

## THE MORMON CRICKET AS FOOD FOR BIRDS

By IRA LA RIVERS

The list of birds which eat the Mormon cricket (*Anabrus simplex*) is sizable and these species constitute a potent natural control of the insect. The cricket, actually a long-horned grasshopper, yearly causes damage in Elko, Eureka, Lander, and Humboldt counties, Nevada, by destroying large quantities of range and field forage, crops, and garden stuffs. Parts of these northern Nevada counties, particularly northern Elko County, rival the best rangeland in the West.

Mormon crickets were first destructively active among the early settlers of the Utah of 1848, and have since been reported in several adjoining states. The Nevada records of these insects date back to 1878, when a band migrated through the mining town of Tuscarora, Elko County. Since then, there have been periodic invasions, the present one not attaining any importance until 1932. While working on the control program in northern Nevada during the summer of 1939, I made the following observations on bird-cricket relationships.

*Cathartes aura teter*. Turkey Vulture. It was with considerable surprise that I came upon an individual of this species working a cricket in its cavernous bill near Whiterock. I had seen the bird from a distance in the tall sagebrush (*Artemisia tridentata*), and had worked my way up a short intervening gully expecting to find one of the larger buteos feeding on a small cricket band. The vulture was facing in the opposite direction a few yards away as I edged over the rim of the gulch, and seemed to be munching the insect in its bill. I am not sure whether the bird was actually feeding on it, or merely satisfying some innate curiosity. I startled it into flight the next instant, and the cricket was dropped.

*Accipiter velox velox*. Sharp-shinned Hawk. During a cold, blustery two weeks in the Diamond A country of northern Elko County, I saw what was patently the same individual of this species attacking crickets on four occasions. Twice the insects were abandoned as the bird scooted away, but in the other two instances, the bird flew away with its prize. During this cold spell, when temperatures hovered between 6°C. and 9°C. at noon, and dropped below freezing at night, crickets were to be found out over some parts of the area in all but the coldest periods. It may have been that the unseasonable weather made the normal food of the hawk scarce, and crickets became a necessity.

*Buteo borealis calurus*. Western Red-tailed Hawk. This hawk, the commonest of the large buteos, fed almost exclusively on Mormon crickets, especially in the regions of heaviest infestation, where insect bands sometimes spread as marching armies over several square miles. It was no uncommon sight to see a Red-tail standing sentinel-like in the brush where it had been feeding on crickets. Many small bands of crickets were first discovered because of the bird's conspicuousness among the medium-sized bushes. The species proved to be quite tame, as a general rule, for it is seldom persecuted here, and often allows a close approach before flying off. From a vantage point, after a feeding hawk had been located, it was easy to get close enough to see it walking about on the ground and picking up crickets at leisure.

*Buteo swainsoni*. Swainson Hawk. These birds, although less common than the foregoing, had, nevertheless, much the same habits where crickets were concerned. The species, which normally spends more time walking about on the ground than does the Red-tail, possessed one exceptional individual. While making a cricket survey at the headwaters of California Creek, east of Mountain City, I noticed this hawk behaving rather oddly. From a perch among large, granitic boulders it descended periodically to the ground below, dropping heavily and checking its fall with outspread wings, grasped a cricket and returned to the perch with it. It was then torn in two and eaten. The main band of crickets was passing several hundred yards from the hawk, but stragglers were streaming by the rocks abundantly enough to provide a meal.

*Buteo lagopus s. johannis*. American Rough-leg. Uncommon but fond of crickets. An amusing incident occurred while I was watching an individual consuming crickets in the brush. Driving up directly opposite the bird, some fifty yards away, I stopped to watch it. Distrustfully, the hawk returned my scrutiny, and refused to eat any more of the insects. The migrating crickets had been leaping erratically away from the hawk whenever it moved. They became quiet and again moved in an orderly stream. The motionless hawk was no longer regarded as an enemy. Through glasses,

crickets could be seen passing over the bird's claws, and soon one began to investigate the bird. This one was followed by another, and a third. Two began to climb up the hawk's tarsi. A moment later, the hawk cocked its head down at them, then pecked at his legs. This was followed by the shaking of one leg, a short skip and hop, and then the low, labored flight off over the brush.

*Aquila chrysaetos canadensis*. Golden Eagle. I have never seen these common birds actually feeding on Mormon crickets, but inhabitants of the area told me that the eagle eats the insects occasionally.

*Circus hudsonius*. Marsh Hawk. A large female was eating Mormon crickets in a newly-mown field beside the Owyhee River, several miles south of Mountain City. A band of the insects had clustered in great numbers on the long, overhanging giant wild rye (*Elymus condensatus*) which grew thickly along the irrigating ditches, and the bird was catching them in the shorter grass bordering the ditch.

*Falco columbarius bendirei*. Western Pigeon Hawk. This bird, although not common, was a persistent devotee of the cricket, and failed to equal the record set by the Sparrow Hawk only because the latter far outnumbered it. The species was occasionally seen on telephone poles and fences, sometimes in company with the Sparrow Hawk, from which vantage points individuals darted down to seize crickets passing below. These they usually carried back to their perches, but occasionally ate them on the ground. On one occasion I saw a belligerent Pigeon Hawk attempt to contest possession of a cricket with a smaller Sparrow Hawk but without success.

*Falco sparverius sparverius*. Sparrow Hawk. This species, by far the commonest hawk in northern Nevada, is found in nearly every situation. Normally more insectivorous than the Pigeon Hawk, the Sparrow Hawk seemed to live exclusively on Mormon crickets where the insects swarmed. How it fared on such a diet, I do not know, but probably it never suffers the digestive disturbances which affect turkeys fed too extensively on the insects (and which probably bother the large *buteos* as well), since the falcon eats, in common with all smaller birds, only the softer body contents, and discards the hard body-shell.

An interesting incident occurred while I was surveying wasp-cricket relationships on a sagebrush ridge south of Mountain City. Several species of birds, prominent among which was the Brewer Blackbird, were seen feeding on crickets throughout the length of the ridge. A small group was working just beyond me, screened largely by a high, but straggling, stand of *Purshia tridentata*. At the sound of a commotion I looked up in time to see a Brewer shoot rapidly from between two sage bushes and fly erratically toward me with a Sparrow Hawk in close pursuit. As the blackbird darted over the tall bush which had hidden me, it saw me and veered sharply upward, dropping something from its claws. The falcon, right behind, dove for the falling object, but veered away also when it caught sight of me. The birds disappeared in different directions. The object proved to be a mutilated female cricket upon which the blackbird evidently had been feeding when startled by the falcon. From the hawk's actions, I judged the cricket had been the booty sought, but I know of one instance where a Sparrow Hawk attacked and killed a nesting blackbird which had attempted to harry the predator; but in that instance, too, my presence disrupted the tableau, and the bird flew away.

*Pedioecetes phasianellus columbianus*. Columbian Sharp-tailed Grouse. I have seen this species but once in northern Nevada. Cowan (U. S. Dept. Agr., Tech. Bull. No. 161, 1929:1-28) lists it as a cricket feeder.

*Centrocercus urophasianus*. Sage Hen. This common Nevada grouse feeds quite extensively on crickets, and groups often collect at favorable spots to feed. It is difficult to watch satisfactorily the feeding of this species which is unlike the bolder predatory hawks. The Sage Hens manage to keep well-hidden even in a minimum of brush, and become aware of an interloper long before he has located them. However, two dead birds were found with gizzards stuffed to capacity with cricket remains, and I also was able to follow a flock over rather sparsely-covered land, and to see them, with the aid of binoculars, feeding on the insects.

*Phasianus colchicus torquatus*. Ring-necked Pheasant. I have seen these birds, now common in the vicinity of Reno, eat grasshoppers. Pheasants have been reported as eating the Mormon cricket in Long Valley, 20 miles northwest of Reno.

*Bubo virginianus occidentalis*. Montana Horned Owl. I found pellets containing cricket remains beneath an occupied nest near Jarbidge.

*Speotyto cunicularia hypugaea*. Western Burrowing Owl. Does not, in my experience, feed extensively on the cricket, but on two occasions I caught one in the act of dismembering a cricket and several times found cricket remains about inhabited burrows.

*Colaptes cafer collaris*. Red-shafted Flicker. I know of one instance of this ground-loving woodpecker eating a Mormon cricket. The bird was accompanying a large flock of feeding Brewer Blackbirds, and the cricket may have first been opened and abandoned by a blackbird.

*Asyndesmus lewis*. Lewis Woodpecker. During the summer of 1939, when most of these observations of cricket-eating birds were made, this species was particularly abundant in northern Nevada. It seemed to have difficulty in obtaining food and invaded orchards where, in many instances, the apple crop was spoiled because the birds ate holes in the fruit. This seemed not to be an attempt to obtain codling moth larvae, but merely to taste the fruit, for a bird seldom ate a very large part of one apple before flying on to another. Scarcity of food may account for the two woodpeckers I saw feeding on the crickets, one, strangely enough, sampling the still living contents of a tin trap which contained thousands of the insects.

*Tyrannus verticalis*. Arkansas Kingbird. This common bird was several times seen flying to the ground from a fence or telephone pole to pounce upon a cricket. Customarily, the bird then returned to its perch with the victim and dismembered it much after the manner of the Brewer Blackbird.

*Empidonax difficilis difficilis*. Western Flycatcher. An *Empidonax*, apparently of this species, was the source of an amusing episode south of Mountain City. I watched a bout between the small bird and a large, female cricket, in which neither contestant could claim the honors. I heard a few brisk, shrill notes in a small clearing off to my left and as I turned to see what was up, I saw plainly that the hitherto steady, uninterrupted stream of migrating crickets had been disturbed. Frightened insects were leaping erratically in all directions away from the source of the disturbance. Moving to bring the clearing into fuller view, I was surprised to see the bird clutching a large, blackish female cricket by the hard thoracic shield and trying in vain to subdue the intended victim, meanwhile balancing precariously on the free foot. But the cricket kept jumping and hopping, her long and powerful hind legs again and again upsetting the determined bird which each time managed to struggle to its feet and hop upright for a moment before being tumbled about again. It was obvious that the bird was no match for the cricket, not only because of the attacker's lightness, but because the flycatcher was holding the insect by a thickly-armored segment and could do it no possible harm. The climax came soon. Once more the cricket threw the bird off balance, then grasped the bird's free leg with her forelegs, probably merely as support. However, this ended the matter, and the bird loosed its hold and darted off through the brush, while the cricket leaped frantically for cover. The insect possesses powerful jaws and these seemed to have been in a position to persuade the bird that the situation had gotten out of hand.

*Otocoris alpestris*. Horned Lark. Larks were everywhere assiduous feeders on the crickets, and were adept at incapacitating and eviscerating the large insects. These birds generally pulled the head off the insect and fed entirely upon the digestive and reproductive tracts which came with it.

*Pica pica hudsonia*. American Magpie. This avid consumer of the insects, more than any other bird, seemed to prefer the contents of tin traps. These traps catch crickets by the thousands, and these become, in a few hours, a nauseating decomposing mass. The first crickets to enter the trap are smothered by the hundreds pouring in on top of them and the boiling sun shortly kills the remainder. Fly larvae may be found in the bottom layers of crickets on the following day. It is from such rank and fetid traps that I have seen many magpies placidly feeding. Magpies of course pick up crickets wherever and whenever encountered, but probably prefer to get them from the traps because of the convenience.

*Corvus brachyrhynchos hesperis*. Western Crow. Not common in northern Nevada. This species fed readily on Mormon crickets, once in company with magpies, another time close to a foraging Red-tail.

*Cyanocephalus cyanocephalus*. Piñon Jay. These birds, characteristic inhabitants of the juniper-piñon belt throughout Nevada, commonly eat crickets.

*Oreoscoptes montanus*. Sage Thrasher. This is one of the three species which fed most destructively on the insects. Eggs as well as adults were consumed. From my observations, the thrasher played nearly as important a role in the destruction of cricket egg-beds as did the more conspicuous Western Meadowlark, but, because of its relative shyness, drab plumage, and general inconspicuousness, such work was not as readily appreciated as that of the meadowlark or as that of the destruction of adults accomplished by the noisy, bluff Brewer Blackbird. South of Mountain City, where the most intensive observations were carried on, I found the Sage Thrasher feeding not only on the migrating crickets, in company with grasshopper mice (*Onychomys leucogaster brevicaudus*) and shrews (*Sorex vagrans amoenus*), but also digging up crickets from partly-finished wasp burrows. One individual was surprised in the act of eating a black wasp (*Chlorion laeviventris*) which had been left by a marauding shrew.

*Turdus migratorius propinquus*. Western Robin. These birds often congregate in small flocks to feed persistently upon the Mormon cricket.

*Anthus spinoletta rubescens*. American Pipit. I know of one instance in which this species ate a cricket. In the Bull Run Mountains, southwest of Mountain City, I came upon a pipit just finishing

a female cricket. The insect had been opened along the dorsum, and the contents, including eggs, were missing. Apparently most of the smaller birds confine their attacks to the females (see account of Brewer Blackbird).

*Lanius ludovicianus nevadensis*. Nevada Loggerhead Shrike. This bird was an avid consumer of the Mormon cricket, and perhaps one of the best controls of the adult pest. Willow thickets in regions of heavy infestation were used as storehouses for the excess catch, and the dried and shriveled remains of crickets impaled on stiff twigs and forgotten was visual record of the bird's assiduous labor. Barbed-wire fences were used in other sections of the area.

*Passer domesticus*. House Sparrow. These small, hardy settlers probably never attack full-grown crickets, at least, not in my experience, but on one occasion I noted a small flock of them feeding on half-grown crickets, members of a band passing the outskirts of Elko.

*Sturnella neglecta*. Western Meadowlark. This species is by far the ablest avian predator of the Mormon cricket, for it specializes upon the eggs of the pest. Meadowlarks have been reported at various times as destroying entire, vast cricket egg-beds, and I have, on many occasions, seen them hard at work in such egg-beds, digging industriously for the palatable eggs, which are generally laid in clusters of from a few to over fifty. When it is appreciated that such egg-beds may be several square miles in extent, and that, in the first few years, at least, of the cricket swarms, insect egg parasitism is practically of no importance in holding the cricket in check, this wholesale destruction of the eggs becomes increasingly important in any human scheme to control the insect.

Because each egg will develop, normally, into a cricket, and because a bird can consume up to two hundred eggs at a time, but only, at the most, 8 or 10 adults, egg predators are generally more efficient against a species than animals which eat only adults. Western Meadowlarks are seen occasionally with adult crickets in their bills, and at certain times they appear to feed extensively on the adults, but this is not the general rule.

*Xanthocephalus xanthocephalus*. Yellow-headed Blackbird. This bird, known locally as "White-wing," is anomalous. I saw but one individual of this species, and it was feeding on a Mormon cricket. The incident occurred along the highway several miles south of Mountain City, a short distance from the Owyhee River. A band of crickets had been severely dusted at the northern edge of a field which they had been about to enter and had been brought up short at a marginal ditch into which oil was running as a secondary line of defense. Poisoned crickets lay thickly on the ground along the ditch, most of them killed by direct contact with the insecticidal dust, the remaining ones secondarily killed by eating the carcasses of their more strongly-poisoned fellows. Along this ditch bank, which harbored thick willow clumps on the opposite side, I came upon the solitary "White-wing" early the following morning, feeding on a cricket. The bird flew off as I came up, and, upon inspection, the insect appeared to have been dead for some time. It was not yet stiff, but was no longer limp. The head had been pulled off, and some of the body contents eaten. I adjudged the insect to have been one of those secondarily poisoned from eating other poisoned crickets, and, since I failed to see the bird again, have wondered about the effect the small amount of arsenic might have had.

*Agelaius phoeniceus nevadensis*. Nevada Red-wing. Although these birds were seen occasionally on the more marshy, moist bottomlands, such habitats were not widely distributed in the area. Consequently the Red-wing was not common. I have but one record of its attacking a cricket. In this instance the insect was handled in the same way as by the Brewer Blackbird.

*Euphagus cyanocephalus*. Brewer Blackbird. This bird, in company with the Sage Thrasher and Western Meadowlark, is one of the destructive "Big Three" of the northern Nevada cricket fields. It has been known to destroy entire bands of adult crickets, but has never been reported as working on the egg-beds. It can safely be said that each of these three species of birds is responsible for more destruction of the Mormon cricket than all the other species together.

The Brewer's assault upon the cricket is confined entirely to the females, which the birds covet for their eggs. These they take by splitting the dorsum of the abdomen transversely along the soft membranous tissue between the sclerites, a feat accomplished by grasping one end of the body in the bill, the other in a claw, and tugging; some go to less trouble and merely tear the head off, pulling with it the entire abdominal, and much of the thoracic, contents, which are all consumed. An unexplained habit of these birds is their snipping off of the female cricket's ovipositor, something they quite frequently do.

However, while blackbirds feed extensively on the crickets in lean areas, they may almost ignore them adjacent to fields where they can obtain abundant seed. In one region south of Whiterock I observed a band of approximately 200 blackbirds working on a hillside which bore a cricket population of five per square foot. After an hour's observation I investigated their work and found, at the spot, only one attacked cricket to the square yard. Females constituted fifty per cent of the cricket population, and, on this basis, the kill ratio amounted to 1 out of 22.5, a very low figure.

Jan., 1941

CRICKETS AS FOOD FOR BIRDS

UNIVERSITY OF IDAHO  
BOISE, IDAHO 69

*Molothrus ater artemisiae*. Nevada Cowbird. I did not find this species commonly in northern Nevada, but occasionally it mingled with the ubiquitous Brewer Blackbird, feeding upon the crickets.

*Carpodacus mexicanus*. House Finch. At Primeaux I found a nesting bird bringing quarter-grown Mormon crickets to her nestlings.

*Oberholseria chlorura*. Green-tailed Towhee. *Pipilo maculatus curtatus*. Nevada Towhee. These two species of towhees were found feeding on the small, third-instar crickets in the Bull Run Mountains, southwest of Mountain City.

*Chondestes grammacus strigatus*. Western Lark Sparrow. This bird was found in the higher foothills of the Jarbidge, Bull Run, and Jack Creek ranges, and, like the two preceding species, was seen to feed only on the small, immature crickets.

*Passerella iliaca schistacea*. Slate-colored Fox Sparrow. A high montane species, which I observed once feeding on immature crickets only a few days old.

*Zoological Laboratories, University of Nevada, Reno, Nevada, October 5, 1940.*