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MIGRATION IN RELATION TO BAROMETRIC AND TEMPERATURE CHANGES

By WILLIAM ROWAN

THERE are few factors whose effects on migration at first sight appear to be more readily demonstrable than the weather. In the northern hemisphere birds come north when the temperature is rising, and they go south again when it is falling, a relationship that was taken at its face value by the older writers —a simple case of cause and effect. It was considered obvious that birds retreated before the annual arrival of cold and advanced with the return of clemency. Against this viewpoint there are now known to be so many arguments that although the fact still remains and is accepted as such, the causal relationship is generally refuted. The fact that a majority of species leaves the northern hemisphere in July and early August, long before they can perceive the advent of cold weather, is sufficient evidence to cast doubt on the universal applicability of the hypothesis. Certain species of water fowl—but by no means all—seem to stay on till the last minute, *i.e.* until wintry conditions make life no longer possible in the higher latitudes, but these cases never appear to have been critically analyzed, and it is possible that they, too, may ultimately prove to be less obvious than they seem.

It is not intended here to discuss a controversial topic, but primarily to put on record an exceptionally interesting migratory movement, one of such proportions as to have been observed over hundreds of square miles of territory in central Alberta. Such a pronounced movement, judging from the infrequency of comparable records in migration literature, must be of comparatively rare occurrence, and an investigation of the meteorological conditions prevailing at the time would seem to be worth while.

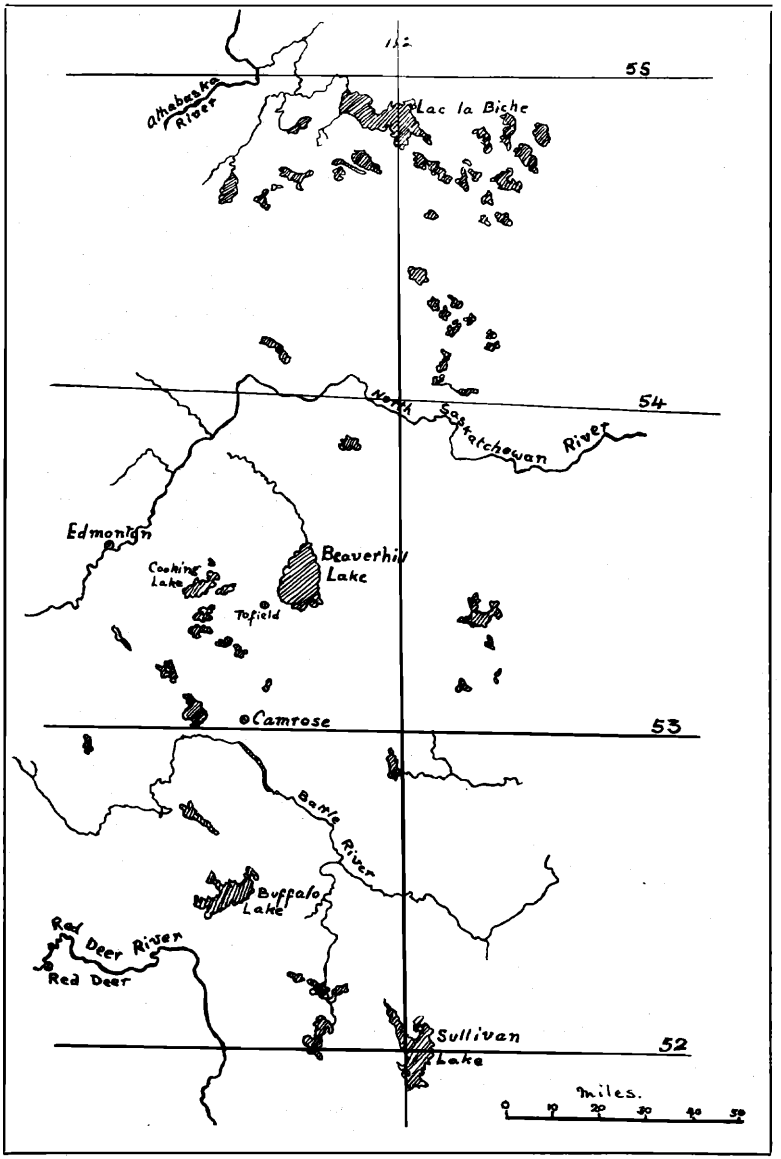
The writer happened to go to Beaverhill Lake, the largest sheet of water in central Alberta south of Lac la Biche, for a day's duck-shooting on October 30, 1928. On arriving at

the east side of the lake, we received reports of huge stubble flights of Mallards on the preceding day, the 29th, and were assured that, since the weather was cold, we could depend on excellent shooting. On visiting the most promising fields, however,—the centre of the flight of the previous day—nothing more than a mere handful of ducks was to be found, possibly a couple of hundred at the most. Miles of country were thereafter covered round the south end of the lake, but nowhere were Mallards to be found in sufficient numbers to make even mediocre hunting likely. This was quite surprising, since the best Mallard shooting of the season is generally to be had during the last few days of October and the first week of November. As far as shooting was concerned, the day was a complete failure. At the south end of the lake we met an old friend, a local farmer, who regaled us with what at first appeared to be a somewhat extravagant account of the happenings of the evening before. Apparently during the daytime of the 29th the lake was still covered with ducks, geese and swans, but at about sunset unrest overtook them, and before dark one flock after another had left the lake, climbed high into the sky and disappeared into the south. An hour later, in the town of Tofield, we met a well-known goose-hunter who had spent the evening before at the south end of the lake locating geese for a shoot on the 30th. He, too, had witnessed the entire movement and his account was even more dramatic than the one already received. He was so impressed with events that he did not bother to go out with his gun on the day following. He assured us that an estimate of the numbers leaving the lake on the evening of the 29th was quite impossible, but said that for an hour before dark the entire sky was full of flocks of wild fowl, rising higher and higher as they headed for the south.

The general aspect of the lake on the 30th certainly left no doubt that something drastic had occurred. The small fringe of ice round the margins was but a fraction of what it frequently is at that time of year, with shooting at its very best. The 29th had been fine, although the 30th was windy and cloudy. But of the swans, geese, and the thousands of Mallards we had expected to see, there was no sign beyond a trifling vestige.

On the fifty-mile run back to Edmonton we inspected two other lakes. Neither was completely frozen over, but both were innocent of ducks. To the south of Cooking Lake (about fifteen miles east of Beaverhill Lake), we called on a farmer friend to hear if he had noted anything unusual in the way

PLATE I



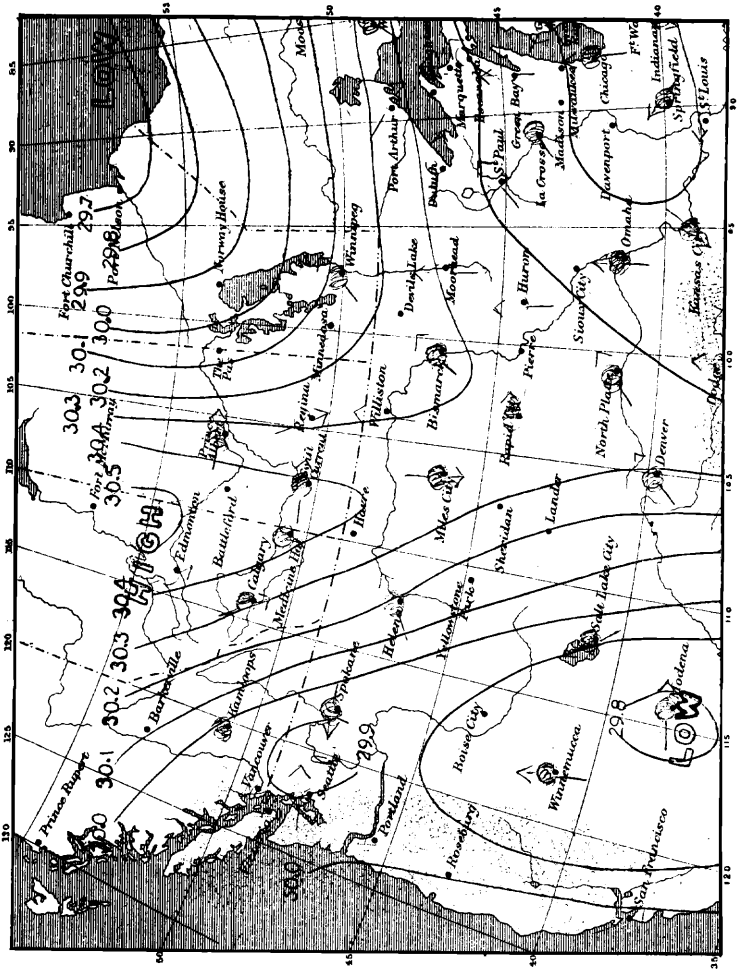
SKETCH MAP OF CENTRAL ALBERTA SHOWING THE LAKE SYSTEMS REFERRED TO IN THE ACCOMPANYING ARTICLE

of migration of wild fowl. His description of what occurred on the evening of the 29th, to quote his own words from a written account subsequently received, was as follows: "I never saw so many ducks in the air at once in the twenty years that I have been here. They rose from the lake just at sundown and for an hour the sky was black with them, flying in formation like geese, in bunches of around thirty to forty. As to numbers, all I can say is that they passed over in thousands about one hundred yards up. The weather was bright and fair, but cold. A friend two miles south of here tells me that they passed over his house at a great height and looked as if they were set down for a long flight." (Stanley E. George.)

The moment Edmonton was reached, inquiries were sent to residents at a large number of lakes scattered through central and southern Alberta in an effort to determine the extent of the movement. The results may be summarized as follows:

The movement extended at least from Lac la Biche in the north (just south of latitude 55) to Sullivan Lake on latitude 52, a distance of two hundred miles (see outline map). Beaverhill, Cooking, and a cluster of smaller lakes are approximately half way between these points. They were the centre of the exodus, and its magnitude here has been described above. Myriads of wild fowl left them between sunset and dark on the evening of the 29th of October. None of them was completely frozen over, even on the 30th, in spite of falling temperatures; and Beaverhill Lake, the only really large one (fourteen miles long and nine wide), was practically wide open. At Lac la Biche there was a marked passage of ducks and geese from the 25th to the 27th of October. Most of these were on passage and did not stop. There was only shore ice on the lake. On adjoining smaller lakes the resident wild fowl pulled out en masse between midday of the 27th and the afternoon of the 28th, and this no doubt applies also to Lac la Biche, but on account of its size and the simultaneous passage of northern contingents, the fact would not be so evident as on the smaller lakes. At the southern extreme, Sullivan Lake, all geese departed on the 29th and 30th. This is a famous goose lake. Presumably there was also an exodus of ducks, although a few Mallards were still there on the 13th of November. At Pine Lake, a little lake on the same latitude as Sullivan, but sixty miles east, a great flight of ducks was noted travelling very high in batches of fifty to one hundred on the 30th, no doubt some of the hordes that had started south the evening before from points further

PLATE II



NORTHWEST PORTION CANADIAN WEATHER MAP OF OCTOBER 30, 1929

north. At Lake Newell, one hundred miles south of Sullivan Lake, the migration did not exist.

Thanks to Mr. A. Griffin, Superintendent of the reservoir, precise temperature figures are available. It is interesting to compare these with the ones from the Edmonton Meteorological Station, Edmonton being in the centre of the movement. There is no striking difference, but the Edmonton figures show a slightly steeper gradient than those of Lake Newell and are, on the average, a few degrees lower. An area of exceptionally high pressure, travelling slowly southward, extended over the major portion of the Province, with Lake Newell about 0.2 inch lower than Edmonton—not a great difference (see portion weather map of Oct. 30, '28, Meteorological Service, Dominion of Canada. Plate II).

Date Oct. 1928	M.D. Press.	Temperatures (Fahr.) Maximum		Minimum		Weather	
	Edmonton	Edmonton	Lake Newell	Edmonton	Lake Newell	Hours of Sunshine Edmonton	Lake Newell
26	27.942	36	45	31	31	0.8	Cloudy
27	28.202	31	34	19	28	5.8	Cloudy
28	28.056	40	35	19	27	6.5	Cloudy
29	27.993	40	47	17	18	7.0	Clear
30	28.010	32	38	12	15	8.7	Clear A.M.; Cloudy P.M.
31			25		18		Cloudy

During the migration, meteorological conditions were fairly uniform from Lake Newell in the south to Lac la Biche in the north, and beyond. At the southern extreme, the barometer was not quite so high; temperatures were slightly higher, but falling nevertheless, and there was less sunshine. The exodus from Beaverhill and adjacent lakes on the 29th was apparently part of a much wider movement, commencing in the north (at Lac la Biche and neighboring lakes on the 27th and 28th) and terminating in the south at Sullivan Lake on the 30th. Farther south, the birds seem to have remained unaffected. Somewhere north of Lac la Biche, at which a great passage of birds was noted from the 25th to the 27th, the movement no doubt began on the 25th. The dates are of particular interest for even at the northernmost point, la Biche, the exodus was considered premature, and in the Beaverhill Lake district it was fully ten days in advance of the average date. It was, more-

over, a concentrated evacuation occupying an hour, in place of the usual southward trickle extending over a couple of weeks.

It may legitimately be inferred from the above that certain conditions of the environment were exciting an urge on the wild fowl of central Alberta and precipitating their departure for the south. There was a combination of falling temperatures (nowhere extreme), an exceptionally high barometer, and, in the main, clear skies, though even at Edmonton the weather was cloudy on and off. Such a combination has been noted by various observers (notably Cooke and Eagle Clarke) as being favorable to autumnal migration. A more striking example of the effects of such conditions than the one herewith presented could hardly be wished for. Countless thousands of waterfowl participated, and an area at least two hundred miles in length was involved.

There are numerous minor points of interest that should be mentioned. The migration of these fowl was not inaugurated by the conditions described. The birds were already on migration (the vast majority, at least) and they would subsequently have continued to migrate whatever the weather. The effect was incidental, not fundamental; additive, rather than causative. A high barometer occurs at irregular intervals at other seasons of the year without evoking any migratory movements. Clear skies are usually quite ineffective. Falling temperatures are not infrequent, and our ducks, geese, and swans at times remain not only through such a fall without any response, but through considerably lower actual temperatures than those here recorded. Not even the smaller lakes were completely frozen over. There was plenty of open water and food conditions were excellent. The birds were obviously not being driven out. They were neither presaging nor fleeing before a coming storm. The winter remained snowless and mild till January.

From somewhere outside the area affected, ducks later, apparently in the normal manner, partially restocked the zone of evacuation of the 29th. At Beaverhill Lake one observer noted some two thousand Mallards and a flock of geese on the 4th of November.

The popular conception of the fall migration is a forced departure before winter storms. In contrast to this view, the southward movement herewith described, one of the most remarkable ever to have been observed in the Province of Alberta, took place during an unusually long spell of exceptionally high pressure with accompanying fine weather.

The only wintry aspect was a gently falling thermometer.

The movement undoubtedly began in the north and passed southward, ceasing to the south of Sullivan Lake, although conditions there were almost identical with those farther north. It is difficult to escape the impression that the birds evinced sensitivity and response to latitude.

AN UNUSUAL MALLARD RETURN

By Frederick C. Lincoln

During the summer of 1927 a Mallard duck selected as a site for her nest a box placed on the roof of a barn on the ranch of F. J. Keller, of Antioch, Nebraska. On November 29, 1927, she was caught by Mr. Keller, together with several of her offspring and associates, and was given Biological Survey band No. 555414. Before the end of the shooting season then in progress, members of this flock were reported from Colorado, Oklahoma, New Mexico, Texas, and Louisiana.

No. 555414 escaped, however, and on March 12, 1928, she reported back to her home station, and again nested in the box on the roof of Mr. Keller's barn. Before leaving in the fall she entered Mr. Keller's trap and was recorded on October 14, although she was not definitely checked out for the season until December 6. During the hunting season of 1928–29, ducks banded by Mr. Keller were reported from Swan Lake, South Dakota; Kit Carson, Colorado; the Gila River, Arizona; Boynton, Oklahoma; and Engelo, Texas. As these records of birds banded at Antioch began to come in, much interest was naturally aroused as to whether No. 555414 would be heard from. But again she escaped.

At 2:00 p.m. on March 10, 1929, Mr. Keller observed six Mallards that dropped into the pond near his windmill. One of hese, after drinking and preening her feathers, walked over toward the barn, and when within about 20 feet flew to the roof and without hesitation entered the old nest box. It was No. 555414, who had arrived for her third consecutive nesting in this unusual site. The box was immediately cleaned out and soon contained a well-lined nest. Mr. Keller reports that on April 11 she was incubating a set of 10 eggs. A cold spell from April 7 to 10 threatened disaster for the eggs, as the temperature dropped to 16° above zero, with a heavy snowstorm. Feeling much concerned for the safety of the eggs, Mr. Keller examined the nest on April 11, and found