

SNAKES VERSUS BIRDS; BIRDS VERSUS SNAKES

BY J. E. GUTHRIE

“But when I found myself on the ground, I speedily untied the knot, and had scarcely done so, when the roc, having taken up a serpent of a monstrous length in her bill, flew away. I could not view without terror a great number of serpents, so monstrous that the least of them was capable of swallowing an elephant. They retired in the daytime to their dens, where they hid themselves from the roc, their enemy, and came out only in the night.” From *The Second Voyage of Sindbad*, “*Arabian Nights*”. Ingersoll (65, p. 200).

“Between the eagle and the dragon there is constant enmity, the eagle seeking to kill it, and the dragon breaks all the eagles’ eggs it can find; and hearing the noise of the eagle in the air, speedeth to its den, and there hides himself.” *Cruden’s Concordance*, 1737 (p. 152).

“By them there sat the loving pellican
Whose young ones poisoned by the serpent’s sting,
With her own blood again to life doth bring.”

Noah’s Flood. Michael Drayton in “*Birds in Legend, Fable and Folklore*” (65, p. 59).

Quoting further from Ingersoll (65, p. 24): “Whatever tradition or superstition or other motive affected the choice of a bird as a tribal totem, or endowed it with sacredness, practical considerations were surely influential. It is noticeable that the venerated ibis and hawk in Egypt were useful to the people as devourers of vermin—young crocodiles, poisonous snakes, grain-eating mice, and so forth. A tradition in the Aegean island Tenos is that Poseidon, a Greek St. Patrick, sent storks to clear the island of snakes, which originally were numerous there. Australian frontiersmen preserve the big kingfisher dubbed laughing-jackass for the same good reason.”

Ingersoll (65, p. 39) recounts how “the Aztecs moved into the valley of Mexico and settled upon certain islets in a marshy lake—the site of the subsequent City of Mexico; and this safe site is said to have been pointed out to them by a sign from their gods—an eagle perched upon a prickly-pear cactus, the nopal, in the act of strangling a serpent. Cortez engraved it upon his Great Seal, and Mexico has kept it to this day.”

Someone has said: “A bird is but a glorified reptile”, and the Mayas of Yucatan guarded their great temple with stone statues of feather-decked rattlesnakes representing their deity Huitzilopochtli or Kukulcan—surely a glorified reptile!

Naturally, the main relation between birds and snakes is a food-relation. Snakes are meat and birds are meat. Snakes are carnivorous and so are many birds, very few birds being entirely vegetarian. Some snakes eat eggs and so do some birds. Some snakes and some birds compete among themselves and with each other for items in the same food supply. If the heron spears the frog, the water snake goes hungry; if the bull snake seizes the mouse, the hawk dines elsewhere. The garter snake dozes away the morning, digesting his supper of earthworms while the early bird hunts just that much harder for a cropful. Mrs. Mary L. Bailey (6, p. 221) even witnessed a spirited battle between an American Bittern and a snake, judged to be a garter snake, for the possession of a frog which both had seized. The bird got the lunch. And we may go even deeper; for the mouse that would have eaten the weed seeds is the prey of a milk snake, and the Song Sparrow converts those very seeds into songs. It might make life interesting to a cricket to speculate whether a young blue racer will seize him, or whether he will be stuffed down the hunger-well of a nestling meadowlark. Moreover, sometimes the scaly and the feathery beings have common enemies. A garter snake, a chickadee, a mouse and a grasshopper might easily find themselves close neighbors—centrally located in a henhawk.

Before going more specifically into these food relations, let us look at a touching instance of devotion, in which the serpent even gives the coat off his back for the comfort of the others' bairns. It is *Myriarchus crinitus boreus*, of course, that "Wild Irishman of the fly-catchers" as the Sage of Slabsides called the Northern Crested Flycatcher, who is the best known "ol'-clo'es man"—he and some cousins of his. Alexander Wilson (120, Vol. 2, p. 134) says: "Snake skins with this bird appear to be an indispensable article, for I have never yet found one of his nests without this material forming a part of it. Whether he surrounds his nest thus by way of *terrorem*, to prevent other birds or animals from entering, or whether he finds its silky softness suitable for his young is uncertain; the fact however is notorious." In speaking of the several species of birds which bed themselves with snake sloughs, Finn (41, p. 113) says: "All of the birds with this liking for snakes' old clothes breed in holes, and it has been suggested that the slough is used to terrify intrusive lizards, which are no friends to eggs and young birds, and are themselves preyed upon by snakes." Strecker (111, p. 506) apparently disproves this supposition by listing among fourteen snake-skin users, eight which nest in holes, one which usually does and five which do not. Dugmore (38,

p. 106) remarks of the same bird's home: "Nest in a hollow in a tree, it is rather bulky composed of grasses, weeds, feathers, and frequently castoff snake skins." Davie (34, p. 241) speaks of the nest of the Arizona Crested Flycatcher, *Myiarchus tyrannulus magister*, as being "entirely similar to that of *M. crinitus* even to the traditional snake skins." Of the Mexican Crested Flycatcher, *Myiarchus tyrannulus nelsoni*: "With one exception no snake skins were used in the construction of any of the nests." Also noted by Merrill (81, pp. 118-173). According to Chapman (27, p. 124) Lieut. Wirt Robinson has discovered that one of the commonest and most generally distributed species of the genus in South America places cast snake-skins in its nest. The habit is therefore widespread and is common to birds living under greatly varying conditions. Myers (85, p. 78), describing nest linings of *Myiarchus cinerascens cinerascens*, comments: "Occasionally snake skins, but these are not so frequently used as by the eastern birds." Strecker (111, pp. 501-507) has collected written records and has observed widely concerning this use of cast snake skins. He mentions, besides the flycatchers already referred to, the Eastern and Western Blue Grosbeaks, *Guiraca caerulea caerulea* and *Guiraca caerulea interfusa*, the Gray-tailed Cardinal, *Richmondia cardinalis canicauda*, a single instance of the English Sparrow, *Passer domesticus domesticus*, and four instances of the Carolina Wren, *Thryothorus ludovicianus*. One of these, Abbott (1, p. 158), was in New Jersey. Of the Black-crested Titmouse he says: "A description of the nest of this species would be incomplete without mention of the 'casts'." The road-runner, *Geococcyx californianus*, shows also this habit according to Jaeger (66, p. 13) and Bailey (5). Hume (61, p. 72), mentioned also by Strecker, mentions the Bank Mynah, *Acridotheres gingianus*, as using "feathers, grass and scraps of snake skins." Hume (61, pp. 77-79) also remarks the same habit in the two robins of India, viz., the Brown-backed Indian Robin, *Thamnobia cambaiensis*, and the Black-backed Indian Robin, *Thamnobia fulicata*. Whitaker (119, p. 74) finds the Rufous Warbler building snake skins into its home. And now, if only snakes would build themselves nests of birds' feathers! Snakes have been found in hens' nests, of course, which is not surprising when one considers how fond a serpent is of that warmth which Mother Nature has denied it in its own right. A considerable number of instances have come to our attention in newspaper clippings and otherwise. In one case, Tessman (newspaper item), it was a rattlesnake, and the hen was dead when found, the assassin coiled beneath her body. A parallel case is on record, Cameron (26, p. 383), of a

viper found in the nest of a Buzzard, *Buteo vulgaris*. In this instance, noted from Pomerania, the living viper was found beneath the dead body of the female Buzzard. Sometimes it has been bull snakes or other snakes which may have come because they were egg-hungry.

SNAKES EAT BIRDS

In dealing with the direct food relations between these two classes of animals we shall first consider snakes as the eaters. Some birds and some snakes consume eggs. All birds and some snakes lay them. Advantage goes to the snake, however, for her eggs are usually better concealed. To offset this, the caciques, icterine birds allied to the orioles, weave pendant nests a yard long, apparently to ensure safety from monkeys and snakes. An instance is recorded by Blanchard (18, p. 48) in which a captive milk snake ate even the eggs of a ring-neck snake. Two tropical, egg-eating snakes are so specialized for this egg diet that ventrally projecting blades from the neck vertebrae slit the shells of birds' eggs that are being swallowed. Did the man who invented the band-cutter on the threshing machine know about this, we wonder! In Boulenger's Fauna of British India (22, p. 393) we read concerning the genus *Elachistodon*: "As in the African genus *Dasy-peltis*, each of the anterior vertebrae has the hypapophysis or inferior process much elongate, toothlike, capped with enamel and penetrating the walls of the oesophagus." It has been observed that the African snakes feed on eggs, (Wood, 122, III, p. 135) "which are broken in passing along this series of processes, and having arrived so far down the gullet that the mouth can be closed, none of the contents are lost. The same is doubtless the case with *Elachistodon*."

The process of engulfing an egg is an interesting one to watch, whether it is by a milk snake or young bull snake swallowing a sparrow's egg, or a full-grown pilot blacksnake taking down a hen's egg. The egg is approached, touched delicately with the tips of the exquisitely sensitive tongue, and the diner is satisfied that it is desirable food. (How can a young snake know what is going to be inside his first egg? Ask Nature!). The snake now often moves about, stretches its jaws, does various things before actually beginning the swallowing process. Why? Perhaps its imagination is setting its salivary glands at work secreting the large amount of saliva necessary as a lubricant. The snake does not lick over its prey—egg, bird, or mouse—to make it slippery before beginning its meal. An egg is a difficult object to get into the mouth; it is so big, round and smooth, and so hard. John Cole, of Wisconsin, told the writer that his father had known a bull snake in Iowa to visit a turkey's nest daily and swallow the freshly

laid egg. The jaws are pushed over it as the egg is pressed against some convenient object or even against the snake's own coils. Advancing right and left sides alternately its jaws literally crawl over the mouthful. When it is past the head, the muscles of the neck contract and pull it down. After passing down perhaps a foot (in a five-foot snake), the muscles are powerfully tightened and the rough lower ridges of the vertebrae brought to bear on the egg so that the shell gives way. Some snakes are said to swallow the egg whole all the way down and to rely on the digestive juices to dissolve the shell in the stomach. Snakes are sometimes over-eager nest robbers, as witness the note by Holt (58) describing the swallowing of a stone nest egg by a pilot snake, *Elaphe obsoleta*. Another snake, a bull snake, is also referred to by Trine (117, p. 4) as having swallowed a glass one. Several episodes are reported of the persistence of snakes after they had once located a nest of eggs. Northup (in 86, p. 330) drove a blue racer out of a bush in which it was caught in the act of taking an egg from the nest of a Red-winged Blackbird. Thirty minutes later the bird's cries of distress drew the observer back to the nest where he again found the racer. Seiler (103, p. 189) discovered a large bull snake which was climbing the tree containing a wren's nest. She frightened the intruder away. It soon returned and was found with its head inside the entrance of the wren house. One more such instance: Spencer (106, pp. 108-110) records the attack of a black racer on a Catbird's nest in a huckleberry bush. Having eaten all but two of the young birds, it was driven away but was soon back for another, and a little later returned for the last survivor. This observer also found that the eggs of a Bob-white, placed under a hen for hatching, were disappearing, with a great commotion by the foster-mother every time one was taken. When the last one disappeared he saw a great black snake gliding off through the grass.

Some species of snakes confine themselves to cold-blooded prey. Ditmars (37, p. 249) says: "Water snakes do not eat birds," and of garter snakes, Ditmars (36, p. 246): "Adult garter snakes feed principally upon frogs, toads, and earthworms—never upon warm-blooded prey." This statement agrees with the experience of the writer, Guthrie (55, p. 186), who has had scores of garter snakes in captivity and has yet to see one consume or even kill a bird or mouse, or eat a bird's egg. Esther E. Gilmore (52) working at the University of Michigan Biological Station in 1930 tried repeatedly to get garter snakes to eat living and dead birds and birds' eggs. The only success she had was in using a kinglet with wings and tail clipped off. A

garter snake, *Thamnophis sirtalis*, was finally induced to swallow it.

Garter snakes do eat birds occasionally, however, for we have the word of several good observers on this point. Gabrielson (48, p. 137) saw a garter snake swallow the last of nine eggs in a Bobolink's nest in Iowa. Ruthven (97, p. 13) says of garter snakes, genus *Thamnophis*: "On the dryer uplands they have been observed to eat . . . fledgling birds. While in captivity it seems to be impossible to get them to eat dead food, but in the wild state specimens of three species (*sirtalis*, *radix*, *elegans*) have been observed to eat . . . birds that had been dead for a considerable time." The writer has had several garter snakes in captivity that came after a time to accept dead frogs or pieces of any kind of meat. Branson (23, p. 377) mentions a case where a western hognose snake, *Heterodon nasicus*, ate a dead Western Meadowlark. Some snakes such as the grass snake, *Liopeltis vernalis*, the red-bellied snake, *Storeria occipito-maculata*, and De Kay's snake, *Storeria dekayi*, as well as the tiny worm-snakes of the genus *Carphophis* are too small to eat birds, even if they cared for warm-blooded prey.

Of the bull snake, *Pituophis*, Ditmars (37, p. 319) says it "is particularly fond of eggs, and consumes them entire, breaking the shells in the throat by a contraction of the muscles. The writer witnessed an illustration of the voracity of one of these creatures. It swallowed fourteen hens' eggs, breaking the shell of each after the egg had passed about a foot down the throat. The demonstration closed by the supply of eggs becoming exhausted and not from any indifference on the reptile's part." Many large bull snakes in the author's cages could not be induced to eat hen's eggs at all, and others only occasionally.

As to the eating of birds by snakes, probably any snake that eats eggs will as readily eat the young birds, or even the old birds if of the proper size, and if it can catch them. The young are helpless and cannot escape, but the parents usually do unless surprised on the nest, bird-charming stories to the contrary, notwithstanding. Of the food of the copperhead, Ditmars (37, p. 422) also writes: "Here these snakes find abundance of food in the shape of birds, small rodents, and frogs. During the late spring these snakes prefer young birds, showing in fact such a decided preference to this food that some snakes will fast unless provided with the feathered prey."

The ways in which snakes catch birds are varied and interesting. With helpless nestlings and eggs, of course, the maurauder usually has an easy time of it, as nests are often placed on the ground or in low

bushes. Van Denburgh writes (Blanchard 19, p. 78) of the Boyle's king snake, *Lampropeltis getulus boylii*: "I have twice found it swallowing the contents of quails' nests, and once observed one crawling along the ground, and looking up into the bushes for nests of small birds. Several times while I watched, its quick eyes detected nests three or four feet above it, but although the snake immediately climbed up to these, it did not obtain a meal, for the nests which it examined had been abandoned by their builders or robbed by some earlier comer." Director Edgar R. Harlan of the Iowa Historical Society Museum, told the writer that he once shot a pilot snake while it "was investigating a flicker's nest about sixty feet from the ground." Sometimes the parent birds become militant in defense of their homes. Dr. T. C. Stephens mentions (in correspondence) a case in which a female Brown Thrasher fought an intruding snake. Birds of other species than those molested frequently gather about an attacking snake and try to scold it to death. Results negative.

The usual method of capture is by a quick dart of the head—a snake's lunge is almost unbelievably swift—and the victim is seized by the nearest corner, head, body, leg, wing; the serpent sometimes getting only a mouthful of wing or tail feathers. The writer has observed that when a rattlesnake strikes a mouse or ground squirrel or rat it usually sinks its fangs with their charge of venom, then retreats to a little distance to await the victim's death. With an English Sparrow, however, the rattler seldom lets go after the stroke but holds on until the poison has done its work. As a snake could not follow its wounded prey by the air route it probably saves not a few meals by this habit. Of course the non-venomous bird-eaters retain their hold until the captured prey is either killed—in the case of such constrictors as the bull snake, fox snake, or pilot snake—or until it gets the living prey jockeyed around into swallowing position—in case of a racer or coach-whip. As to how the bird is approached or attracted near enough to be taken there seems to be some doubt. Probably such an inconspicuous object as a snake, fitting so well into the lines and colors of its surroundings, may often be accidentally approached by a hapless bird which does not realize the presence of the danger until too late. Probably, also, the noiseless reptile occasionally sneaks up successfully while its intended quarry is otherwise occupied. It is interesting to know that from the same Anglo-Saxon word *snican*, to creep, came the two words, snake and sneak.

The question of the occult influence which a snake's mind is popularly supposed to exert on the mind of the bird is a matter of spirited debate. Over a century ago, James E. DeKay observed (35, p. 57): "The absurd notion of fascination is entertained by few at the present day." Psychologists versed in the lore of mind, and knowing how much inferior is the reptile brain to that of its avian prey deny this power to the snake—and one cannot doubt that men who have observed snakes for half a life time and studied them understandingly, would be likely to be on the lookout for and would notice any evidence of this phenomenon. Such men almost universally express their disbelief in any such occurrence in nature. The writer has had many bird-eating snakes—rattlers, fox snakes, bull snakes, pilot snakes, whip-snakes, blacksnakes, blue racers, king snakes, and boas. He has seen a sparrow peck at a rattlesnake's nose and ride around on the coils of a writhing rattler or bull snake. There was usually no evidence of fear unless the snake lunged, and never a sign of that paralysis supposed to hold the victim immovable through the baleful glare of the serpent's eye. To be sure, not to have seen such a phenomenon does not prove its impossibility. In explanation of the happenings one often hears recounted one is inclined to think of a fear paralysis such as sometimes is said to hold a man when a locomotive or automobile bears suddenly down upon him. Perhaps, thus, fear is the explanation. Undoubtedly the frantic parents in defense of nest and young sometimes venture too close for safety. Possibly a pugnacious bird in attacking an intruder becomes foolhardy—and rues it. And so, in the face of many hard-to-explain accounts by observers who thus interpreted the things they observed, Mr. H. A. Surface in "The Serpents of Pennsylvania" (114, p. 120) observes: "It is popularly believed that snakes have the power to charm birds and the lower animals and even mankind, but with the most careful investigation, we can not find satisfactory evidences of the truth of this. It is true that some creatures, such as birds, and even some persons, become so terrified at suddenly seeing a snake that they act more or less helpless, but this is quite different from being charmed."

Max Morse in *Batrachians and Reptiles of Ohio* (84, p. 100) remarks: "So many superstitions are associated with these forms of animal life that it would be impossible to cover them in this paper, to say nothing of attempting to disprove them. As classic examples we may cite . . . the charming power of snakes. It is needless to say that all these are myths." In "the Poisonous Snakes of North America" (108, pp. 292-293) Dr. Leonard Stejneger reviews the evidence con-

cerning "charming" thus: "The popular belief in the power of the poisonous snake to 'charm' its victims into a state of helplessness is by no means exterminated. In spite of all that has been argued and explained against it there are people still who profess to have ocular proof of this power. Time and again it has been related by trustworthy observers how birds or small mammals have been seen to approach the coiled snake, drawn toward it as if by a magic spell they were unable to withstand, etc. There is evidently enough truth in the numberless observations of this nature to keep the scientist busy trying to evolve a theory by which to explain so much of the stories as appeared worthy of being admitted as facts." D. Humphreys Storer in *Reptiles of Massachusetts* (112, p. 234) writes of the rattlesnakes, *Crotalus*: "The power of fascination attributed to this genus is too absurd to require our serious consideration." Another authority on reptiles, E. D. Cope (29, pp. 713-714) explains thus: "Snakes are popularly believed to possess the power of 'charming' or attracting to themselves other animals, especially birds, against their will, so that they easily capture them for food. This belief rests on a habit which is usual among the smaller birds of annoying other animals which they dislike or fear. Every one knows how they will congregate about an owl which has not sufficiently concealed itself by daylight and will make their hostility known by cries and efforts to strike their enemy. I have witnessed a crowd of birds collected about a black snake, which displayed their hostility by many cries and movements, the snake the while eying them with an inactive interest. Should one of the birds venture too near, I strongly suspect that the snake would take advantage of the opportunity to secure a meal, but this I have not witnessed. I believe, however, that the stories of 'charming' are due to an observation of this not uncommon experience of the field naturalist." In his account of the Boomslange (tree-snake), *Bucephalus capensis*, Wood states (122, p. 136): "The Boomslange is generally found in trees, to which it resorts for the purpose of catching birds, upon which it delights to feed. The presence of a specimen in a tree is generally soon discovered by the birds of the neighborhood, who collect around it and fly to and fro, uttering the most piercing cries, until some one, more terror-stricken than the rest, actually scans its lips, and almost without resistance, becomes a meal for its enemy." Dr. S. Weir Mitchell (82, p.), who had unexcelled opportunities for observation, wrote of the way in which birds and small animals behaved fearlessly when introduced into a cage with rattlesnakes and often came to live intimately with them. He concluded: "These are the sole

facts which I have seen bearing any relation to the supposed fascinating faculty. They appear to me to lend no strength to the idea of its existence."

AND BIRDS DEVOUR SNAKES

So far as the literature goes the writer has found no record of birds having consumed the eggs of snakes, though doubtless some of them would do so if they could find them. Some strange instances come to light occasionally in which the most unexpected of birds are snake-eaters. The writer has been told of hens killing and eating green snakes, *Liopeltis vernalis*, in Iowa, and Blatchley (20, p. 549) writes: "I saw a chicken running along the roadside with a squirming snake in its bill. After a sharp chase of the fowl through a rail fence and a blackberry patch, its prey was dropped and proved to be a fine specimen of Storer's snake, *Storeria occipitomaculata*." Crimmins (32, p. 46) says: "I have personally seen chickens kill and eat rattlesnakes." These were young Texas diamond-back rattlers about twelve inches long. Oddly enough, several observations show that Robins sometimes feed them to their nestlings. McIntosh (76, p. 152) found a Robin pecking a thirteen-inch garter snake. The snake was evidently nearly dead when the bird finally managed to pick it up and fly off about seventy-five feet to a post on which one of its young was seated. It tried to feed it to the baby, which, of course, was unable to handle the unwieldy morsel. The snake was dropped to the ground but was picked up later and another futile attempt made to feed it to the young bird. Marshall (80, p. 304) saw a Robin kill a ten-inch garter snake and carry it up into a tree. Being called away he did not see the snake eaten but it was gone when he returned. Friedmann (47, pp. 259-260) once put two young Cowbirds in a Robin's nest. The Robins accepted and reared them and on one occasion he noticed that one of the young Cowbirds had been fed a very young garter snake which it finally swallowed and digested. Mallard Ducks are reported to occasionally eat snakes, (McAtee 78, p. 113), while Hay (56, p. 527) says that turkeys and ducks eat garter snakes. Crimmins (32, p. 47) says chickens and muscovy ducks ate pieces of a young Texas diamond-back rattlesnake, *Crotalus atrox*.

However, these are apparently unusual cases. Some birds which are mainly meat-eaters as shrikes, hawks, herons and the like eat considerable numbers of the scaly prey. Note the name "serpent eagle" applied to members of the genus *Spilornis* in the East Indies and Africa. The harrier eagles, *Batastur*, are also called "serpent eagles" and several kites go by the name of "snake hawks". The shrikes or

butcher birds, besides their usual fare of insects, rodents, and birds have serpents occasionally on their menu. Ditmars (36, p. 274) narrates thus: "During a collecting trip a queer observation was made. A heavy rain had fallen the night before, enticing the burrowing snakes from their hiding places. Evidently the scarlet snakes, *Cemophora coccinea*, had been conspicuous objects during the early morning. On the ends of dead twigs and stems, right and left, were the weird souvenirs of the shrikes or butcher birds, consisting of partially-eaten bodies of snakes. The reptiles were securely fastened by forcing the tip of the twig into the body cavity like a finger into a glove. The shrike is a carnivorous bird, notorious in having eyes too big for its stomach. Its half-eaten prey is thus jauntily deserted."

One would consider venomous sea-snakes safe from attacks of birds, but sea captains of the Molucca and Sunda Straits told Dr. Ditmars (36, p. 289) of having seen albatrosses and frigate birds dragging these serpents from the waves and flying to the rigging of the ship to kill and devour them. South Africa has two animals commonly known as "ringhals". One is a cobra which eats birds and eggs, the other is the white-necked raven which often feeds on snakes. Even the bush kingfisher, *Halcyon*, of Africa, and the "laughing jack-ass", *Dacelo gigas*, kingfisher of Australia, are snakivorous. The latter, according to Wood (122, p. 170), "catches them by the tail and crushing their heads with its powerful beak . . ." Another observer, Lucas and LeSouef (74, p. 161), describes the execution somewhat differently: "Swooping down from his perch of observation, with his formidable beak the latter (Laughing Jackass) strikes the snake before his own feet reach the ground, breaks the back of the reptile, and so disables it. He will fly up with the snake in his mouth, and then let it drop from a height back to the ground, and repeat this treatment until the snake can be safely swallowed." The ground hornbill, *Bucorax cafer*, subsists partly upon these reptiles as does the ground cuckoo known as Road-runner or chaparral cock of our Pacific coast, renowned in popular belief as being a valiant slayer of rattlesnakes. Naturally, many raptorial birds such as hawks, owls, and buzzards find scaly prey to their taste. Of the wading birds, the Sandhill Crane, *Grus canadensis tabida*, the Great Blue Heron, *Ardea h. herodias*, and the American Bittern, *Botaurus lentiginosus*, are serpent eaters. Klauber (70, p. 13) observes: "Aside from man, the principal enemies of the rattle snakes in this county [San Diego County, California] are birds and other snakes. Eagles, hawks, and owls are sometimes seen carrying rattlers and other snakes in their talons." Blatchley

(20, p. 548) says: "I observed a sparrowhawk fly across a meadow bearing a wriggling snake in its talons. I stepped up behind the thorn tree in which it alighted and giving a sudden whoop caused it to drop its prey, which proved to be an example of *Eutainia (Thamnophis) sirtalis parietalis*, the red-barred garter snake." Quoting from Barbour (9, p. 28): "Our red-shouldered hawk seems to feed almost exclusively upon snakes, at least in Florida. That curious hawk, the Secretary-bird of South Africa, classified as *Serpentarius secretarius*, eats any and all snakes, as do some of the great heavy-billed storks and ibises which kill their prey with blows of their powerful beaks." W. P. Pycraft (95, p. 115) writes: "The Secretary-bird (*Serpentarius reptilivorus*) of South Africa, from its fondness for poisonous snakes, has during the last few years been rigidly protected by law. Standing nearly four feet in height and of powerful build, this remarkable bird—an aberrant member of the hawk tribe—displays no small skill and caution in attacking its venomous prey, shielding itself by means of the wings and kicking violently with both feet until its victim is vanquished." Sometimes it is said to fly high in the air and kill its prey by dropping it on the rocks. Saintleven (100), in speaking of rattlesnakes in southern Texas, recounts: "Wild turkeys show a great antipathy to them, and never fail to make a direct and persistent attack until the reptile is destroyed." Speaking of an instance which he had witnessed, he tells of watching a large flock of wild turkeys of which the gobblers were engaged in killing a large rattlesnake. "One after another would spring into the air in rapid succession and come down on the reptile which they struck a hard blow with one wing. . . . It is their custom to eat the snakes killed in that way."

Thus between birds and snakes the honors, or dishonors, appear to be rather equally divided. To some species of birds, and to other species at certain seasons, snakes, both venomous and non-venomous, are the preferred normal diet. Other birds of somewhat omnivorous habits so far as animal food goes, get an occasional serpent. A few, Robins for example, may classify small snakes as merely unusually active angleworms and therefore good baby-food.

And with snakes much the same situation exists. Some are inveterate nest yeggs, getting most of their living by this species of burglary. Others catch many birds, both nestling and adult. A few occasionally eat dead birds, even as Crows and buzzards prize a dead snake as highly as a living one.

For practical purposes, for the Middle West, the *Buteo* hawks, especially the Red-tailed Hawk, the Marsh Hawk, and probably to a lesser extent Crows, herons and bitterns are the birds which send a shudder down the sinuous backbones of small snakes. Yet even though these birds take toll of some of our most valuable snakes, their rodent-destroying habits place them safely in the column of our feathered farm friends. And as to our snakes, what shall we say? Probably the pilot blacksnake, an inveterate climber, destroys more birds than any other in its habitat. Branson (23, p. 388) believed this to be the case in Kansas. Bull snakes, fox snakes, and racers get some eggs and young birds, with occasionally an adult. All these snakes are extremely valuable as mousers, ratters, squirrelers, and gopherers; and the blue racer as an insect-eater as well, to be too hastily condemned and summarily executed *en masse* for being "bird-lovers". Our other snakes probably do too little harm to birds to even deserve dishonorable mention.

Following is a list of snake bird-eaters and bird snake-eaters, not at all exhaustive, but suggestive, gathered from what literature was accessible to the writer. A considerable number of the references were kindly suggested by T. C. Stephens.

SNAKES EATEN BY BIRDS

In the following list the scientific as well as the common names of both snakes and birds are given when known. Of course, in many cases the species was unknown to the observer, at least the name was not recorded. In other cases the statement found applies to a whole group: as "herons", "hawks", "birds", "birds' eggs", "garter snakes", "colubers", etc. In the numerous cases recorded merely as "reptiles", snakes and lizards or either one of them may have been meant, but they have not been included in this list. It is probable that any birds that would eat lizards would also eat snakes of suitable size; and that snakes which would eat one bird or egg would devour any other of like size if obtainable. Some of the records are of isolated cases, while others indicate a regular food habit. Moreover, some are records of captive specimens, others of observations in the wild; while many have been gained from stomach examinations of collected specimens. It is not always possible from the records to determine which of the above was the case.

- Albatrosses eat sea snakes, Boulenger (21).
- Water Turkey or Snake Bird, *Anhinga anhinga*, eats snakes, Audubon (4).
- Florida Cormorant, *Phalacrocorax auritus floridanus*, ate a water snake, *Natrix*, Pearson (94).
- Frigate birds eat sea snakes, Boulenger (21).
- Large sea birds eat poisonous sea snakes, Ditmars (36, p. 289).
- Mallard Duck, *Anas boschas*, eats small snakes, McAtee (77, p. 10); McAtee (78, p. 113). Rattlesnakes, Crimmins (32, p. 47).
- Ducks eat garter snakes, Hay (56, p. 527). Eat *Thamnophis sirtalis*, De Kay (35, p. 45).
- Crested Screamer or snake crane, *Chauna cristata*, (of Brazil) fond of snakes as food, McAtee (78).
- White Ibis, *Guara alba*, eats snakes, mostly moccasins, *Agkistrodon piscivorus*, Baynard (13).
- Glossy Ibis, *Plegadis autumnalis*, eats snakes, mostly moccasins, Baynard (14).
- Egyptian Ibis, foe to small snakes, Ingersoll (65, p. 17).
- Wood Ibis, Jabiru, *Mycteria americana*, eats snakes, Netting (88, p. 28); Smith (105, p. 59).
- Ibises eat snakes, Barbour (9, p. 28).
- Storks eat snakes, Barbour (9); Netting (88). Eat ringed snake, *Tropidonotus natrix*, Schmeil (102, p. 240).
- American Bittern, *Botaurus lentiginosus*, eats snakes, Barrows (11, p. 128); Howell (59, p. 24). Water-snakes, Netting (88, p. 28).
- Great Blue Heron, *Ardea herodias*, eats snakes, Baker (7); Barrows (11, p. 136); Howell (59, p. 25).
- American Egret, *Ardea egretta*, eats small water snakes, Wilson and Bonaparte (120, Vol. 2, p. 300). Mostly moccasins, *Agkistrodon piscivorus*, Baynard (13).
- Egret, *Ardea* (?) *rufa*, eats snakes, mostly moccasins, *Agkistrodon piscivorus*, Baynard (13).
- Snowy Egret eats snakes, mostly moccasins, *Agkistrodon piscivorus*, Baynard (13).
- Little Blue Heron, *Ardea caerulea*, eats snakes, Baynard (14). Mostly moccasins, *Agkistrodon piscivorus*, Baynard (13).
- Louisiana Heron, *Ardea tricolor ruficollis*, eats snakes, Baker (7).
- Green Heron, *Ardea virescens*, eats snakes, Baker (7).
- Black-crowned Night Heron, *Nycticorax nycticorax naevius*, eats snakes, Baker (7).

- Yellow-crowned Night Heron, *Nyctanassa violaceus*, eats snakes, Baker (7).
- Whooping Crane, *Grus americana*, eats snakes, Netting (88, p. 28).
- Sandhill Crane, *Grus mexicana*, eats snakes, Barrows (11, p. 150).
- Virginia Rail, *Rallus virginianus*, ate a DeKay's snake, *Storeria dekayi*, and a garter snake, *Thamnophis sirtalis*, Cahn (25, p. 94).
- Emu, *Droma novae-hollandiae*, eats snakes, Smith (105, p. 59).
- Chickens, *Gallus gallus*, ate a red-bellied snake, *Storeria occipitomaculata*, Blatchley (20, p. 549). Garter snakes, *Thamnophis sirtalis*, DeKay (35, p. 45); Crimmins (32, p. 47).
- Turkeys, *Meleagris*, eat garter snakes, *Thamnophis* species, Hay (56, p. 527). *Thamnophis sirtalis*, DeKay (35, p. 45); Saintleven (100).
- Vultures eat living serpents, Wilson and Bonaparte (120, Vol. 3, p. 325).
- Turkey Buzzard, *Cathartes aura*, (nestling) ate a house snake, *Lampropeltis*, Roddy (96, p. 245). Eats snakes, Barrows (11, p. 256).
- Black-winged Falcon, *Elanus melanopterus*, eats snakes, Wood (122, p. 63).
- Swallow-tailed Kite, snake hawk, *Elanoides forficatus*, eats snakes, Barrows (11, p. 260); Fisher (42); Howell (60, p. 37); Netting (88, p. 28). Seen carrying long, slender snakes, Audubon (4).
- Mississippi Kite, *Ictinia mississippiensis*, eats snakes, Barrows (11, p. 261); Howell (60, p. 37); Netting (88, p. 28). Eats rough green-snake, *Ophedryx aestivus*, Wilson and Bonaparte (120, Vol. 1, p. 71).
- Kites are large consumers of snakes, Baskett (12, p. 143).
- Sharp-shinned Hawk, *Accipiter velox*, only occasionally snakes, Netting, (88, p. 28).
- Goshawk, *Astur atricapillus*, only occasionally snakes, Netting (88, p. 28).
- Marsh Hawk, *Circus hudsonius*, eats snakes, Fisher (42); Wilson and Bonaparte (120, p. 244); Howell (60, p. 37).
- Buzzard, *Buteo*, (an African hawk) eats useful snakes, Fitzsimons (43, Vol. 2, pp. 34-35).
- Buzzard, *Buteo vulgaris*, natural enemy of the viper, *Pelias berus*, and ringed snake, *Tropidonotus natrix*, Schmeil (102, p. 240). Snakes, Thorburn (115, p. 80).
- Red-tailed Hawk, *Buteo borealis*, nestling ate a spreading adder, *Heterodon contortrix*, Over (91, p. 28). Rattlesnakes, Netting (88, p. 28).

- Western Red-tailed Hawk, *Buteo borealis calurus*, eats snakes, Eliot (40, p. 151).
- Krider's Hawk, *Buteo borealis krideri*, ate a blue racer, *Coluber constrictor flaviventris*, Gloyd (53, p. 141).
- Red-shouldered Hawk, *Buteo lineatus*, eats snakes (almost exclusively in Florida), Barbour (9); Nicholson (90, Vol. 42, p. 35); Eaton (39, Vol. 2, p. 84); Howell (59, p. 39).
- White-tailed Hawk, *Buteo albicaudatus sennetti*, eats snakes, Fisher (42).
- Swainson's Hawk, *Buteo swainsoni*, occasionally brought snakes for its young. Ate a garter snake, *Thamnophis sirtalis*, and an entire rattlesnake, Cameron (26, p. 174 and pp. 282-283).
- Golden Eagle, *Aquila chrysaetos*, very partial to snakes, Cameron (26, p. 382); Fisher (42). Prairie rattlesnake, *Crotalus confluentus*, Netting (88, p. 28).
- Bald Eagle, American eagle, *Haliaeetus leucocephalus*, eats snakes, Barrows (11, p. 288).
- Jean le blanc Eagle, *Circaetus gallicus*, eats snakes, Wood (122, p. 38).
- Eagles eat rattlesnakes and other snakes, Klauber (70, p. 13).
- Serpent eagles, genus *Spilornis*, eat snakes, New Internat. Encyc. (89).
- Harrier Eagle or serpent eagle, genus *Batastur*, (Asiatic and African) eats snakes, New Internat. Encyc. (89).
- Bataleur, *Helotarsus ecaudatus*, (African) eats snakes. New Internat. Encyc. (89).
- Jardine's harrier (Australia) very fond of small snakes, Wood (122, p. 94).
- Harrier hawk, *Polyboroides*, (African) eats snakes, Fitzsimons (43, Vol. 2, p. 38).
- Sparrow Hawk, *Falco sparverius*, ate red-barred garter snake, *Thamnophis sirtalis parietalis*, Blatchley (20, p. 548). Eats small snakes, Wilson and Bonaparte (120, Vol. 1, p. 30); Howell (59, p. 41).
- Hawks eat rattlesnakes, genus *Crotalus*, and other snakes, Klauber (70, p. 13). Garter snakes, *Thamnophis*, Hay (56, p. 527). *Thamnophis sirtalis*, DeKay (35, p. 45).
- Secretary-bird, serpent eagle, *Serpentarius secretarius*, (Africa) eats snakes, Fitzsimons (43, Vol. 2, pp. 38 and 155); Baskett (12, p. 143); Barbour (9, p. 28); Daglish (33, p. 176). Poisonous snakes, Pycraft (95, p. 115). Eats cobras, three snakes as thick as a man's arm found in one, Wood (122, pp. 89-90).

- Screech Owl, *Otus asio asio*, ate young garter snake, Allen (2, p. 6).
- Burrowing Owl, *Speotyto cunicularia*, attacks live snakes, eats dead ones, probably eats small rattlesnakes, Netting (88, p. 28).
- Burrowing Owl, *Speotyto cunicularia hypogaea*, eats Hammond's garter snake, *Thamnophis ordinoides hammondii*, (body of one photographed in burrow), McLean (79, p. 13).
- Owls eat rattlesnakes and other snakes, Klauber (70, p. 13). Garter snakes, Hay (56, p. 527). Garter snake, *Thamnophis sirtalis*, DeKay (35, p. 45).
- Road-runner, snake-bird, *Geococcyx californianus*, eats small snakes, Eliot (40, p. 162). Kills rattlesnakes, Myers (85, p. 2). Eats snakes, Barbour (9, p.); Cockerell (28). "Kills and eats rattlesnakes", Saintleven (100).
- Ground hornbill, *Bucorax cafer*, (Africa) eats snakes, Fitzsimons (43, Vol. 2, p. 126); Ingersoll (65, p. 16).
- Bush kingfisher, *Halycon*, eats snakes, Fitzsimons (43, Vol. 2, p. 24).
- Laughing jackass, *Dacelo gigas*, eats snakes, Ingersoll (65, Vol. 2, p. 24); Wood (122, Vol. 2, p. 170).
- Rollers, *Coracias* and *Eurostomus*, (Africa) eats snakes, Fitzsimons (43, Vol. 2, p. 22).
- Magpie, *Pica pica hudsonica*, killed a rattlesnake, Boulder Daily Camera, Boulder, Colorado, June 4, 1895.
- California jay, *Aphelocoma californica*, eats snakes, Beal (15).
- Crow, *Corvus brachyrhynchos*, eats snakes, Barrows (11, pp. 424-425). Harmless snakes, Barrows and Schwartz (10, pp. 49-50). Milk snake, *Lampropeltis*, Wilson (121, p. 124).
- Pied crow, *Corvus scapulatus*, (Africa) eats snakes, Fitzsimons (43, Vol. 2, p. 1).
- White-necked raven, ringhals, *Corvulture albicollis*, eats snakes, Fitzsimons (43, Vol. 2, p. 1); Wilson (121, p. 124).
- Cowbird, *Molothrus ater*, nestling ate garter snake, Friedmann (47, p. 270).
- Northern Shrike, *Lanius borealis*, eats snakes, Blanchan (17).
- Loggerhead Shrike, *Lanius ludovicianus*, killed garter snake, ate DeKay's snakes, *Storeria dekayi*, Judd (67, pp. 100, 102). Eats snakes, garter snake, *Thamnophis sirtalis*, and a snake of the genus *Lepthophis*, impales snakes on barbed-wire fence, Judd (68, p. 21).
- White-rumped Shrike, *Lanius ludovicianus excubitorides*, eats snakes, Cockerell (28).

- Migrant Shrike, *Lanius ludovicianus migrans*, eats small snakes, Barrows (11, p. 563).
- Shrike attacked a snake, Gignoux (51, p. 75).
- Shrikes ate scarlet snakes, *Cemophora coccinea*, Ditmars (36, p. 274).
- Robin, *Planesticus migratorius*, ate garter snake, McIntosh (76, p. 152); Marshall (80, p. 304); Simpson (104). Fed garter snake to nestling cowbird, Friedmann (47, p. 270).

BIRDS EATEN BY SNAKES

- Massasauga, *Sistrurus catenatus*, eats young birds, Ditmars (37, p. 438). Probably small birds, Atkinson and Netting (3, p. 42); Netting (88, p. 26).
- Pigmy rattlesnake, *Sistrurus miliarius*, eats very young birds, Ditmars (37, p. 436); Hurter (63, p. 212).
- Banded or timber rattlesnake, *Crotalus horridus*, eats birds, Ditmars (37, p. 446); Netting (88, p. 26); Morse (84, p. 138); Forbush (44, p. 45); Hurter (63, p. 214). Small birds, Wood (122, Vol. 3, p. 101). An occasional bird, Stejneger (108, p. 432).
- Rattlesnake (probably *C. horridus*) ate field sparrow, *Spizella pusilla*, and young, Nauman (86, p. 331).
- Prairie rattlesnake, *Crotalus confluentus*, eats birds, Ditmars (37, p. 457). Occasionally birds, Over (91, p. 29).
- Diamond-back rattlesnake, ate a quail, Stoddard (110).
- Western diamond-back rattlesnake, *Crotalus atrox*, eats birds, Ditmars (37, p. 453).
- Tiger rattlesnake, *Crotalus tigris*, eats birds, Ditmars (37, p. 460).
- Copperhead, *Agkistrodon mokasen*, eats small birds, Ditmars (37, p. 424); Hay (56, p. 532). The smaller disabled birds, DeKay (35, p. 54). Birds, Hurter (63, p. 207); Netting (88, p. 26). Eggs and young, Forbush (44, p. 45). A sparrow, Surface (114 p. 189).
- Cotton-mouth moccasin, *Agkistrodon piscivorus*, birds, Ditmars (36, p. 322 and 37, p. 419). Green heron's eggs, *Ardea virescens*, Howell (60, p. 103).
- Fer-de-lance, *Bothrops atrox*, coiled up in nest of bird whose eggs or young it had devoured, Wood (122, Vol. 3, p. 98).
- Puff adder, *Bitis arietans*, a large bird, Loveridge (73).
- Viper, *Pelias berus*, eats birds, Wood (122, Vol. 3, p. 114); Palmer and Westell (93, p. 288).
- Viper (in Pomerania) found in nest under dead buzzard, *Buteo vulgaris*, Cameron (26, p. 383).

- Horned palm viper, *Lachesis schlegelii*, young birds, Ditmars (36, p. 348).
- Ringhals, *Sipedon haemachates*, (a South African cobra) birds and eggs, New Internat. Encyc. (89).
- Cobra de capello or hooded cobra, *Naja tripudians*, young poultry and birds, New Internat. Encyc. (89).
- Spitting cobra, Black-necked cobra, chickens, struck hen in nest-box, Loveridge (73, pp. 109, 112).
- Cobras, birds and eggs, Ditmars (36, p. 297).
- Green mamba, *Dendraspis angusticeps*, probably killed black-bellied bishop bird, *Pyromelana nigriventris*, on nest, Loveridge (73, p. 115).
- Genus *Elachistodon*, especially fitted for egg-eating, Boulenger (22, p. 393); Ingersoll (64, p. 57).
- Egg-eater, *Dasyptelis scabra*, eggs and nestlings, Fitzsimons (43, Vol. 1, p. 240). Eggs, Wood (122, Vol. 3, p. 135); Forbush (44, p. 41).
- Boomslang, *Dispholidus typus*, eggs, young and adults, Fitzsimons (43, Vol. 1, p. 240).
- Boomslang, *Bucephalus capensis*, birds, Wood (122, p. 136).
- Bird snake, *Theltornis kirtlandii*, eggs, young and adults, Fitzsimons (43, Vol. 1, p. 240).
- Spreading adder, *Heterodon contortrix*, bird, Netting (88, p. 26); Surface (114, p. 185). Birds and eggs, Forbush (44, p. 45).
- Western hognose, *Heterodon nasicus*, ate adult meadowlark, Branson (23, p. 377).
- Blacksnake, black racer, *Coluber constrictor constrictor*, birds, Ditmars (36, p. 255). Birds and eggs, Ditmars (37, p. 282). Birds, eggs and young, DeKay (35, p. 36). Birds 4% of food, birds' eggs 4%, Surface (114, p. 169); Forbush (44, pp. 43-44). Catbird eggs, Morris (83, p. 253); Spencer (106, p. 108). Young catbird, Burroughs (24, pp. 27-30). Wren, quail eggs, Spencer (106, p. 108). Young Florida blue jay, Nicholson (90, Vol. 29, p. 190). Young blue jay, Linsdale (72, p. 557). Small birds, adult robin, Storer (112, p. 226).
- Blue racer, *Coluber constrictor flaviventris*, eggs of red-wing blackbird, *Agelaius phoeniceus*, in nest of cardinal, *Cardinalis cardinalis*, eggs of vireo, and of red-winged blackbird, Nauman (86, pp. 330, 331). Eggs of bobwhite, *Colinus virginianus*, prairie chicken, *Tympanuchus americanus*, and fowls, Morse (84, p. 128). Birds and eggs, Wood (122, Vol. p. 132); Force (46, p. 31); Netting (88, p. 26).

- Racer, *Coluber semilineatus*, young Woodhouse jay, *Cyanocitta woodhouseii*, Stejneger (109, p. 155).
- Coachwhip, *Masticophis flagellum frenatum*, small birds, Ruthven (98, p. 576).
- Striped racer, *Coluber lateralis*, young house finch, Law (71, p. 179).
- Racers, genus *Zamensis*, feed principally on mammals and birds, Boulenger, G. A. (22, p. 323).
- Coachwhip, *Masticophis flagellum flagellum*, English sparrows, Force (46, p. 30). Birds and eggs, Ditmars (37, p. 287); Hurter (63, p. 173). Attacked a hawk, Wood (122, Vol. 3, p. 132).
- Coachwhips, *Masticophis*, birds, Ditmars (37, p. 287); Ditmars (36, p. 257). Young quail, Stoddard (110).
- Dryophis prasinus*, small birds, Boulenger, G. A. (22, p. 369).
- Elaphe spiloides*, eggs of guinea fowl, Hurter (63, p. 182).
- Emory's coluber, *Elaphe laeta*, small birds, Ditmars (37, p. 299).
- Davis Mountain coluber, *Elaphe subocularis*, small birds, Ditmars (37, p. 300).
- Corn snake, *Elaphe guttata*, quail, two instances, Ditmars (37, pp. 301-302). Birds, Wood (122, Vol. 3, p. 130).
- Pilot blacksnake, *Elaphe obsoleta*, hens' eggs, flickers, quail and other birds, Hurter (63, p. 180). Killed a large horned owl in captivity, Blatchley (20). Birds and eggs, Branson (23, p. 388). Birds' eggs, chickens, robins, red-winged blackbirds, crow blackbird, sparrows, eggs 2%, birds 28% of food, Surface (114, p. 161); Ditmars (37, p. 312); Forbush (45, p. 41); Netting (88, p. 26). Canary, Touissant (116, p. 222). Barn swallows, canary, Forbush (45, pp. 42-43).
- Chicken snake, *Elaphe obsoleta confinis*, birds, young chickens and eggs, Hurter (63, p. 181). Birds, Corrington (31, p. 73).
- Lindheimer's coluber, *Elaphe obsoleta lindheimeri*, hens' eggs, Ditmars (37, p. 306). Contents of birds' nests, Garman (50, p. 291).
- Banded chicken snake, *Elaphe quadrivittata*, chickens, hens' eggs, Ditmars (37, pp. 311-312). "Habit of stealing chickens from roost", Wood (122, Vol. 3, p. 131).
- Fox snake, *Elaphe vulpinus*, sparrows, birds and their eggs, Ditmars (37, p. 298); Surface (114, p. 162). Eggs of common tern, Lyon (75, p. 186); Williams (75, p. 186).
- All culubers, birds and eggs, Ditmars (37, p. 294); Boulenger, G. A. (22, p. 330).
- Indigo snake, blue gopher snake, *Drymarchon corais couperi*, Ditmars (37, p. 278).

- Big cribo, *Drymarchon corais melanurus*, birds, Ditmars (37, p. 278).
- Pine snake, *Pituophis melanoleucus*, birds, Surface (114, p. 171).
Birds and eggs, hens' eggs, Ditmars (37, p. 318).
- Bull snake, *Pituophis sayi*, birds and eggs, Hurter (63, p. 174). Birds and hens' eggs, Ditmars (37, p. 319). Birds, sparrows, pigeon's egg, Ruthven (97, p. 583); Branson (23, p. 360). Chewink and eggs, Nauman (86, p. 330). Young chewinks, Over and Thoms (92, p. 26). In wren's nest, Seiler (103). English sparrows, Force (46). Young blackbirds, Keller (69, p.). Eggs of Townsend's solitaire, Hunter (62). Glass nest egg, Trine (117, p. 4).
- Speckled king snake, *Lampropeltis getulus holbrooki*, small birds, Hurter (63, p. 185); Force (46, p. 32).
- Common king or chain snake, *Lampropeltis getulus getulus*, sparrows, Ditmars (36, p. 270, and 37, p. 362). Birds, a chipping sparrow, Blanchard (19, p. 52). Birds, Wood (122, Vol. 3, p. 131).
- Boyle's king snake, *Lampropeltis getulus boylei*, contents of quails' nests, Blanchard (19, p. 78); Van Denburgh (70, p. 172).
- Brown king snake, mole snake, *Lampropeltis rhombomaculata*, young birds, Ditmars (37, p. 355); Blanchard (19, p. 131).
- Yellow-bellied king snake, *Lampropeltis calligaster*, young birds, Ditmars (37, p. 356).
- Milk snake, house adder, *Lampropeltis triangulum triangulum*, bird, robin's egg, Surface (114, pp. 178-179). Birds, cowbirds' eggs, Blanchard (18, p. 48); Forbush (45, p. 44); Netting (88, p. 26). Eggs of red-winged blackbird, Nauman (86).
- Grass snake (European) birds, Palmer and Westell (93, p. 228).
- Water snake, *Natrix sipedon*, eggs and young of marsh wrens and rails, Forbush (45, p. 46).
- Plains garter snake, *Thamnophis radix*, dead birds, Ruthven (97, p. 13).
- Common garter snake, *Thamnophis sirtalis*, sparrow, Surface (114, p. 149).
- Garter snake, *Thamnophis elegans*, dead birds, Ruthven (97, p. 13).
- Garter snakes, *Thamnophis*, birds, New Internat. Encyc. (89); Fledgeling birds, Ruthven (97, p. 13). Bobolink eggs, Gabrielson (48). Young yellow warbler, Bigglestone (16). Eggs and young of birds, Forbush (45, p. 45).
- Rubber boa, *Charina bottae*, very small birds, Ditmars (37, p. 212).
- Anaconda, *Eunectes murinus*, waterfowl, Netting (88, p. 26).
- Boa constrictor*, birds, Schmeil (102, p. 241).

- Boas, family *Boidae*, feathered creatures, Ditmars (36, p. 220); Netting (88, p. 26).
- Rock python, *Python reticulatus*, "two 8-pound roosters every ten or twelve days", Netting (88, p. 27).
- Pythons, birds, Stebbing (107, p. 183); Boulenger, G. A. (22, p. 245); Netting (88, p. 26).
- Snakes, robbed two nests of prothonotary warbler in Louisiana, Ganier (49). Enemies of Bob-whites, Howell (60, p. 89); Catbird eggs, Over and Thoms (92, p. 26).

REFERENCES

1. Abbott, C. C. Naturalist's rambles about home. Appleton, 1885.
2. Allen, A. A. Auk, 41, 1924, pp. 1-16.
3. Atkinson, D. A. and Netting, H. Graham. The distribution and habits of the massasauga. Bull. Antiven. Inst., July, 1927.
4. Audubon, John James. Birds of North America.
5. Bailey, Florence Merriam. Handbook of the birds of Western United States. Boston, Houghton, 4th Ed., 1914.
6. Bailey, Mrs. Mary L. The WILSON BULLETIN, Dec., 1925, p. 221.
7. Baker, Frank C. Proc. Acad. Nat. Sci., Philadelphia, 41, 1889.
8. Baldwin, S. Prentiss. The WILSON BULLETIN, 36, 1924, p. 103.
9. Barbour, Thomas. Reptiles and Amphibians.
10. Barrows, W. B. and Schwartz, E. A. The Common Crow of the United States. Bull. 6, U. S. D. A. Div. Orn. and Mam., 1895.
11. Barrows, W. B. Michigan Bird Life. Special Bulletin, Mich Agr. College, 1912.
12. Baskett, James Newton. The Story of the Birds. Appleton New York, 1902.
13. Baynard, Oscar E. The WILSON BULLETIN, 24, 1912, pp. 167-169.
14. Baynard, Oscar E. The WILSON BULLETIN, 25, 1913, pp. 103-117.
15. Beal, F. E. L. U. S. Biol. Surv. Bull. 34, 1910.
16. Bigglestone, Harry C. The WILSON BULLETIN, 25, June, 1913.
17. Blanchan, Neltje. (Mrs. Doubleday). Bird Neighbors.
18. Blanchard, Frank N. Amphibians and Reptiles of the Douglas Lake Region in Northern Michigan. Copeia, 1928.
19. Blanchard, Frank N. A revision of the king snakes, Genus *Lampropeltis*, Smithsonian Inst., U. S. N. Museum Bull. 114, 1921.
20. Blatchley, W. S. Notes on the Batrachians and Reptiles of Vigo County, Ind. 24th Ann. Rept. State Geologist, 1899.
21. Boulenger, E. G. Animal Mysteries. Macaulay.

22. Boulenger, Geo. A. Fauna of British India, Reptilia and Batrachia. London, 1890.
23. Branson, Edwin B. Snakes of Kansas. Kansas Univ. Science Bull., Vol. 2, No. 13, 1904.
24. Burroughs, John. Wake-Robin.
25. Cahn, Alvin R. Auk, 32, 1915, pp. 94-95.
26. Cameron, E. S. Swainson's hawk in Montana. The Auk, 30, 1913.
27. Chapman, Frank M. Bird-Life. Appleton, 1903.
28. Cockerell, T. D. A. N. Mex. Agr. Exp. Sta. Bull. 37, 1901.
29. Cope, E. D. Crocodilians, lizards, and snakes. Ann. Rpt. Smithsonian Inst., 1898.
30. Cope, E. D. A critical review of the characters and variations of the snakes of North America.
31. Corrington, Julian D. Copeia, No. 172, 1929.
32. Crimmins, Col. M. L. Rattlesnakes and their enemies in the southwest. Bul. Antiv. Inst. of America, Vol. V, No. 2, 1931.
33. Daglish, Eric Fitch. The life story of birds. Morrow, New York.
34. Davie, Oliver. Nests and eggs of North American birds. 4th Edition, 1889.
35. DeKay, James E. Zoology of New York, Part III.
36. Ditmars, Raymond L. Reptiles of the world.
37. Ditmars, Raymond L. The reptile book. Doubleday Page, 1922.
38. Dugmore, A. Radclyffe. Bird homes. Doubleday & McClure, 1900.
39. Eaton, Elon Howard. Birds of New York. N. Y. State Museum, Mem. 12, 1914.
40. Eliot, Willard Ayres. Birds of the Pacific Coast. Putnam, 1923.
41. Finn, Frank. Bird behavior. New York, Dodd.
42. Fisher, A. K. Div. Orn. and Mamm. Bull. 3, 1893.
43. Fitzsimons, F. W. The natural history of South Africa, Birds, Vols. I and II.
44. Forbush, Edward Howe. Useful birds and their protection. 1907, p. 371.
45. Forbush, Edward Howe. The natural enemies of birds. Econ. Biol. Bull. No. 3, Mass. State Board Agric., pp. 40-46.
46. Force, Edith R. The amphibians and reptiles of Tulsa County, Oklahoma and vicinity. Copeia, 1930, No. 2.
47. Friedmann, Herbert. The Cowbirds. Springfield, 1929, pp. 259-260.
48. Gabrielson, Ira N. Bird Lore, 24, p. 137.
49. Ganier, Albert F. Bird Lore, 2, 1900, p. 89.

50. Garman, H. A synopsis of the reptiles and amphibians of Illinois. Bull. Ill. State Lab. of Natural History, Vol. 3, 1892.
51. Gignoux, Claude. Shrike attacking snake. Condor, XXIX, 1927, p. 75.
52. Gilmore, Esther E. Manuscript.
53. Gloyd, Howard Kay. The WILSON BULLETIN, Sept., 1925, p. 141.
54. Greenwich Bird Protective Society, 1st Ann. Rpt. Greenwich, Conn., 1915.
55. Guthrie, J. E. The snakes of Iowa. Agr. Exp. Sta. Iowa State College, Bull. 239.
56. Hay, O. P. The Batrachians and Reptiles of the State of Indiana.
57. Henderson, Junius. Practical value of birds, 1927, p. 227.
58. Holt, Ernest G. Copeia, Dec., 1929.
59. Howell, Arthur H. Birds of Arkansas. U. S. D. A. Biol. Surv. Bull. 38, 1911.
60. Howell, Arthur H. Some game, birds, and fish of Alabama. Dept of Game and Fisheries of Alabama, 1925.
61. Hume. Nests and eggs of Indian birds. 2nd Ed. V. 1.
62. Hunter, J. S. Osprey, IV, 1900, p. 173.
63. Hurter, Julius, Sr. The Herpetology of Missouri. Trans. Acad. Sci. St. Louis, XX, 1911.
64. Ingersoll, Ernest. The wit of the wild. 1906.
65. Ingersoll, Ernest. Birds of Legend, Fable and Folklore. Longmans, 1923.
66. Jaeger, Edmund C. Denizens of the desert. Houghton, 1922.
67. Judd, Sylvester D. U. S. Biol. Surv. Bull. 17, 1902.
68. Judd, Sylvester D. U. S. Biol. Surv. Bull. 9, 1898.
69. Keller, Mrs. F. J. N. O. U. Letter of Information, No. 44, p. 8.
70. Klauber, L. M. Some observations on the rattlesnakes of the extreme southwest. Bull. Antiven. Inst. of America, Vol. 1, No. 1, March, 1927.
71. Law, J. Eugene. Condor, 25, 1923, p. 179.
72. Linsdale, Jean M. Univ. Kansas Sci. Bull., XVIII, No. 11, Apr., 1928, p. 557.
73. Loveridge, A. Notes on snakes and snake-bites in East Africa. Bull. Antiven. Inst. of America, April, 1928.
74. Lucas, A. H. S., and LeSouef, W. H. D. The Animals of Australia. 1909.
75. Lyon, W. I. The WILSON BULLETIN, 39, Sept., 1927, p. 186.
76. McIntosh, Franklin Gray. Bird Lore, 24, 1922, p. 152.

77. McAtee, W. L. Food habits of the mallard ducks of the United States. U. S. D. A. Bull. 720, 1918.
78. McAtee, W. L. Nature Magazine. Feb., 1930, p. 113.
79. McLean, Donald D. The owls of California. Teachers' Bulletin, Calif. Fish and Game Commission, No. 10, 1928.
80. Marshall, W. A. Bird Lore, 1921, p. 304.
81. Merrill, James C. Notes on the ornithology of southern Texas. Proc. U. S. National Museum, 1878.
82. Mitchell, S. Weir. Researches on the venom of the rattlesnake. Smithsonian Rept., 1860.
83. Morris, Robert T. Bird Lore, 27, 1925, pp. 253-254.
84. Morse, Max. Batrachians and reptiles of Ohio. Ohio State Univ. Bull. Series 8, No. 18, 1904.
85. Myers, Harriet Williams. Western Birds. 2nd Ed. Rev. Macmillan, 1923.
86. Nauman, E. D. Bird Lore, XXXI, 1929, pp. 330-331.
87. Neff, Johnson A. Oologist, 29, 1924, pp. 117-118.
88. Netting, M. Graham. Cardinal, Vol. II, No. 2, July, 1927, pp. 25-29.
89. New International Encyclopedia. 2nd Ed.
90. Nicholson, Donald J. The WILSON BULLETIN, 41, 1929; 42, 1930.
91. Over, William H. Amphibians and reptiles of South Dakota. S. Dak. Geol. Nat. Hist. Surv., Bull. 12, 1893.
92. Over, William H. and Thoms, Craig S. Birds of South Dakota. S. Dak. Geol. Nat. Hist. Surv. Series XXI, No. 9, 1921.
93. Palmer, Ray, and Westell, W. Percival. Pests of garden, orchard, farm, and forest. Drane, London, 1922.
94. Pearson, T. Gilbert. Birds of North Carolina by Brimley, C. S. and Brimley, H. H.
95. Pycraft, W. P. A history of birds. Methuen & Co., London, 1910.
96. Roddy, J. Hustin. Feeding habits of some young Raptores. The Auk, V, 1888.
97. Ruthven, Alexander G. Variations and genetic relationships of the garter snakes. Smithsonian Inst., U. S. N. Museum, Bull. 61.
98. Ruthven, Alexander G. A collection of reptiles and amphibians from southern New Mexico and Arizona. Amer. Mus. Nat. Hist., Vol. 23, 1907.
99. Ruthven, Alexander G. The reptiles of Michigan. Mich. Geol. Biol. Surv. Publ. No. 10, 1912.
100. Saintleven, August. A Texas Pioneer. (Quoted by Crimmins (32)).

101. Schaeffer, J. Parsons. *Bird Lore*, 8, 1906, pp. 137-8.
102. Schmeil, Otto. *Introduction to Zoology*. A. and C. Black, London, 1901.
103. Seiler, Lydia Joanna. *Bird Lore*, 29, 1927, p. 189.
104. Simpson, R. B. *Oologist*, 29, 1912, p. 402.
105. Smith, Francis Gow. The snake, Brazil's national problem. *World's Work*, 1926.
106. Spencer, Hugh. *Bird Lore*, 30, 1928, pp. 108-110.
107. Stebbing, Edward Percy. *A Manual of Forest Zoology for India*. Government Printing, Calcutta, 1908.
108. Stejneger, Leonhard. The poisonous snakes of North America. *Rept. U. S. Nat. Mus. for 1893*.
109. Stejneger, Leonhard. The reptiles of the Huachuca Mts., Arizona. *Proc. U. S. Nat. Mus.*, XXV, 1902.
110. Stoddard, Herbert L. *Progress on Cooperative Quail Investigations*, 1924.
111. Strecker, John K. On the use, by birds, of snakes' sloughs as nesting material. *The Auk*, 1926, pp. 501-507.
112. Storer, D. Humphreys. *Reptiles of Massachusetts*. Zoological and Botanical Survey, Mass., 1839.
113. Stull, Olive Griffith. A revision of the genus *Tropidophis*. *Occasional Papers, Univ. of Mich.*, No. 195, Oct. 1, 1928.
114. Surface, H. A. The serpents of Pennsylvania. *Penn. State Dept. of Agr. Monthly Bulletin*, IV, 4 and 5, 1906.
115. Thorburn, Archibald. *British Birds*, Vol. II.
116. Touissant, Mrs. L. H. *The Bluebird*, Vol. VII, No. 8, May, 1915.
117. Trine, Mrs. George. *N. O. U. Letter of Information*, No. 50, p. 4.
118. Van Denburgh, John. The reptiles of the Pacific Coast and Great Basin. *Occ. Papers, Calif. Acad. Sci.*, Vol. V, p. 172.
119. Whitaker. *Birds of Tunisia*. London, 1905, Vol. 1.
120. Wilson, Alexander, and Bonaparte, Charles Lucian. *American Ornithology*.
121. Wilson, Ralph R. *Bird Lore*, XXV, 1923, p. 124.
122. Wood, J. G. *Illustrated Natural History*. Routledge, 1869, Vols. 2 and 3.

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