

THE HAWK MIGRATION DURING THE FALL OF 1934, ALONG
THE KITTATINNY RIDGE IN PENNSYLVANIA.

BY MAURICE BROWN.

Plate IX.

UNTIL recent years the extensive fall migrations of Hawks along the Kittatinny Ridge appear to have been unknown to ornithologists. Yet each year, over a long period of time, hunters have taken heavy toll of the migrating Hawks at a number of places along the ridge, which follows a northeast and southwest course for hundreds of miles from northern New Jersey to the southern states.

By far the most popular shooting grounds along this migratory highway were located between the villages of Eckville and Dreherstown, in east-central Pennsylvania. The U. S. topographic maps give the name of "Blue Mountain" to a large section of this part of the ridge. Hunters gathered here in large numbers—as many as 150 to 200 on a Sunday, and perhaps half as many on a week day—throughout the period of Hawk migration, which extends from late August to December. Many of these men came from points a hundred miles or more distant, so attractive was this "sport" to the hunting fraternity.

The result was an appalling slaughter. The victims were rarely retrieved—merely left to rot, and if wounded, to die a lingering death, and eventually all were consumed by four-footed scavengers. It has been estimated conservatively that from 3,000 to 5,000 birds of prey were killed each fall. The number was undoubtedly much larger before the depression. Hunters with whom I discussed the situation expressed the view that during the last two or three years less than a quarter of the numbers of Hawks went by as did ten years ago. Most of the men interviewed said that these "Hawk-shoots" had been going on for over twenty years. During the past few years they had been well advertised in local sportsmen's organizations by a couple of enterprising business men in a nearby city. Each fall these men drove a truck-load of ammunition up the mountain and made a small fortune selling their wares at much-reduced prices. Other men, equally anxious to profit, gathered and burned the used shells, in order to salvage the brass for whatever mintage they could get!

The earliest published information that we have in regard to the Hawk migrations, is found in an interesting paper by George M. Sutton, in which the author tells of a visit to the mountain (above Dreherstown) on October 19 and 20, 1927. Data are presented concerning plumage differences, weights, and stomach examinations of 158 Hawks of four species, all col-

lected in a remarkably short period of time.¹ During the fall of 1932, R. H. Pough,² and H. H. Collins, Jr.,³ made several visits to the region, making extensive investigations into the Hawk destruction. For a very full and graphic account of the devastation, the reader is referred to Collins' article. The first definite information concerning the nature and extent of the local Hawk migrations is found in a brief, but comprehensive paper by Earl L. Poole⁴ who has been familiar with the locality for a number of years.

In the late summer of 1934, before the Hawks began to appear in appreciable numbers, this shooting paradise of the hunters was turned into an inviolate wild life sanctuary, thanks to the active interest and initiative of Mrs. C. N. Edge, of New York City. Mrs. Edge acquired control of 1393 acres of the mountain, the heart of which property held the Hawk shooting-stands. The writer was directed by Mrs. Edge to supervise the sanctuary, and as far as possible to make daily observations of the Hawk migration.

I arrived at "Hawk Mountain," as it is known to the hunters throughout the region, on September 10. Hunters were already on the grounds. The following day "no trespassing" posters went up everywhere along the steep and difficult road that led to the former shambles. Meanwhile a series of notices appeared in all the local newspapers, apprising the sportsmen and hunters of the newly established refuge and the strict prohibition of all trespassing.

The reader may easily imagine the astonishment of the local hunters, and the opposition that precipitated. The farmers of the surrounding countryside were particularly hostile. Some of them made the preposterous claim that "the Hawks even carried off young pigs," as well as poultry. The sportsmen raised the usual hue and cry that the Hawks had depleted their game. Notwithstanding the outcries of the farmers I found large numbers of White Leghorns and other poultry roaming at large in the fields at the foot of the mountain. Rabbits, Quail, and Pheasants were very plentiful along the borders of the fields. The unusual numbers of Ruffed Grouse in these woods impressed me the most, however. Throughout September and early October they could be heard drumming almost everywhere. On October 1, I recorded 33 Grouse in different parts of the sanctuary.

My first three weeks at the sanctuary were spent in patrolling the road, fortunately the only approach, as all hunters came by automobile. From the amount of adverse discussion in the newspapers, and the rumors that circulated among the farmers in the immediate vicinity, I anticipated trouble

¹ Wilson Bulletin, 1928, pp. 84-95.

² Bird-Lore, 1932, p. 429.

³ Annual Report of The Hawk and Owl Society, Bull. No. 3, 1933, pp. 10-18.

⁴ The Auk, 1934, pp. 17-20.

daily. Only 53 gunners appeared at different times during this period, however, most of them having heard of the sanctuary but desirous of learning for themselves the *status quo*. On September 27 we secured the full-time services of Robert H. Kramer, a deputy-sheriff. Henceforth I was able to spend more time making observations of the flights. From September 10 to November 1, the opening day of the hunting season, we turned away 166 Hawk-hunters, and had no serious trouble in doing so.

The greatest part of the sanctuary lies in Berks County; the western and northern borders of the tract are in Schuylkill County. A rough, dirt road traverses the mountain from Dreherstown. Mounting this road a mile and a half or so to near the summit of the mountain, which is irregular and plateau-like at this point, one finds on the left a well-beaten path running northwards into the rocky woods for a distance of three-quarters of a mile. The path leads to a series of sandstone promontories which jut out along the ridge and form a striking part of the rugged topography. These promontories are the vantage points from which to observe the passing Hawks. Looking up the ridge, which in this region surprisingly enough runs east-northeast to west-southwest, one is deeply impressed by the steep flanks of the mountain, and its virtually razor-back crest. Scrub-oak and black birch, showing the effects of many forest fires, form the dominant tree growth. Interspersed among these are a few hemlocks, and great tangles of rhododendron and mountain laurel. A number of fine specimens of mountain ash (*Pyrus americana*) and of mountain holly (*Ilex monticola*) have found footing among the promontories. On the whole, the scene is that of a much-scarred wilderness, withal presenting one of the most magnificent views to be had anywhere in Pennsylvania.

An explanation for the autumnal flights of Hawks along this particular ridge, the most eastern of the Appalachian Chain, may be found, as pointed out by Poole, in the unbroken character of the ridge, and more specifically in the air-currents that are generated and forced upwards by the wind striking against the steep slopes. These currents of air enable the birds to coast for mile on mile; thus they enjoy easy transit to their winter feeding grounds.

The ridge above Dreherstown offers opportunities for field study of Hawks that cannot be surpassed. The reason for this is the extreme narrowness of this part of the mountain, thereby creating a focal point for the passing birds. Comparative ease of accessibility by automobile and by foot was a great point in its favor for the hunters. As the Hawks progress along the ridge and pass the promontories, alternately coasting or flapping, or circling a moment above the trees, one is keenly aware of the novelty of studying these birds from a position seldom if ever enjoyed by the average student in the field. Whereas the latter is obliged to look *up* to make

identifications, the observer at "Hawk Mountain" frequently looks *down* upon the birds, or sees them come head-on, sometimes on a level with his position. It is this condition which made the Hawks such easy targets and occasioned their wholesale slaughter.

A question frequently asked is to what extent, if any, do Hawks migrate along this ridge in the spring? We are not prepared to answer. Some hunters have given me a negative view. Others have maintained that the birds straggle up the valleys. At any rate, the hunters have never manifested an interest in the mountain in the spring, although this may be ascribed to dormancy of the desire to hunt. Obviously the only definite knowledge concerning the spring migration of the Hawks will be forthcoming when ornithologists essay to visit the ridge in late March or early April.

I spent approximately 306 hours making observations from the promontories, which by the way, are some 1506 feet elevation. On days of particularly good flights I held a vigil of from eight to nine hours. There is an almost continuous movement, from a few straggling birds on some days to really heavy flights on others, which may however, be of but two or three hours duration. Only when the weather is rainy or very misty is there any break in the migration. Thus, on October 24, a day of overcast skies during the morning, but clear weather with moderate northerly winds in the afternoon, only 10 birds were recorded: 6 Sharp-shins, 1 Red-tail and 3 Marsh Hawks. On October 31 the weather was not particularly favorable for Hawk migration; during seven and a half hours of watchful waiting 176 birds were seen: 21 Sharp-shins, 148 Red-tails, 4 Red-shoulders, 2 Marsh and 1 Turkey Vulture. Of these, 143 passed between 10 A. M. and 1 P. M.

During the early hours of the morning a few birds may always be seen loitering over the ridge, searching for food. By 7.30 or 8 o'clock, providing the weather is favorable, the first birds fly by the promontories. An hour later the flight is well under way. In regard to the time of day the birds pass through in greatest numbers, my observations tally fairly well with those of Poole, who in past years made some eighteen visits to the region. The maximum numbers usually pass during the forenoon, and again from 2 o'clock to about 4.30 o'clock, at which hour they may be seen settling down for the night. The mid-day lull in the migration is probably explained by a feeding and resting period of which the birds avail themselves. This condition is not invariable, however, as my records show a number of days when the hour between noon and 1 o'clock proved the best of the day. Notable instances occurred on October 15, 28, 30 and November 11. It may be of interest to present the lists for two days, in illustration of the foregoing remarks:

<i>Typical—October 25</i>		<i>Infrequent—November 11</i>	
11 Turkey Vultures	8- 9 A. M.. 12	4 Goshawks	8- 9 A. M.. 9
1 Goshawk	9-10.....27	15 Sharp-shins	9-10.....48
42 Sharp-shins	10-11..... 64	3 Cooper's	10-11.....31
5 Cooper's	11-12.....20	269 Red-tails	11-12.....27
115 Red-tails	12-1 P. M... 6	1 Red-shoulder	12-1 P. M...72
3 Red-shoulders	1-2..... 7	3 Golden Eagles	1-2.....34
4 Marsh Hawks	2-3.....35	1 Marsh Hawk	2-3.....46
1 Unidentified ..	3-3:30...11		3-4.....28
			4-4:30..... 1
-----		-----	
182 birds		296 birds	

According to Poole the earliest migrants, a few Sharp-shins and Broad-wings, arrive the latter part of August. I was able to observe no considerable flights of birds previous to September 23, owing to the close guarding that was necessary on the road. So far as I know, no large flights occurred until September 17, a day of clear, warm weather, with brisk winds from the north. I was informed by two gunners who were on the ridge a few miles away, that they saw between 1500 and 2000 small Hawks pass over during that afternoon. I gathered from their descriptions that the birds were Broad-wings, the species which is expected in large numbers during the latter part of September. Had the wind come from a southerly quarter there is no doubt I would have seen these birds from my position on the road. Invariably when the wind is in that direction the birds pass along the south side of the ridge and cross the "kettle"—a large bowl-shaped area fronting the promontories—thus taking something of a short cut. Having crossed the kettle the birds pass over the road, usually near the summit, and continue on over the broadening back of the mountain, which at length takes a course that is more truly northeast to southwest. A case in point is the flight of Broad-wings that we witnessed from the road on September 23. Not a Hawk of any kind was seen until early afternoon. There had been no wind during the morning, but soon after mid-day light southerly breezes sprang up. Between 3 and 3.30 o'clock we counted 427 Broad-wings pass.

Large flights depend entirely on the weather conditions. As indicated in the chart, a cold, but not necessarily clear day, immediately after rainy weather, with strong winds from northerly quarters (preferably northwest) is most productive. For maximum number of species, I found the second week in October the best. During the nine day period from October 7 to 15, I recorded 16 species of raptores, as many as 13 species on a single day. The greatest numbers of Hawks may be looked for after freezing temperatures and snows have settled over eastern Canada and northern New England.

CHART. (Read across)

Sept. 12	49 Hawks, all flying very high. Partly cloudy; warm and moderate east wind.	Sept. 13-16	Light rains locally. Many showers and storms in North and Middle Atlantic States, and lower temps.*	Sept. 17	"1500 to 2000" Broad-wings (see page 237). Fair; warmer; brisk northerly wind.
Sept. 28	18 to 27 and Oct. 1 to 4—data incomplete.	Sept. 29	Heavy rains in North Atlantic States; no material change in temperature.	Sept. 30	128 Hawks of 9 species, flying low. Cloudy; light n. w. wind; temp. dropped 10°.
Oct. 5	13 Hawks, flying high. Clear; cool; light west wind.	Oct. 6	Rains in the Atlantic States; no change in temp.	Oct. 7	107 Hawks of 13 species, flying low. Cloudy; no change in temp.; strong n. w. wind.
Oct. 9	24 Hawks, flying quite high. Cloudy; raw east wind; temp. av. 55°.	Oct. 10	Heavily overcast and fresh east wind, locally. Rains in Quebec and n. New England; temp. dropping.	Oct. 8	192 birds of 10 species, flying low. Clear; warm; brisk n. w. wind.
Oct. 12	80 birds, at very great height. Clear; warmer; light s. e. wind.	Oct. 14	Rain in Quebec and most of New England and New York. Weather in e. Penna. clear with freezing temperatures and strong n. w. wind. 258 Hawks of 9 species, flying low, generally.	Oct. 11	257 Hawks of 12 species, all flying low. Clear; colder; brisk n. w. wind.
Oct. 13	369 birds of 13 species, all passing very high. Fair; cold; strong n. w. wind. Rain and snow in n. New England.			Oct. 15	255 Hawks of 11 species, all flying low. Indian Summer weather; moderate n. w. wind.
Oct. 13	125 birds of 8 species, flying very high. Fair; cold; strong n. w. wind.				

* The records of the U. S. Weather Bureau were consulted in the preparation of this chart.

- Oct. 16 113 Hawks of 8 species, generally very high. Indian Summer day; light s. e. wind.
- Oct. 17 Cloudy and heavy mists locally, and moderate s. w. wind; only 9 birds seen. A disturbance over the Great Lakes, and cold weather in central Canada, otherwise fair weather prevailed in the eastern States.
- Oct. 19 189 Hawks of 8 species, all flying very high. Clear; cool; brisk n. w. wind. Fair in the north.
- Oct. 20 51 Hawks of 9 species, flying quite high. Clear; colder; moderate n. w. wind.
- Oct. 23 Hawks passing at great height. (See notes above).
- Oct. 25 Hawks flying low during A. M., usually high during P. M.
- Oct. 18 535 Hawks of 8 species, all flying low. Cloudy; warm; light n. e. wind. Lower temps. in n. New England, and relatively low pressure over eastern Quebec and New Brunswick.
- Oct. 23 571 birds of 9 species, nearly all passing high. Lowering weather; temp. dropping; strong n. e. wind. Rain in New England, New York and Quebec.
- Oct. 25 182 birds of 7 species, flying low in A. M. Fair; warm; moderate s. e. wind. No change in the north.
- Oct. 28-30 Over 200 Hawks each day, mostly Red-tails, flying low. Generally cold and cloudy, with fresh n. w. winds during this period. Unimportant weather changes in eastern States.
- Oct. 21 Rain in North Atlantic States and showers locally.
- Oct. 22 Rain in the North Atlantic States and s. e. Canada, with low over entire region.
- Oct. 24 Lowering weather; warm; moderate n. wind. Clear in the north, but lower temps.
- Oct. 26 Rains and falling temps. in North Atlantic States.
- Oct. 27 Rains and snows in northern Appalachian region and the North Atlantic States. A pronounced low over New Brunswick.

- Oct. 31 176 Hawks, mostly Red-tails, flying at varying levels, some very high. Lowering weather; no change in temp., moderate west wind.
- Nov. 3 P. M. Fair; warm; moderate s. wind. Rising temps. in eastern States.
- Nov. 5 Hawks passing at very great height. Clear and mild; light s. w. wind, locally.
- Nov. 6 All Hawks flying high; usually rapidly.
- Nov. 9 39 Hawks, mostly Red-tails, all flying high. Clear; slight drop in temp.; moderate n. w. wind.
- Nov. 12 Hawks flying high generally. Light snow in North Atlantic States.
- Nov. 1 Rain and falling temps. in North Atlantic States. A disturbance over e. Quebec. Low over s. e. New York. In eastern Penna. clear after mid-day.
- Nov. 4 Rain and rising temps. in North and Middle Atlantic States, with considerable disturbance above Gulf of St. Lawrence.
- Nov. 5 A disturbance over North Atlantic States, attended by rain in southern New England, but no change in temp.
- Nov. 7 Light rains in the North Atlantic States, with low pressure area centering over New Brunswick.
- Nov. 10 Rains in northern New England and in the Appalachian region. Low pressure area across Great Lakes, moving eastwards.
- Nov. 13 Snow in northern Appalachian region and New England.
- Nov. 1-3 641 Hawks on 1st, 1013 on the 2d, mostly Red-tails, and flying low. Freezing temps. and strong n. w. winds prevailed. 375 Hawks on the 3d.
- Nov. 5 A straggling movement of only 63 Hawks, occurring mainly in P. M.
- Nov. 6 258 Hawks, mostly Red-tails, flying high. Cloudy; slight drop in temp.; brisk n. wind. Rain in n. New England.
- Nov. 8 59 Hawks, all flying very low. Fair; warmer; light w. wind. Fair weather over all eastern States.
- Nov. 11 296 Hawks, mostly Red-tails, flying low generally. Cloudy; colder; strong n. w. wind. Low over n. New England, and much colder.
- Nov. 12 440 Hawks, mostly Red-tails, flying high generally. Cloudy, with occasional snow squalls; freezing temps. and strong n. w. wind.
- Nov. 14 45 Hawks, mostly Red-tails. Fair; very cold; strong n. w. wind. Migration has definitely begun to peter out.

We have often heard rural folk claim that when the fire-flies are seen high in the air it is a sure token of approaching rain. I was not a little surprised to find that precipitation occurred soon after flights, during which the Hawks were seen higher than two hundred feet or so above the promontories. There were a few days when buteos and accipiters alike travelled so high in the ether as to be barely discernible. Rain of course was not necessarily local, but it was certain to fall elsewhere along the Appalachians or in New England. Thus the passage of high-flying Hawks, as influenced by atmospheric pressure or contrary winds, is succeeded by rains and falling temperatures, usually pronounced in the regions to the north, which in turn precipitate an exodus of birds of prey from those regions. The cyclic nature of the Hawk migrations is apparent in the accompanying chart. Of course there are exceptions to every rule; the only one that is demonstrable in our case is shown for October 16-18, when precipitation failed to occur anywhere in the region in question. It is interesting, nevertheless, that marked meteorological changes took place in the regions adjacent in the west.

As the reader will observe, there were relatively few days when the birds flew high, or well out of range of gun-shot. Undoubtedly during such flights many birds went by unnoticed. Bird students and conservationists may be grateful for just such migrations in the past, for all but these birds flying high were subject to the ceaseless barrage of the hunters. On the many days during my observations when the birds passed low along the ridge, from fifty to seventy-five per cent of the migrants might easily have been killed. Indeed, on some of his visits to the mountain in 1932, Collins estimated that half of the birds that went over were shot. It is quite plain, then, that if the Hawks flew low invariably, certain species would long have become extinct, or nearly so, in the eastern states.

It would be interesting to know how the Hawk flights at Cape May, N. J. compare with those along the Kittatinny Ridge. The migratory status of certain species may be found to offer sharp contrasts. For example, large flights of Pigeon Hawks occur at Cape May, according to many observers; which evidently explains the dearth of this species along the inland route. It is likely that the fall migrations of Hawks at Fisher's Island, N. Y., links up with the Cape May flights. We may safely assume that the bulk of the breeding Hawks of New England, eastern New York, and the easternmost parts of Canada, passes through these two migratory channels. The birds issuing from the western part of this region probably reach the Kittatinny Ridge, with a maximum altitude of 2,000 feet, *via* the Taconic Mountains on the New York-Massachusetts state line and the New York-Connecticut state line, thence along the Shawangunk Mountains, which begin in Ulster County, New York, and continue into New Jersey as the Kittatinny.

The following records of banded Hawks killed along the Kittatinny Ridge or in its general course are of interest in that they throw some light on the origin of some of the migrants. For use of the records I am thankful to Mr. F. C. Lincoln, of the Bureau of Biological Survey. Recoveries of banded Hawks are certainly meager. In this connection it may be recalled that of the thousands of Hawks that were killed above Dreherstown, rarely were any retrieved. All but the Golden Eagle were juvenals when banded.

<i>Species</i>	<i>Band no.</i>	<i>Locality</i>	<i>Date</i>	<i>Bander</i>
1. Red-tailed Hawk	A683598	Huntington, Mass.*	6/13/31	H. E. Woods
2. Red-sh. Hawk	311766	Belchertown, Mass.	6/17/26	E. G. Rowland
3. Broad-winged Hawk	387581	Huntington, Mass.	7/5/26	A. A. Cross
4. Broad-winged Hawk	660558	Huntington, Mass.	7/10/32	A. A. Cross
5. Golden Eagle	323094	Ambler, Penna.	5/10/26	J. R. Gillin
6. Duck Hawk	387576	Huntington, Mass.	6/23/28	A. A. Cross
7. Duck Hawk	228872	Russell, Mass.	6/1/25	Don V. Messer
8. Duck Hawk	204970	Woronoco, Mass.	6/1/24	A. A. Cross
9. Duck Hawk	204971	Woronoco, Mass.	6/1/24	A. A. Cross

<i>Recovery</i>	<i>Date</i>	<i>By whom recovered</i>
1. Branchville, N. J.	10/15/31	Dean L. Haggerty
2. Hanover, Penna.	12/25/26	H. W. Sterner
3. Thornhurst, Penna.	8/18/27	John Yentock
4. Winchester, Va.	9/8/32	Chas. McFarland
5. Berkeley Springs, W. Va.	12/19/26	Lawrence Batt
6. Northumberland, Penna.	10/20/28	C. G. Riggs
7. Nokesville, Va.	2/24/26	J. M. Marmel
8. "Kittatinny Ridge, N. J."	9/28/24	J. Von Lengerke
9. Near York, Penna.	11/—/25	W. F. Maul

* Huntington, Russell and Woronoco are within three or four miles of each other, in western Hampden County, Massachusetts.

In view of the relentless, unceasing persecution which our raptors have been universally subjected to through the years, it is amazing that large numbers may still be seen. It is particularly gratifying that we still have a fairly sound breeding stock of Red-tails, as our data seem to indicate. The rising tide of enlightened sentiment in favor of the Hawks should do much to level out the discrepancies in the laws of the different states. The Massachusetts laws afford protection to each of the species in the above chart. Pennsylvania allows its citizens to mow down these same birds.

Some idea concerning the relative frequency of the different Hawks during migration may be gained from the following list. The figures include for the most part my personal observations, which extended from September 10 through November 13. For a month thereafter, during the course of his duties patrolling the sanctuary, Kramer made daily observations of from



Photos by Broun

VIEWS OF HAWK MOUNTAIN.

1. PROMONTORY FROM WHICH HAWKS ARE OBSERVED; LOOKING EAST-NORTHEAST.
2. CREST OF KITTATINY RIDGE FROM PROMONTORY.
3. VIEW FROM PROMONTORY, SOUTHWARD ACROSS THE KETTLE.

three to four hours at the promontories. His records of 413 birds (nearly all observed up to November 25) have been incorporated in the text. As stated previously, my records covering the first three weeks are incomplete. It is necessary, therefore, to point out that the totals for the Broad-wings, the Sharp-shins, and possibly the Ospreys, are not representative, as no doubt many of these birds passed before I was able to make systematic observations.

TOTAL NUMBER OF HAWKS RECORDED DURING MIGRATION, FALL OF 1934.

1. <i>Cathartes aura septentrionalis</i> . TURKEY VULTURE.....	166
2. <i>Astur a. atricapillus</i> . EASTERN GOSHAWK.....	123
3. <i>Accipiter v. velox</i> . SHARP-SHINNED HAWK.....	1913
4. <i>Accipiter cooperi</i> . COOPER'S HAWK.....	333
5. <i>Buteo b. borealis</i> . EASTERN RED-TAILED HAWK.....	5609
6. <i>Buteo l. lineatus</i> . NORTHERN RED-SHOULDERED HAWK.....	90
7. <i>Buteo p. platypterus</i> . BROAD-WINGED HAWK*.....	2026
8. <i>Buteo lagopus s. johannis</i> . AMERICAN ROUGH-LEGGED HAWK.....	20
9. <i>Aquila chrysaetos canadensis</i> . AMERICAN GOLDEN EAGLE.....	39
10. <i>Haliaeetus l. leucocephalus</i> . BALD EAGLE.....	52
11. <i>Circus hudsonius</i> . MARSH HAWK.....	105
12. <i>Pandion haliaeetus carolinensis</i> . OSPREY.....	31
13. <i>Falco rusticolus candicans</i> . WHITE GYRFALCON.....	2
14. <i>Falco rusticolus obsoletus</i> . BLACK GYRFALCON.....	2
15. <i>Falco peregrinus anatum</i> . DUCK HAWK.....	25
16. <i>Falco c. columbarius</i> . PIGEON HAWK.....	19
17. <i>Falco s. sparverius</i> . EASTERN SPARROW HAWK.....	13
Unidentified.....	208
Total.....	10,776

* The actual number of Broad-wings recorded by the author was 526. To this is added the more conservative side of the "1500 to 2000" birds reported on September 17.

***Cathartes aura septentrionalis*. TURKEY VULTURE.**—These birds were seen at frequent intervals from the time of my arrival until November 8, when I recorded a single individual. Kramer reported a lone bird on December 2. At times it was difficult to determine whether they were migrating, or merely loitering in the vicinity. The thirty or more "Buzzards" that occurred in late October and November, however, kept apace with the rapid-flying Red-tails.

***Astur a. atricapillus*. EASTERN GOSHAWK.**—On October 10 Kramer reported seeing four Goshawks. A pronounced movement ensued, with 24 observed on the 11th, 23 on the 12th, 19 on the 13th, 6 on the 14th, and 4 on the 15th. In the same period 330 Sharp-shins and 99 Cooper's Hawks were observed. This migration was attended by rain and snow and rapidly falling temperatures in northern New England. A flight perhaps comparable to this occurred on slightly later dates in 1927. Sutton, in the article already referred to, records 4 Goshawks shot on October 19, and 16 on October 22 of that year. We may imagine the number that passed unharmed.

Notwithstanding their early arrival in unusual numbers, Goshawks afterwards

appeared desultorily and in negligible numbers—14 birds during the rest of October, and 29 during November and up to December 2.

Accipiter v. velox. SHARP-SHINNED HAWK.—This species suffered heavily when "Hawk Mountain" was a shambles. Collins estimated that on many days over 50% of the Sharp-shins were killed. The explanation is found in the birds' manner of flight. They usually skim just above the trees on the crest of the ridge, and when nearing the promontories they suddenly dart upwards, barely touching the rocks.

The migration of these Accipiters is longer and more continuous than that of the other species of Hawks. Beginning with a few straggling birds in late August, according to local reports, the Sharp-shins continued coming until November 19, when two individuals were seen. The flight reaches its peak in mid-October. Record Sharp-shin days came on October 11, with 135 birds; October 18, with 466 birds; and October 23, with 399 birds.

Early in the season I started to keep tabs on the ratio between the sexes, and to differentiate immature birds. Valuable as such data might be, it was almost futile to continue its compilation. The fleeting glimpses of the little Sharp-shins were often unsatisfactory for such determinations, while larger raptors constantly intruded and demanded equally close study. It was my impression, however, that the bulk of Sharp-shins seen previous to October 15 were immatures.

Accipiter cooperi. COOPER'S HAWK.—This species was seldom plentiful, as may be inferred from the total number recorded. If we may judge from Poole's "composite picture," the Cooper's Hawk probably has never been a conspicuous migrant along the Kittatinny Ridge. A few birds were seen almost daily from September 30 to November 19. Exceptional days in the migration of this species, all occurring in October, follow: 42 on the 8th, 36 on the 11th, 34 on the 12th, and 26 on the 23d.

Buteo b. borealis. EASTERN RED-TAILED HAWK.—It may come as something of a surprise to learn that these splendid birds made up fully 50% of the entire Hawk migration. The first Red-tails recorded were two on September 30. No conspicuous movement took place until October 12, when 205 birds were counted. Thereafter during the month there were nine days of relatively heavy flights, the greatest number of 427 birds occurring on October 23. The first part of November, however, brought the major flights, with an average of 244.5 birds per day for 12 days. On November 1 I recorded 592 Red-tails—as many as 213 in a single hour; on November 2, 853 Red-tails. Kramer reported diminishing numbers of Red-tails during the latter part of November, except for 67 on the 24th. He saw 9 on December 2, and 4 on the next day.

These Buteos usually travelled singly, or in pairs. Occasionally during heavy flights groups of seven or eight birds would be seen. On October 31, during the forenoon, a few larger, compact flocks were observed: one of 16 birds, and three each containing 10 to 14 birds.

An attempt was made to ascertain the speed of flight of the Red-tails. Forty miles per hour was the average, when the birds were flying low. The rate of speed increased considerably when the birds were passing well above the promontories.

A puzzling aspect of the Red-tail migration was the decided scarcity of immature birds. Of an aggregate of 3001 birds occurring on fourteen days when it was possible to determine plumage differences easily, 425 or 14.2% were birds-of-the-year. On November 2, when 853 Red-tails were counted, only 85 young birds were seen—a ratio of ten adults to one immature. Of 32 Red-tails killed on October 22, 1927, according to Sutton only three were immature. What becomes of the young Red-tails? Do they follow the coastal route, or the valleys? Perhaps they learn to take

the easier mountain route with its air-currents and well-marked line of travel, after a year or so of experience.

Absolute silence during migration was characteristic of all species excepting the Red-tails. On eleven different occasions I heard the rasping whistle of these Buteos as they flew by the promontories.

Buteo l. lineatus. NORTHERN RED-SHOULDERED HAWK.—Ninety individuals flew by between October 2 and November 18. The greatest number observed in one day was thirteen on November 2.

Buteo p. platypterus. BROAD-WINGED HAWK.—This species has always had a major part in the Hawk migrations along the Kittatinny Ridge, and has suffered particularly at the hands of the gunners here in past years. The Broad-wings arrive in small numbers the latter part of August, making up the vanguard of the Hawk flights. By mid-September, or during the third week, large numbers appear, and thereafter the migration of this species is definitely on the wane. My field notes show the last Broad-wings (12 birds) passing through on October 9, just as the flights of the Red-tails were gaining momentum. Elsewhere in the text (page 237) I have given the data of two noteworthy flights of Broad-wings.

Buteo lagopus s.johannis. AMERICAN ROUGH-LEGGED HAWK.—That the Rough-leg is not prone to journey down mountain routes is evidenced from our negligible total of 20 birds, seen singly as a rule, from October 12 to December 3.

Aquila chrysaetos canadensis. AMERICAN GOLDEN EAGLE.—The occasional appearance of Golden Eagles among the lesser Falconiformes proved to be the most interesting feature of the season, and a revelation to the many persons who were fortunate enough to see some of these magnificent birds. In most cases these eagles favored us with exceptional opportunities for study. They would pass obligingly close to the promontories, and in fact head right for them unless there was some movement on the part of the observers. Once as I sat motionless and partially concealed by a great slab of rock, an adult Golden Eagle came within thirty feet of, and somewhat lower than, my position. On several other occasions I was able to look directly down upon these birds.

In the majority of cases the identifications were made easily. The "golden" color of the hind head was seen on immatures as well as adults. The latter showed more or less gray on their otherwise dark backs, while grayish lesser wing-coverts were quite distinct at all times. Young birds were carefully identified by the conspicuous white areas in their wings, and by the basal white of their tail feathers—both unflinching characteristics. It was also possible to distinguish Eagles approaching in the distance, for the noticeably small heads of the Golden Eagles marked those birds from the huskier-headed, large-billed Bald Eagles.

Golden Eagle No. 323,094, cited with the data on banded Hawks, is a worthy subject for speculation. Banded near Philadelphia in the spring of 1926, the bird was killed just seven months later in the direct line of flight of the southward-bound raptors. Where did this bird spend the intervening months? If Golden Eagles do not breed in the vast wildernesses of eastern Canada, or in the remoter wilds of north-eastern New York, it is barely possible that they drift eastwards across the continent after the breeding season. In the latter category may be placed an adult Golden Eagle which was seen on July 19, 1931, over the Housatonic River, Ashley Falls, Mass., by S. Waldo Bailey, Leonard Sweitzer and the author.

Sutton reports an unusual abundance of Golden Eagles in Pennsylvania during the winter of 1927-28, and cites four records of birds having been killed.¹ An adult

¹ George M. Sutton, *The Auk*, 1928, p. 375.

Golden Eagle, shot by a hunter above Dreherstown, on November 10, 1931, is in the collection of the Reading Public Museum.¹

The data follow for each of the 39 Golden Eagles seen during the season:

Date	No. seen	Age	Time		Seen by others besides the author.
			A.M.	P.M.	
Oct. 7	1	ad.		1	10 members of the Delaware Valley Ornithological Club.
	9	1		3:40	
	11	1		3:15	
	12	2		1:15; 3.	Mrs. C. N. Edge and Mrs. Alfred Edey
	14	5		3:30-4:30	Two seen by 30 members of the D. V. O. C.
	15	4	11:15	12-3	Three birds seen during P.M., one by Messrs. B. S. Bowdish and J. Parmely.
	16	1		8:45	
	18	2		3; 3:50	
	22	1		1:40	Mrs. G. G. Fry.
	28	2	11:45	1:30	Both seen by 35 members of the D. V. O. C.
	29	1		12 N.	
	30	1		2:30	
Nov. 8	1	ad.		1:35	
	10	1		1:30	
	11	3	10:05	1:30	R. H. Pough and E. L. Poole.
			11		
	12	3		9:50	
				10:15	
				11:15	
	14	1		12:45	This and the following identified by R. H. Kramer.
	15	2			
	18	1			
	24	2		12:35; 1:35	
	25	1	9:10		
Dec. 2	2	?		1:15; 1:30	

The above data bring several questions to mind. Do these birds occur regularly each fall along the Kittatinny Ridge, or is their appearance in numbers this season unprecedented? Whence came these Golden Eagles? Their exact status anywhere in the east is a moot question.

Haliaeetus l. leucocephalus. BALD EAGLE.—This species evidently occurs throughout the greater part of the Hawk migration. I saw four adults on September 14, and one or two birds at rather frequent intervals during October. A noteworthy

¹ Earl L. Poole, *The Auk*, 1932, p. 234.

flight of Bald Eagles was witnessed by Kramer on September 27. He reported seeing 22 individuals, mostly adults, pass over the road about 2 o'clock. Five Eagles of this species were seen in November, the last being recorded on the 24th, by Kramer. The total of 52 Bald Eagles for the season includes at least 20 birds-of-the-year. All but four of the entire number of Bald Eagles flew past in the afternoon, generally between 1 and 3 o'clock.

Circus hudsonius. MARSH HAWK.—Our records of this species extend from September 24 to November 24. The majority of the 105 individuals recorded passed through between October 10 and November 10. The greatest number seen on one day was 11 on October 18, and 11 on November 3. The females precede the males, apparently, as most of the 51 birds that occurred up to October 19 were of the former sex. Of 38 Marsh Hawks observed from November 1 to 12, 28 were males.

Pandion haliaetus carolinensis. OSPREY.—Ospreys sailed down the ridge at infrequent intervals from September 15 to October 11. Ten individuals flew by on October 7, but it was usual to see one or two a day.

Falco rusticolus candicans. WHITE GYRFALCON.—On October 11, shortly after 1 o'clock, Charles French and R. H. Kramer saw a bird which they described as a "pure white Hawk, bigger than a Red-tail, and built like a Falcon." The bird swooped low over the promontory, and between the two observers, coming within a dozen feet of them. I happened to be walking through the woods at the time, and missed the observation.

Late in the afternoon of November 2, the day when 1013 Hawks flew by, I was busy counting Red-tails when suddenly a great white Falcon appeared and passed about one hundred feet below the promontory. This bird, as well as all other Hawks, was studied carefully with Zeiss 8X binoculars.

That the above occurrences of Gyrfalcons in Pennsylvania are by no means unique is attested by the following records of recent years. A dark-colored Gyrfalcon was killed by a farmer on January 7, 1927, near Manheim, Lancaster County (within 20 miles of the Kittatinny Ridge).¹ It was mounted and is in his possession.

A White Gyrfalcon was killed on November 11, 1928, twenty miles northeast of Dreherstown, in the Kittatinny Ridge, by Dr. Samuel B. Kern. This bird is mounted and on exhibition in the Reading Public Museum.²

Falco rusticolus obsoletus. BLACK GYRFALCON.—So far as I know, there are no published records of the occurrence of this race in Pennsylvania. We therefore offer the following sight records with the realization that they must be relegated to the hypothetical list. A Gyrfalcon in very dark plumage was studied on October 12 (a day later than the first White Gyrfalcon noted above) by Mrs. C. N. Edge, Mrs. Alfred Edey and the author. During the brief two minutes that we watched it, the bird dashed round the promontory and just over our heads, occasionally plunging at the passing Sharp-shins and even Red-tails. Again on October 15 I saw a Gyrfalcon, apparently of this race, flying over the ridge and swooping about the promontories. On the following day I had a brief, unsatisfactory view of a large, very dark Falcon which may, however, have been an immature Duck Hawk.

Falco peregrinus anatum. DUCK HAWK.—According to Poole's chart, these Falcons were seldom seen during the migrations. The 25 Duck Hawks on our records occurred on scattered dates between September 30 and November 8. Only five of these were birds-of-the-year.

Falco c. columbarius. PIGEON HAWK.—Seven Pigeon Hawks were seen on

¹ Witmer Stone, *The Auk*, 1927, p. 250.

² Earl L. Poole, *The Auk*, 1933, p. 97.

September 12, the rest in October: 2 on the 7th, 3 on the 8th, 1 on the 10th, and 6 on the 11th.

Falco s. sparverius. EASTERN SPARROW HAWK.—Single birds flew by on the 12th and 25th of September; in October 6 occurred on the 7th, 1 on the 8th, 2 on the 11th, and single birds on the 12th and 20th.

Orleans, Mass.