted from Taber's field notes of January 25, 1950, and is typical. "Jay flies to rump, hops to head, bends over as if pecking or searching. Flies back to rump, then hops to base of neck, searches and thence to head. Stays there, bending over one minute then flies off. All this time the deer has not changed position or even flicked ears."

I have observed jays on bedded does and on standing does and, whenever they have been watched for any length of time, they have been seen to pick at the back of the deer as if for ectoparasites.

Yellow-billed Magpies (*Pica nuttallii*) have, on several occasions, been seen walking on bedded or standing deer and picking at the backs of the deer. Deer have remained undisturbed during these observations and apparently tolerate this behavior of magpies as they do the actions of the jays. Mr. Robert Lassen reports similar relations existing between Black-billed Magpies (*Pica pica*) and mule deer near Doyle, in Lassen County, California.

Deer as temporary resting sites.—Mr. Raymond Dasmann observed a Scrub Jay perched, in a sleeping position, on a doe's back in Sequoia National Park on January 27, 1950 (oral communication).

I observed a Black Phoebe (*Sayornis nigricans*) rest momentarily on the back of a bedded doe, fly out and up in a short flight after an insect, then perch on a nearby oak branch.

These two observations serve further to emphasize the mutual toleration of birds and deer. Such occurrences are probably common and are doubtless observed far more often than they are recorded.

COMPETITION FOR FOOD BETWEEN BIRDS AND DEER

Deer are so highly adaptable in their food habits that, in my opinion, competition with birds in the Jawbone area is unimportant, for, while preferences may overlap, the conflict is usually so slight that neither birds nor deer suffers from lack of food by the presence of the other. However slight and insignificant such competition eventually proves to be, it does exist and may be more important in other areas.

Mexican Bluebirds (*Sialia mexicana*) and mule deer have been seen eating the berries of the hairy mistletoe (*Phoradendron villosum*) on the Jawbone winter range. The eating of mistletoe by deer, however, is largely confined to cleaning up bits that drop to the ground from storm-blown trees, except in favorable circumstances where they can reach low growing plants from the ground. The bluebirds concentrate mainly on the berries, whereas deer eat all but the hardest woody parts.

In summer and fall deer sometimes compete with jays, magpies, Band-tailed Pigeons (*Columba fasciata*), Acorn Woodpeckers (*Balanosphyra formicivora*) and Gray Squirrels (*Sciurus griseus*) for acorns. On one occasion a doe was seen to lower its head and walk rapidly toward a Scrub Jay, chasing it from beneath a California black oak (*Quercus kelloggii*) into the under branches of a neighboring oak. When first seen, both animals were feeding on acorns under the same tree.

Marked year to year variations in abundance of acorns will doubtless modify the character and importance of competition for acorns between birds and deer.

Influences of birds on deer disturbances.—All the senses of deer, with the possible exception of taste, are important in keeping them in touch with other animals in their surroundings and in warning them of environmental disturbances. My observations are restricted in this paper to those involving the sense of hearing. It should be recognized that the other senses of deer play important and often parallel roles.

Deer react to two main types of environmental disturbance involving birds: bird sounds which indicate a sudden change in the birds' activities and zones of silence in disturbed areas. Sounds such as the whirr of quail or grouse wings, the vigorous scolding of jays or the excited and erratic "thup" notes of the Oregon Junco (*Junco oreganus*) elicit alarm reactions in deer. Equally important in warning deer are the absences of bird sounds, or zones of silence that often surround intruders as they penetrate a previously undisturbed environment. Silence results because the alarmed birds seek shelter and become inactive.

Reactions of deer to disturbance vary from mild curiosity to headlong flight and

vary among individuals, being different for the sexes, for various age groups and at different seasons. As a general rule, the more sudden and greater the disturbance, the quicker and stronger the reaction. But if a deer or group of deer has already been alerted by some disturbance, then the slightest sound or movement is apt to cause flight.

I have on several occasions tested a deer's hearing. In one instance, a doe had been watched for several minutes and was completely undisturbed. I was concealed with another observer 50 yards down wind from her and inside the edge of a fir thicket. One finger nail was clicked against another. Instantly the deer alerted. I waited until she resumed grazing and clicked again, and again her head snapped up in an alert position. Clicking was continued at intervals for about 10 minutes until the doe finally became so agitated she circled around us, picked up our scent about 50 yards down wind, and then bounded off.

Frequency of bird-deer contacts.—In the past four years, I have observed more than one hundred incidents in which a bird by reacting normally to some disturbance with an alarm note or a sudden flight was incidentally responsible for either alerting the deer or causing it to leave the disturbed area. It is natural that in observations of this type most of the incidents encountered are incompletely understood. But it seems apparent that bird-deer contacts frequently occur as a normal part of a deer's life. It follows that birds, as part of a deer's organic environment, are extremely important in keeping deer in touch with local disturbances. In the Jawbone study area, I have observed coyotes, bears, bobcats and man alarm birds which in turn alerted deer to the disturbing influence. In most of the instances observed, the deer eventually became aware of the predator involved. However, many incidents of birds alerting deer were seen where the cause of the disturbance remained unknown.

Man. Examples of man-caused disturbances are commonplace to hunters and naturalists; therefore only one example is cited here. In September, 1949, a Steller Jay (*Cyanocitta stelleri*), disturbed by a member of the deer study crew, called loudly, causing a doe and fawn to cease feeding in a meadow and to trot out of sight into pine cover. This incident was observed and recorded by another member of the deer study crew, from a distance of several hundred yards. During the hunting season it was common to make several observations of this type each day.

Coyote. In the winter of 1948, Spotted Towhees (*Pipilo maculatus*) were seen flushing about 30 feet ahead of a coyote (*Canis latrans*) and flying to the tops of nearby manzanita bushes. I followed the progress of the coyote by watching the birds. A wave of disturbance accompanied the coyote in this instance, followed by a zone of silence, the result of the birds' remaining quiet in the shrubs. In this case, it was ten minutes before the birds resumed their normal activities.

In the summer of 1949, on the Jawbone herd summer range, a doe was alerted by a sudden call of a Red-shafted Flicker (*Colaptes cafer*) followed by several alarm notes of the Robin (*Turdus migratorius*). In less than a minute, I saw a coyote trot out of the timber from which the birds had called and continue along a trail across a clearing. The doe stood without moving near the crest of a small ridge which was between her and the coyote. As she watched the predator, only a portion of her head was visible, for she was almost hidden from the coyote by a large boulder on the ridge. As the coyote passed the deer and moved down trail the doe followed along the ridge, keeping the coyote in sight for at least another 100 yards before both animals were lost to my sight. Although the coyote was apparently not interested in this deer, nevertheless, a Red-shafted Flicker and at least two Robins clearly alerted the doe to the presence of the coyote.

Bear. Although many encounters have been seen between bears (*Ursus americanus*)

and deer and several incidents of birds warning bears of the approach of humans have been recorded, I have only one recorded incident involving birds, bears and deer. This incident took place on June 24, 1949, at 5:50 a.m., on a hillside that at that time had been under continuous observation (by two shifts of observers) for two days and two nights. This area had in no way been altered by human activity.

For over 45 minutes a bear was active foraging across the observation area. During this period we kept track of its progress by noting the actions of the Steller Jays and deer. Does would trot out of the aspen patch in which the bear was moving and stand facing the aspens snorting and stamping their front feet, behavior any mule deer is apt to exhibit while in a state of excitement. The deer could easily hear the bear as it moved through the aspen patch with its understory of broken twigs, and the calling of the jays from distances of from 25 to 50 yards of the bear only added to the general disturbance on the whole hillside. Alarm notes of Robins, Red-shafted Flickers, and the scolding of Steller Jays were heard for another five or ten minutes after the bear had left our study area and after the immediate hillside had returned to a relatively undisturbed state.

If learning plays a role in this bird-deer relation, such incidents probably provide a strong conditioning stimulus for deer.

Bobcat. The normal reaction of adult does to bobcats (*Lynx rufus*) is to chase them. For example, on Jawbone ridge, in the spring of 1949, a doe was alerted by the calling of Steller Jays. Looking quickly in the direction of the jay calls, she located a large bobcat walking slowly across a hillside clearing about 100 yards distant. The doe then turned and trotted stiff-legged toward the bobcat and, as the cat found itself detected and started running, the doe increased her speed and chased the bobcat out of the clearing, a distance of another hundred yards. I have seen variations of this same reaction over a dozen times both in the Jawbone area and in the coast ranges of California.

Although these incidents have been observed at all seasons of the year, the urge to chase cats seems particularly strong during the period when the fawns are young. In the Jawbone area this coincides with the nesting and fledging seasons of birds.

Bird sounds responsible for return to normal behavior.—Familiar to most naturalists are the sudden hushes that spread around us when we exceed even by a slight margin a certain permissible carelessness as we walk into an area. Similar responses are often started by animals other than man. For example, in November, 1947, a Scrub Jay calling loudly in response to an unknown disturbance caused about 20 migrating Hermit Thrushes (*Hylocichla guttata*) in the vicinity of a watering hole to quiet down for 20 minutes. In December, 1948, Spotted Towhees and Fox Sparrows (*Passerella iliaca*) were observed leaving the ground and "freezing" in the upper parts of a manzanita thicket as a coyote trotted along a trail through the manzanita. The duration of such silences can sometimes be shortened by imitating some appropriate bird note. Often this imitation does not have to be accurate to be effective.

I have frequently observed some normal bird behavior provide the stimulus that permitted a deer to abandon an alert attitude and resume its undisturbed activity. For example, in December, 1949, an adult doe accompanied by a fawn was grazing in the center of a small clearing. The attention of the doe was directed suddenly toward one edge of the clearing. She held her head high, with ears pointed forward and took two or three hesitant steps forward. At this time six Oregon Juncos left a manzanita at the clearing's edge, flew about ten feet into the clearing toward the doe and started feeding. Almost as soon as the juncos reached the ground, the doe flicked her ears, partly turned, scratched behind one ear with her hind foot, and resumed feeding.

This type of observation seems to be a good example of a return to normal behavior by deer stimulated by normal bird behavior. However, on some occasions, such examples

are not complete enough to make one certain that birds are the key stimulus for the deer's return to an undisturbed condition.

The best evidence I have in this connection is the fact that, under certain conditions, I have been able to induce deer to resume their normal behavior by imitating bird calls. This is especially effective when deer have been alerted by some sudden sound or movement and have stopped in an alert position, uncertain whether to take flight or to resume undisturbed activity.

An interesting example of this took place in the course of the 1948 fall migration of deer about three miles above the upper limits of the winter range. I had disturbed a small group of deer and in working slowly up one of the main migration trails re-located two of them, a fawn and yearling, standing inside the edge of a fir thicket and about 50 feet up trail from me. I was fully exposed and the deer were in plain sight of me but were facing in another direction. At my first imitation of a sparrow note the deer turned, stepped into the trail and continued walking to within about two feet of me before the fawn, which led, suddenly noticed me and both deer bounded off out of my sight.

In the spring of 1950, on the Jawbone winter range, I demonstrated this aspect of deer behavior to Mr. Archie Mossman. We stalked to within 75 yards of a group of 18 deer without their being aware of our presence. My plan was to alert them deliberately to induce them to return to undisturbed behavior by imitating the song of the Western Meadowlark (*Sturnella neglecta*), a bird absent from the ridge during the winter and which had returned to this clearing only during the previous week. The following quotations are taken from Mossman's field notes for April 16:

"About one half hour after the sun must have reached into a small gully, we moved into the area, without disturbing the numerous deer that were grazing and bedded there. In order to test the effect of familiar bird notes . . . on alerted deer, I watched with 8×24 glasses a deer lying down and several others grazing, all in the field of view at the same time. The bedded deer was close enough so I could see it chewing its cud . . . Riney then slowly whistled Yankee Doodle to disturb the deer. The grazing deer immediately raised their heads and looked at us, and the lying deer looked, lowered its neck and head about eight inches, stopped chewing its cud and looked about ready to jump to its feet. Then Riney gave the song of the Western Meadowlark, and within 5 to 10 seconds, the other deer were grazing again, the ears of the bedded deer were directed away from us, and it turned its head and started chewing its cud again. Similar experiments [gave] . . . the same results. I'm pretty well convinced of the reliance of deer on bird noises, song in this case, for information about danger."

For certain aspects of our deer work when we were concentrating on observing deer in an undisturbed condition, this trick of imitating normal bird notes was often useful in shortening the time we had to wait for the environment to return to an undisturbed condition after we had disturbed some part of it by entering

Is the reaction of deer to sudden changes in normal bird sounds a learned one or is it inherited? I do not know. Because small fawns react in the same manner as adults to bird disturbance, one might be tempted to favor the notion that this type of community reaction is an inherited thing built up from long association with similar past species associations. On the other hand, because of observations such as the bear-bird-deer incident described earlier, it seems probable that learning enters into the picture to at least some extent. Before conclusions can be reached, more work needs to be done along these lines and should include the testing of experimental animals under conditions more accurately understood than those which obtain in the field.

Movements due to accidental disturbance by birds.—Many movements of deer are due to sudden disturbances by birds and are made incidentally to the normal bird activities, without the apparent presence of predators. Four examples are cited to illustrate the variable character of this accidental relation.

At 5:30 a.m., in September on the summer range, a spike buck was walking slowly up hill, feeding, apparently alone. As it passed under a large aspen a female Cooper Hawk (*Accipiter cooperii*) suddenly flew from a branch 10 feet above the buck, struck a few aspen leaves with its wings as it left, and startled the deer so that it immediately jumped ahead and bounded about three times before reaching the edge of the clearing where it disappeared.

In October, 1948, 50 Band-tailed Pigeons left a black oak and neighboring white fir (*Abies concolor*) on which they had been perched and, in leaving, startled at least two deer which bounded away for a distance of about 25 yards before I lost track of them.

On several occasions, I have observed short deer movements caused by a sudden nearby flight of Mountain Quail (*Oreortyx picta*).

The sudden whirring sound made by the wings of a flock of about 50 Robins startled 20 deer which ran about 50 yards and out of the sight of Bernice Riney, who was observing from a tree-top on the Jawbone winter range in November, 1949.

By means of an elaborate three-year live-trapping and tagging program, it was learned that the winter home range of an individual deer of the Jawbone herd was extremely small. The radius of activity for does and fawns measured about 200 yards; bucks had a radius of about 500 yards (Leopold, Riney, McCain, Tevis, 1951). In this area the fact that the home ranges are restricted, and, further, that the food on these ranges is critical in moderate to severe winters, makes an even distribution of deer in available feeding areas an important consideration for the welfare of the deer. Birds, through the cumulative effect of these accidental disturbances as well as the predator stimulated disturbances, are useful in instigating a measure of movement of the deer within their home ranges. If this results in even a little better distribution of deer feeding activities it is advantageous to the deer population.

DISCUSSION AND SUMMARY

Bird activities are in various ways influenced by deer especially in the early summer, fall and winter. Eagles occasionally learn to prey on fawns and have been known to attack adult deer. Vultures and hawks commonly feed on road-killed deer and on those crippled in the hunting season. In the Sierra Nevada, winter is the time of year that the greatest number of deaths normally occurs in the deer population. Hawks and eagles are quick to take advantage of many of the carcasses.

In the spring and summer, birds of several species use the hair of deer as nesting material.

Birds have been seen picking at the backs of deer apparently for ectoparasites. They also perch on the backs of deer and forage out after insects in the vicinity of the deer.

These observations show that the presence of deer, dead or alive, is of a beneficial nature to many birds.

Birds have been observed alerting deer to the presence of man, coyotes, bears and bobcats. On the Jawbone ridge area of the Sierra Nevada two seasons assume special significance, first, the fawning season of the early summer months, and second, the fall hunting season.

Bird sounds are often responsible for a deer returning from a disturbed to an undisturbed state. This relationship involves a recognition by the deer of zones of silence due to sudden disturbance, and the further recognition of the resumption of sounds associated with undisturbed bird activities. Understanding of this relationship was considerably facilitated by imitating bird notes which, under the proper conditions, were successful in inducing deer to abandon attitudes of alertness.

Accidental disturbances of deer by birds are believed to contribute to the daily dis-

tribution of mule deer within their individual home ranges, and to be a factor operating in combination with the influence of predators in helping toward a wider utilization of deer forage within a given individual deer's winter range.

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