

## NOTES ON NESTING PIGEON HAWKS AT PIMISI BAY, ONTARIO

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**D**URING the years 1946, 1947 and 1948 Pigeon Hawks, *Falco columbarius*, resided on a hill at the south end of Pimisi Bay. In 1945 Pigeon Hawks were also sighted in the same neighbourhood during spring and summer and, in all likelihood, nested in the area. While the presence of these falcons during 4 years in the same place indicates that it may have been the same pair returning each year, the male of 1948 was decidedly a darker bird than the one seen in 1947.

In 1946 my observations, covering parts of the townships of Bonfield and Calvin, District of Nipissing, disclosed an unusual number of nesting pairs where previously the species only occasionally had been noted. In 3 different localities I saw groups of juveniles at a time when their presence there could only mean that they had been reared not far from these places.

In 1945 the first Pigeon Hawk was seen on May 14 and the last on September 3, in 1946 the dates were May 17 and August 13, in 1947 April 23 and October 2, and in 1948 April 7 and October 5.

### HABITAT

At Pimisi Bay, which is halfway between North Bay and Mattawa in central Ontario, the falcons' nesting grounds were located about a quarter of a mile south of the Trans-Canada Highway. To the north and east, with the exception of our home, the land is practically uninhabited. To the south, on the other hand, the Canadian Pacific Railway skirts the nesting hill and not a full mile farther on the country becomes quite densely settled with one small farm beside the other.

In general the region is rough and rocky. Its main lakes and rivers constitute an extension of the Ottawa-Mattawa river waterway and the rolling hills beyond are the northwestern end of the Laurentians. After many fires and extensive lumbering, it is now reforested by mixed second growth. The edges of these woods along clearings, creeks, rivers and lakes provide excellent nesting grounds for wood warblers, thrushes, woodpeckers and other forest-dwelling birds.

The hill that the falcons selected for their nesting was burnt over 14 years ago and a stand of dead pine trees was left, crowning the hilltop. In these the birds found the ideal perching which, according to most observers (Bent, 1938), seems to influence their choice of territory. Another circumstance, which coincides with the observations of John and Frank Craighead (1940: 241),

was that the hawk nests, both in 1947 and 1948, were close to water, in neither case more than 75 feet from the shore of Pimisi Bay.

#### NESTING

In 1947 I found the first nest only after the young had left. The finding of a  $\frac{7}{8}$  inch pellet beneath it and the presence of flying young still being fed by their parents in the burnt-out pines just above it, established the identity of the nest beyond much doubt. It was located in a white spruce, *Picea glauca*, about 35 feet from the ground and lodged in a very bushy part of the tree, thus well concealed from all sides and from above. The tree stood at the foot of the hill on the east side and was closely surrounded by two or three of its own kind.

In 1948 the nest was found in a white pine, *Pinus strobus*, which stood on a shelf farther up the hillside, about 40 feet from the old site. The spruce had fallen during the winter and nothing was left of the earlier nest but a few scattered sticks. Both nests were built just above the middle sections of the trees, whereas the Craighead brothers (1940: 241-242), found all of their many nests located near the top, except one which was near the ground.

The new nest was built on the south side of the tree, against the trunk and supported by three stout branches, and also this time the birds had chosen the bushiest part of the tree. It was  $39\frac{1}{2}$  feet from the ground and measured 35 inches in diameter with 5 inches inside depth. The nesting tree was the tallest and branchiest tree of the hillside and it stood alone on its rock shelf with scattered red pines, *Pinus resinosa*, at some little distance from it. It commanded a far view over the sheltered south bay of the lake and distant hills. To the north, a distorted tree, the remains of a *Populus grandidentata*, clung to the rocks; it sometimes served the female hawk as a landing perch on her flights to and from the nest and, occasionally, as a plucking anvil.

#### BEHAVIOUR AT THE NEST

The general pattern of the Pigeon Hawk's nesting behaviour has been rather fully described elsewhere, by Bent, (1938) in his life history of the Eastern Pigeon Hawk and by the Craigheads, (1940) in their paper, "Nesting Pigeon Hawks," and it seems unnecessary to discuss here points other than those which differ or have not been mentioned in detail in the above publications.

The male of this particular pair was not seen feeding the young. During my watches, this was done by the female only. Nor was she observed to go hunting on her own until the male disappeared when the young were about 11 days old. Up to this time, the male was seen to bring all the food, both for the female and the young.

After feedings, an hour's rest for the hunting male was almost a rule, when it would perch in the top of a burnt-out pine, immovable like a sphinx. Occasionally, particularly during incubation when less food was required, the rest

periods would extend even longer, two hours or more, when motionless perching might be interrupted by some preening or an odd flight out over the land in territorial defense.

At first the time occupied in the actual feeding of the young was on an average 5 minutes, depending on the size of the prey, up until the hawklets were about a week to 10 days old. During this time the prey brought in was usually small or, if it were larger, the female would sometimes eat part of it before she brought it to the nest. After this, the prey increased in size and then some of the feedings I witnessed took as long as from 25 to 35 minutes. A curious note came from the female while she was feeding and when she fed the young, a sharp "tick . . . tick . . . tick", quite audible from where I sat some 50 feet away. In the beginning I thought this was a kind of clicking noise of the beak, but as it did not seem to coincide with the movements of the bill it must have been a note coming from the bird's throat. When given at the nest it evidently stimulated the eager anticipation of the young.

There would be many reasons to suppose that the home territory of a raptor like the Pigeon Hawk would be a place shunned and deserted by other bird-life. But, to my surprise, I soon found that the small birds nesting near or within the hawks' territory were, and apparently remained, quite safe. In the course of time I recorded the following species nesting in the immediate vicinity: Nashville Warbler, *Vermivora ruficapilla*, Myrtle Warbler, *Dendroica coronata*, Canada Warbler, *Wilsonia canadensis*, American Robin, *Turdus migratorius*, Olive-backed Thrush, *Hylocichla ustulata*, Veery, *Hylocichla fuscescens*, Red-eyed Vireo, *Vireo olivaceus*, White-throated Sparrow, *Zonotrichia albicollis*. Of these, the Nashville Warbler had a favourite singing perch not 50 feet from the hawks' nest; the Myrtle Warbler male had a feeding ground laid out through the red pines immediately south of the nest; the Olive-backed Thrush successfully reared two young in a willow just below the shelf where the hawks' nesting tree stood; the White-throated Sparrow conducted a party of young just out of the nest through the bushes in full view of the female hawk perched on guard; the Robins repeatedly attacked the hawks with such fury that the birds of prey wobbled on their lawful perches, without lifting a wing to counter-attack.

Apart from the resident birds, small birds passing through the territory, such as Chimney Swifts, *Chaetura pelagia*, Cedar Waxwings, *Bombycilla cedrorum*, and Black-capped Chickadees, *Parus atricapillus*, also seemed to be safe. At any rate, I failed to see either the male or the female falcon take after and chase them, although the small birds sometimes passed uncomfortably close to the hawks' nest. A young Hairy Woodpecker, *Dendrocopus villosus*, on the other hand, once shone too brightly in the female falcon's eye. Whether or not, in this case, she intended to kill the woodpecker was hard to determine; her dash after it was business-like enough, but her failure

to capture the surprised and inexperienced youngster gave me the impression that her pursuit was more in the nature of a chase.

Birds the falcons obviously regarded as enemies were a Great Blue Heron, *Ardea herodias*, Crows, *Corvus brachyrhynchos*, and Hawks, *Buteo platypterus* for instance. The size of these birds seemed to be a factor in releasing the defense reaction in the small falcons. When espied half a mile away, like irate hornets the falcons dashed off, screaming, to route the intruder. By means of vicious diving attacks this was done in short order; none withstood the surprise and fierceness of the falcons' onslaught.

Squirrels and chipmunks, running freely around on the hilltop, seemed to be largely ignored like the smaller birds; but towards the larger mammals, into which category man might be included, unless overly provoked, the hawks generally adopted a defensive attitude. Once my dog, an English setter, came looking for me in my blind and the female, incubating at the time, immediately left the nest and perched on guard in the top of a nearby tree. Whenever the animal moved she followed screaming and so long as it remained on the hill the hawk did not return to the nest. My own watches were invariably spoiled as soon as the birds detected my presence and, no matter how long I then remained, they would not resume normal activities but perched on guard and screamed each time I moved. One day the female saw me coming when I was still far away and began screaming. I dove into the bush and, thinking I could fool her, hid, waiting for a while, and then made a long and laborious detour through a swamp and a dense thicket until I came to a point where I could overlook the situation. To my discomfiture I found the hawk perched in a dead tree above the thicket I had just crawled through and, a second later, she alighted screaming behind me. My entire manoeuvre was as plain to her as if I had walked through a clearing, and that day's watch was in vain. Certainly, this bird showed herself more suspicious and, in agreement with Craig-head brothers (1940: 243), more aggressive than the male, especially when I approached the nest too closely. On such occasions she exhibited great excitement, screamed, dove at me headlong with anything but faked fury, while the male, with a timidity quite inconsistent with his defense behaviour towards birds larger than himself, kept at a distance and only screeched his accompaniment as the female's agitation reached a high pitch, or dashed after her in sympathetic pursuit as her gyrations brought her to the wings of the stage.

#### HUNTING

All the hunting that I had the luck to witness was not closer to the nest than a quarter of a mile and many times I saw the falcons go hunting at far greater distances.

Twice I saw the male hunting at twilight. One time he came streaking along the highway just at the edge of the woods. Suddenly he dashed in amongst the

trees and, an instant later, he reappeared with the prey in his talons. He flew into a dead tree where he devoured it, its tousled feathers slowly floating down upon the still air. That even so fleet a hunter as this falcon could have seen, caught and killed another bird in the gathering dusk of the thicket in that split second, seemed almost incredible. Another time, at sunset, my husband and I came upon the male perched in a dead tree. Just as we stopped to watch him, he flew out in pursuit of a fluttering creature which, at first, we mistook for a bat. After some magnificent manoeuvring the hawk caught it on the wing and then returned to his perch to tear it to pieces. One of its wings fell to the ground. It was the wing of a *Polyphemus* moth.

My banding station was occasionally the scene of the falcons' hunting, but to my knowledge never with success. Once one of them came like a bullet towards my window, but within three feet of the pane it made a neat right-about turn and the chickadees scattered safely under cover. Another time I stood watching a White-throated Sparrow feeding five young. The next instant the hawk whizzed past, so close that I felt the wind of its wings on my cheek. It missed every one of the sparrows all colour-banded, which "froze" within inches of the feathered projectile.

On two occasions I happened to be in at the kill. A pair of Eastern Kingbirds, *Tyrannus tyrannus*, were feeding young, 3 days old, in a nest built at the very top of a tall spruce—the most obvious nest tended by the most conspicuous birds of the neighbourhood. The falcon came in from the lake in headlong flight, having from afar espied the female Kingbird on her way to the nest with food. Her mate, just after feeding the young, sat on a twig above the nest. Instantaneous dodging saved the female and, with a force that rocked the sprucetop, the falcon gripped the edge of the nest instead of the bird. The kingbirds, oddly inefficient, screamed and flitted around the hawk which defended itself merely by raising its wings. The hawk looked into the nest, apparently took a young in the beak and flew back with it to the hill. The whole thing happened with such lightning speed that it was only when I later computed the details of my notes and found the abruptly lowered rate of feeding that I realized the full truth of what had taken place. Two days afterwards, all the young disappeared and I can hardly suspect anyone else but the Pigeon Hawk.

The second time, I was watching a pair of Blackburnian Warblers, *Dendroica fusca*. The nest, also this time, was high up in the top of a tree and contained young, 5 days old. The female had been picking mayflies in the neighbouring tree and was flitting back to the nest when the hawk literally nailed the small bird to the nesting branch. The next second the hawk was gone and the following day, in spite of the father's continued feeding, the young warblers died from lack of motherly care and brooding.

In his life history of the Eastern Pigeon Hawk, Bent (1938: 79) quoted Brew-

ster's description of a Pigeon Hawk pursuing a Blue Jay, *Cyanocitta cristata*, which eluded capture by "dropping into a treetop, where the hawk did not attempt to attack it." In the two instances cited above, it may be noted that the hawk did not hesitate to descend into the treetops when capture on the wing proved incorrectly timed and, in the case of the kingbird, the hawk substituted on the spur of the moment the prey first aimed at but missed by another less elusive victim.

Undoubtedly the falcons thus wreaked havoc upon many nestings of the smaller birds. To make an accurate estimate of the predatory pressure they exercised upon the bird population around Pimisi Bay is, obviously, a difficult matter. The longer I watched the food habits of these hawks, the clearer it became what a surprisingly small quantity of food they actually required relative to their size and expended energy, probably due to the highly nutritious value of their diet. However, if it may be assumed on an estimate based on the feedings seen, 1 to 2 in 3 to 5 hours, and the amount of meat eaten by the young after capture, about 50 to 60 gr. a day by 2 hawklets, that each of the adult hawks, on an average, consumed 2 birds a day during 75 days and the young 3 birds a day during 50 days a total of 450 birds killed in 2½ months is reached. Had not the hunting grounds of the hawks extended over so wide an area, to a radius of at least a mile from the nest in all directions, the smaller bird population of a more restricted locality would certainly have been in danger of being wiped out.

On our lot of about 10 acres, a quarter of a mile from the hawks' nest, where I do most of my bird study, some data were obtained, which may partly be connected with the predatory pressure upon the birds breeding there. In 1947, of all nestings found in trees, 33.3% were known to have been interrupted by predatory birds which included Blue Jays, Crows and the Pigeon Hawks. Furthermore, it may be assumed that the nests abandoned for unknown reasons, 14.3%, belonged to birds which were the victims of depredation since, in most of these cases, the mate or mates in question were found to have disappeared unaccountably from their territories after the nestings were interrupted. The next year, 1948, a marked decline followed in the numbers of certain nesting birds, particularly noticeable in bright-coloured and tree-nesting passerines. For example, counted by nests found and singing males, in that year American Redstarts, *Setophaga ruticilla*, decreased from 5 to 1 pairs, Magnolia Warblers, *Dendroica magnolia*, from 4 to 1 pairs, Blackburnian Warblers from 3 to 1 pairs. Least Flycatchers, *Empidonax minimus*, which are not bright-coloured birds but apparently especially vulnerable to such hunting methods as those of the Pigeon Hawk because of their exposed flycatching habits and often rather obvious nests, decreased from 10 to 4 pairs in the same year. In 1947, only 1 of 8 Least Flycatcher nestings was successful and 3 interrupted by the disappearance of one or both of the mated birds. All 4 first nesting attempts

of 1948 were unsuccessful and, in two cases, I followed new nestings which also were interrupted for undetermined reasons. While I did not follow the nestings closely enough in 1948 to determine the exact causes of so much bad luck amongst the Least Flycatchers, I feel justified, at least in part, to put the blame on the Pigeon Hawks.

With birds nesting in holes in trees, such as woodpeckers and nuthatches, which are notoriously fair meat to the Pigeon Hawk, the picture presents itself somewhat differently. The area is a mecca for birds requiring nest sites in trees and stumps with soft cores and for comparative lack of treeclimbing predators these nestings are for the most part successful. Three pairs of Yellow-shafted Flicker, *Colaptes auratus*, nested here in 1946, but only one pair in 1947 and 1948 respectively, with a consequent decrease of flying young in these years during July and August. A notable decline in the numbers of Yellow-bellied Sapsucker, *Sphyrapicus varius*, took place as early as 1946 when pairs excavating nestholes were reduced from 3 to 1 and in 1947 there were none. On the other hand, 1948 witnessed a slight comeback of the species with 2 nesting pairs. Flying young after both these nestings were conspicuously absent, which may have been due to the death of some of the adult birds. The decline in Hairy Woodpeckers occurred in 1947, when nesting pairs were totally absent from the study area where two or three pairs had been breeding in previous years. Even an old colour-banded female, that had nested in the neighbourhood during 4 consecutive years, avoided the territory this season and no flying young were seen at any time. But in 1948 3 pairs, including the old female, produced an unusual number of young, of which 8 were banded. The same year saw a notable increase of from 1 to 3 pairs of Downy Woodpecker, *Dendrocopus pubescens*, and from 0 to 4 pairs of Red-breasted Nuthatches, *Sitta canadensis*, with a fifth pair nesting a little outside the area. In due time, most of these pairs appeared with flocks of flying young.

Although these variations in the numbers of breeding birds doubtless reflected other causes as well, a point in evidence is that, in one way or another, a compensating balance was obtained within the bird population itself, which, in the end, counteracted whatever predatory pressure may have existed upon it as a whole.

Of the prey seen in the talons of the hawks I was able to identify a mature male Purple Finch, *Carpodacus purpureus*, and the freshly severed head of a male Scarlet Tanager, *Piranga erythromelas*, was found shortly after the female hawk had been seen devouring the prey on the perch above—both species bright-coloured and tree-nesting birds. In the nest, half buried in a heap of dried excrement, the following remains were found: the leg of Cowbird, *Molothrus ater*, the right leg of Blue Jay, the left leg of Yellow-bellied Sapsucker, 2 left legs and the left wing of Yellow-shafted Flicker.

## BEHAVIOUR AND DEVELOPMENT OF THE YOUNG

The young hatched between June 23 and 29. Judging by their size and ability to move about when I first saw them on June 29, I calculated that they hatched on or about June 24.

I can add little to the Craighead brothers' excellent description of the young at feeding time, (1940: 244). In the nest at Pimisi Bay the 3 hawklets usually ranged themselves in a row before the female, the two largest to the left and the smallest to the right. The largest ones seemed to get the lion's share of the food, probably because they reacted more readily to the female's short quick thrusts with which she offered them the pieces of meat torn off the prey. Between feedings the young were generally quiet, but when the parent bird approached and a meal was in the offing they gave voice to their impatience with a sharp "keeyep-keeyep-keeyep-keeyep" which was quite as peevish as the adults' piercing cry, "keeyick-kyick-kyick-kyick-kyick." As the young grew older they moved about a great deal, taking little runs across the nest, flapping their wings and pushing each other, preening their thick coats of down, or fighting off swarms of small yellow wasps and bumblebees, which were attracted to the nest by the fleshy remains of the hawks' meals.

On July 5, the male hawk disappeared and the female alone was hunting and feeding the young. I suspect he had been shot either near the nest or while visiting some nearby farm. The next day a Crow alighted on the rim of the nest. The young whined and crouched down into the bottom of the nest. I must confess to a not altogether involuntary movement which scared the crow away. I expected, however, that the Crow, knowing where a good meal was to be had, would repeat the visit at a more opportune moment, but for some reason this never happened or the female may have been there to prevent calamity.

On July 12 the female apparently shared the fate of her mate. I waited in vain for her return and, finally, decided to save the young.

The rescue was achieved without incident. The young hawks threw themselves on their backs at our approach, ready to fling out their talons in self-defense, but at the age of approximately 18 days they had not yet acquired enough strength to inflict injury.

Covered with faintly bluish pearl-grey, thick, woolly natal down and with their eyes surrounded by bare skin which joined the cere at the base of the beak, like goggles, they looked like masked dolls whose droll air of defiant solemnity in a helpless situation only enhanced their goblin affinity. At this time, the two largest ones were fast losing their down and their feathers were beginning to sprout, creamy buff with dark brown, almost black, stripes on the breast, black-brown on the back, particularly on the shoulders, dark slaty brown edged with cream-buff on the tail, dark brown margined with light buff on the wings which, when spread, showed rounded cream-buff markings. The cere was

lemon-yellow with a faint tinge of greenish towards the forehead, the featherless eye-ring greenish-yellow, the iris of the eyes brown, and their legs bright yellow.

Weights and measurement were as follows:

<i>No. 1 hawklet</i>		<i>No. 2 hawklet</i>		<i>No. 3 hawklet</i>	
Weight.....	161.7 gr.	Weight.....	165.2 gr.	Weight.....	105.9 gr.
Length.....	217 mm.	Length.....	203 mm.	Length.....	168 mm.
Wing.....	119 mm.	Wing.....	122 mm.	Wing.....	92 mm.
Tail.....	66 mm.	Tail.....	52 mm.	Tail.....	42 mm.
Tarsus.....	42 mm.	Tarsus.....	46 mm.	Tarsus.....	42 mm.
Ex. Culmen....	10 mm.	Ex. Culmen....	11 mm.	Ex. Culmen....	10 mm.

We fed the young raw meat and liver which they seemed to take quite readily. C. B. Schaughency and his wife of East Orange, New Jersey, who helped me feed them, discovered that the best way to release the gaping reaction was by offering the food with fast jerky movements, similar to the female's way of feeding them. When the food was given slowly and gently the hawklets did not seem to see it but threw themselves backwards in a defensive attitude.

Unfortunately I had to leave home on July 14 and my husband kindly took over the care of the hawks. Since his work necessitated his being away all day and as he was unable to procure fresh meat, he left a dish of canned dog-food in the cage during his absence. The hawks soon learned to feed themselves and the two largest apparently throve on the unnatural diet, but the smallest one died the day before my return, 8 days later.

At this time the hawklets were already fully feathered. Nothing remained of their natal down except a fringe of fuzz at the tip of the feathers on the shoulders and on the crown where it remained longest, like the soft frill of a bonnet. As I opened the cage to feed them, No. 2 hawklet, which, judging by the length of the tarsus, probably was a female and always proved the most precocious of the two, flew out in a flight of about 100 feet. It landed on the trunk of a pine where it clung for a few moments, then flew about 25 feet up in a tree. There it remained for a couple of hours, preening and observing the surroundings. In the evening it returned to feed at the cage, which henceforth was left open except at night. The hawklet did not remain there for the night but roosted in the tree above. Thus No. 2 left the nestcage at the age of about 4 weeks.

Three days later we banded both hawks. No. 2 was trapped as it came to the cage for food. After No. 1 was banded it remained in the cage for a couple of hours and only in the late afternoon it hopped out of its own volition and down on the ground, apparently still unable or unwilling to make as good a first flight as No. 2. It finally got up in a tree by relays and roosted there without coming down for supper.

The first week after the hawks left the cage they passed most of the day and roosted at night close to our home. During this time they indulged in consid-

erable screeching at feeding time or in play with each other and they often heralded my husband's return home at night by screeching.

I placed deer-mice and raw beef on top of the cage and both hawks came down to feed 3 to 4 times during the day. No. 2 mostly stood on the cage and fed while No. 1 grasped the piece of meat in the talons and flew off with it, devouring it on a branch.

At the age of about 5 weeks, the hawks began to make training flights out over the lake and it was remarkable how fast they acquired agility and technique in flying. I removed the cage and placed the meat on a table. The hawks came to feed a little more rarely than during the first week. With a thud they alighted on the table, bobbed their heads, made a little run to grasp the meat and generally flew off with it in their talons. The meat still had to be cut up in small pieces; if the pieces were too big the hawks dropped them and would not pick them up again until replaced on the table.

At the age of 6 weeks, the hawks began to move away farther afield. Their screeching ceased almost entirely and their movements around the feeding place became silent and furtive. They made extensive training flights, mostly together, when they would wind in and out of each others' paths or chase each other at a fast clip. Feedings at the table now only occurred in the mornings or late in the evenings and it became clear that they must be supplementing these feedings with some hunting of their own. I was reasonably sure that they were not yet able to catch small mammals or birds since they were still dropping pieces of meat when too heavy and could not yet carry away a whole deer-mouse. My speculation on this matter was solved on August 9 when, for the first time, I watched their performance of flycatching, quite an amazing stunt by young hawks which had no parents to learn from and therefore relied entirely upon innate instinct. In a fluttering flight they rose above the tree-tops where insects swarmed these hot high-summer days, caught their prey by dint of twists and swoops, dropped back on to a branch in some dead tree, smote the prey to pulp and devoured it. By this time, the hawks had found their way back to their true home-grounds on the burnt hill and it was here at night that I now saw them most often.

Throughout the last weeks in August I saw them at different places, once as far as a mile from our home. They still returned for meat at the table. Now they no longer alighted but dove on the table, seizing the meat in passing with their talons. Once No. 2 dropped a piece on the upswing and deftly recaptured it in mid-air. Gradually, their visits became rarer, sometimes with several days in between until, on August 29, both perched above the feeding table, looking down for a last meal.

On September 2, I encountered one of them hunting in a place where a pair of American Goldfinches, *Spinus tristis*, were feeding young just out of the nest. The goldfinches behaved with obvious distress and soon afterwards were seen departing with at least one of their young missing. Thus I drew the conclusion

that the young falcon had, at last, fully graduated in the hunting techniques of its species.

#### SUMMARY

A resume is presented of notes on Pigeon Hawks which nested in the same place at Pimisi Bay, Ontario, during at least three years in succession. The habitat was a burnt-over hill near the lake and the nests found were placed a little above the middle-sections of coniferous trees.

The male falcon did most of the hunting and brought food to the female which, in turn, fed herself and the young. The hunting hawk usually took at least an hour's rest before going out on another hunting trip. Small birds and mammals on the hawks' nesting territory were apparently ignored, but larger birds and mammals were not tolerated. It is indicated that the hunting pressure of the hawks upon the smaller bird population was counteracted by two main factors, the extension of their hunting grounds and what seemed to be compensating fluctuations within the bird population itself.

The young hawks, raised by hand for a week after their parents' disappearance, left the nest cage at about 4 weeks of age and reached full independence about 5 weeks later.

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