FIGURE 1: European Starling in full song display, where it belongs, on a rooftop in England (Alnmouth, Northumberland, May 24, 2010). Note yellow bill (typical of spring condition) and speckling limited to the lower abdomen. Photo credit: Peter Taylor

HISTORY OF THE EUROPEAN STARLING
IN MANITOBA AND NEARBY STATES AND PROVINCES

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This article traces the arrival of the European Starling (*Sturnus vulgaris*; hereafter, simply starling) in Manitoba from early reports in the 1920s through initial breeding and wintering records in the 1930s to full establishment by about 1950. Current status and recent trends are also discussed, and comparisons are made with nearby regions and with other invasive bird species.

The misguided introduction of starlings in New York in 1890 and 1891 (with unsuccessful attempts elsewhere) and their subsequent rapid population growth and range expansion, reaching the Pacific Coast in the 1940s, have been described in detail by Kessel and several authors she cites.[1] Though sometimes considered beneficial for their consumption of insect pests, starlings (Figures 1 to 3) are not well regarded in general for several reasons: aggressive competition with native species for nesting cavities, accumulation of droppings in or on buildings (especially at winter roosts), consumption and contamination of livestock feed, and damage to fruit crops.[2-5]

The arrival of starlings in new areas, preceded by their bad reputation, often drew attention as indicated by the many references cited by Kessel.[1] "Broad brush" maps depicting the starling's spread across the continent are limited by sparse published data for the Prairie Provinces.[1,6] Mapping is also complicated by the westward expansion of winter range in advance of the breeding range.[1] Extrapolation of Kessel's map for the lower 48 United States indicates that the breeding-range boundary swept across southern Manitoba from east

to west during the 1930s,[1] while Johnson and Cowan's map shows a sweep from south to north during the late 1930s to the early 1960s.[6] The advancing range boundary was diffuse, with some outlying records well in advance of the main front; for example, just three years separated the first nesting records in Minnesota (1931) and Alberta (1934).[1, 7, 8] These preceded nesting records for both Manitoba (1935) and Saskatchewan (1939), though territorial behaviour was reported in Manitoba as early as the mid-1920s (see below). In this context, Wing distinguishes in his 1943 review between the progress of the *population front* and that of the pioneers that make up the *advancing front*.[9]

The diffuse, moving boundary reflects the starling's capacity for long-distance migration, combined with the highly variable movements of immature birds, both in distance and direction (see discussion of migration patterns, below).[1]

Initial sightings in Manitoba

Many early starling sightings in Manitoba, as well as some in Saskatchewan, were reported in newspaper columns and correspondence, especially in A. G. Lawrence's weekly *Chickadee Notes* column in the *Winnipeg Free Press* and the *Wild Wings* column by various authors in the *Winnipeg Tribune*.[10, 11] Space limitations prevented a detailed review of these reports in *The Birds of Manitoba*.[11] The current article is based in part on a review of over 150 of these columns that mention starlings; an annotated list is available on request from the authors.[10]

The first starling sightings in the Prairie Provinces were reported by J. D. Carruthers at Gainsborough, Saskatchewan, just west of the Manitoba boundary: five birds on top of a bank building in fall 1922, five on a building in 1924, and three found dead after a storm also in 1924. Perhaps because these sightings were just outside Manitoba, they were not mentioned in Lawrence's columns until 1948.[10] These Saskatchewan sightings were followed by reports from Somerset, Manitoba by W. H. Talbot: two starlings, dramatically described as "destroying a building while trying to make a nesting place", were shot but not preserved in summer 1925, while two were "fighting with house sparrows in a church steeple" in spring 1926.[10] Similarly, two starlings in the St. James area of Winnipeg were "fighting with house sparrows on a picture theatre" when seen by J. Haddow on June 15, 1926.[10] Fierce competition with house sparrows was also described in the first Minnesota breeding report.[7] Seemingly more peaceable was a lone starling at Kelloe, Manitoba in 1927; first seen on June 1, it remained all summer "chumming with the blackbirds".[10]

FIGURE 2: European Starling fluffed up against the cold at a Pinawa, Manitoba feeder, January 2, 2014. Note dark bill (typical of winter condition) and extensive speckling around head. Photo credit: Ed Huisman

Surprisingly, the next Manitoba starling report came from the Hudson Bay coast: a specimen found freshly dead in an unused building at York Factory on May 11, 1931.[12] The specimen was found by H. Conn, a Hudson's Bay Company manager, and verified by A. C. Lloyd and G. M. Sutton, but unfortunately could not be preserved.[12] Also in 1931, a lone starling was observed on August 12 by F. B. Anderson near Winnipeg's Louise Bridge.[10]

Increasing numbers, breeding, and overwintering

Reports became more frequent in the mid-1930s, corresponding closely with the expansion of the breeding range as defined by Kessel.[1] On February 6, 1934, V. W. Jackson (professor of biology at the University of Manitoba) received a specimen found dead at Gunton by M. Gooch on an unknown date, likely in January or early February 1934.[10] The specimen was apparently

FIGURE 3: Flock of European Starlings gathered on an electrical transmission tower prior to roosting near Great Falls, Manitoba, October 30, 2015. Photo credit: Peter Taylor

not preserved. J. English noted two starlings at Fort Whyte, Winnipeg in spring 1934, while Mrs. P. Durham reported one overwintering at La Rivière in 1934-1935, as well as one taking refuge from wintry weather in a barn on March 5, 1935.[10]

A flurry of additional records in 1935 included the first Manitoba nest, observed by J. Pollock and J. English at Fort Whyte.[10] It was built on top of an old house sparrow nest in an electrical transformer box with an entrance hole drilled by a flicker; five eggs were laid between May 4 and 12.[10] Three nests in deciduous tree cavities, found by V. B. Latta at Shelley near Whitemouth, followed quickly between May 24 and July 8, 1935.[10] Also at Fort Whyte, a female starling specimen was collected by A. H. Shortt on June 24, 1935; now in the Royal Ontario Museum (ROM) collection, it appears to be the oldest existing Manitoba specimen.[13a] The earliest specimens in The Manitoba Museum's collection in Winnipeg are two eggs collected by G. J. Smith at Fort Whyte on May 4, 1941 and four adult skins collected at various locations between 1940 and 1948.[14] A voucher of a September 1938 bird from Dauphin was entered in the old museum ledger as received September 20, 1938 from Mrs. W.A. Maynard of Dauphin, but the specimen was in poor condition and presumably was discarded before the Museum moved to its present site. The B.J. Hales Museum (Brandon) holds two specimens from Ninette, a male (catalogue no. 479) and a female (catalogue no. 100) caught in a henhouse on March 28, 1938.

At least nine starling reports in 1936 included additional nest records at Shelley and Lockport, while a flock of 12 seen by C. L. Broley at Richer on June 28, 1936 was the largest number reported in Manitoba to that date.[10] Farther north, a starling was collected by S. Waller 30 miles NE of Lake St. Martin on April 28, 1936; it also is in the ROM collection.[13b, 15]

The number of reported localities continued to grow in the late 1930s while starling numbers increased rapidly. The following totals were reported by J. and A. Haak at a St. Boniface (Winnipeg) garbage dump in 1938: 15 on March 6, 56 on March 20, and more than 100 in the first week of April, followed by a fall count of 146 on October 30, dwindling to about 45 overwintering birds.[10] This chronology parallels current observations of migrants in numbers increasing during March and April, and decreasing in October and November, at dumps, cattle feed lots, and other concentrated food sources.

By the end of 1939, starlings had been reported at 31 different localities in Manitoba, with nesting confirmed at eight, counting various sites within the current Greater Winnipeg area as one locality. These reports cover most of the agricultural region, plus a few locations within the southern fringe of the boreal

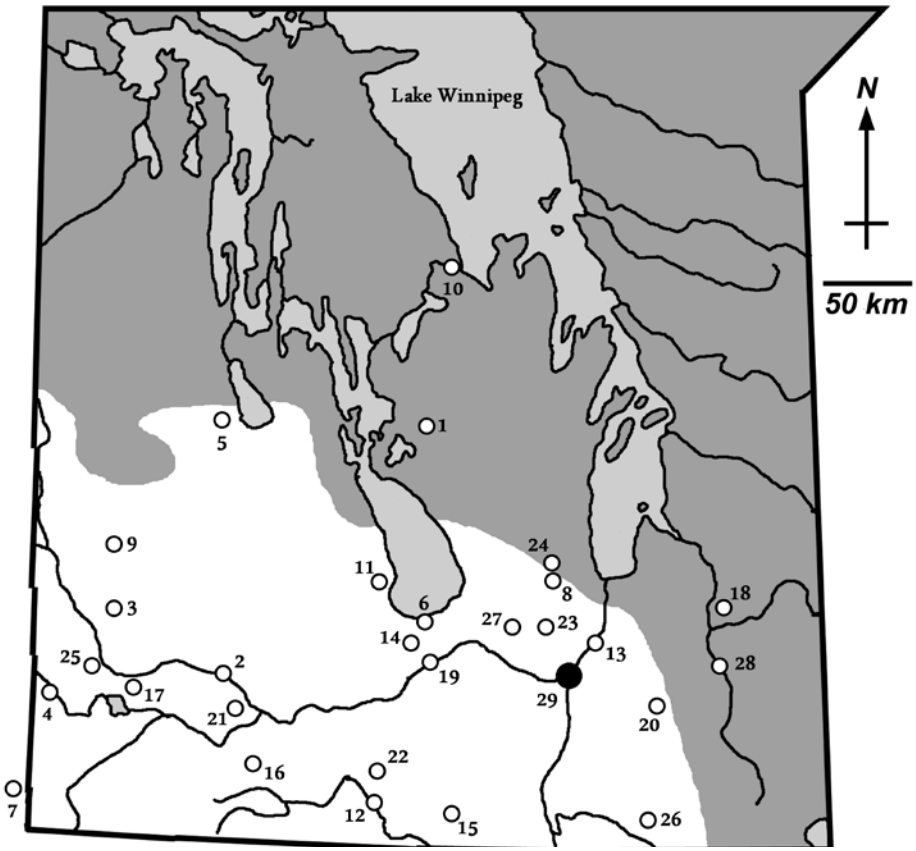

FIGURE 4: Map of localities for pre-1940 European Starling reports in Manitoba, and one in extreme southeastern Saskatchewan, numbered alphabetically with date of first record in parentheses: 1 Ashern (1939), 2 Brandon (1938), 3 Crandall (1938), 4 Cromer (1936), 5 Dauphin (1938), 6 Delta (1939), 7 Gainsborough SK (1922), 8 Gunton (1934), 9 Kelloe (1927), 10 northeast of Lake St. Martin (1936), 11 Langruth (1939), 12 La Rivière (1935), 13 Lockport (1936), 14 Macdonald (1938), 15 Morden (1938), 16 Ninette (1938), 17 Oak Lake (town) (1939), 18 Pinawa (old town-site) (1939), 19 Portage la Prairie (1937), 20 Richer (1936), 21 Rounthwaite (1938), 22 Somerset (1925), 23 Stonewall (1939), 24 Teulon (1935), 25 Virden (1939), 26 Vita (1936), 27 Warren (1939), 28 Whitemouth (1935), 29 Winnipeg (including Fort Whyte, St. Boniface, and St. James) (1926). Two northerly locations are beyond the mapped area: York Factory on the coast of Hudson Bay (1931), and Norway House at the north end of Lake Winnipeg (1939). The darker shaded and unshaded areas correspond to mostly forested and agricultural regions, respectively.

forest, and two more remote, northern sites (Figure 4). Thus the current range was more or less established, albeit at low density, before 1940.

Other indicators of rapidly increasing numbers include an estimated 100 pairs nesting in trees surrounding fields and clearings in the Whitemouth area in summer 1939 (V. B. Latta), a flock of about 150 birds following a snowstorm near Carman in late March 1942 (E. Robinson), "hundreds" on wires and in nearby oat stubble at Lenore on September 11, 1947 (A. Caldwell), and a flock of 150 at harvest time near Wawanesa in 1947 (observer unknown).[10] An extraordinary report from H. A. Hochbaum and P. Ward of the Delta Waterfowl Research Station mentions a concentration of 2000 starlings in trees on the southern shore of Lake Manitoba on October 27, 1939.[10] It is possible that this number included some blackbirds.

The presence of starlings at the Morden Experimental Farm arboretum in three consecutive winters, 1938-1939 to 1940-1941, was reported by Dr. W. R. Leslie, the Farm's long-time superintendent.[10] Each autumn, 40 to 60 starlings arrived in late fall, but their numbers declined to six to eight birds by late winter. Other winter reports included: "a number" of starlings feeding on clover stacks and riding on the backs of sheep, apparently for warmth, at Virden in 1938-1939 (A. B. Herkes); 18 feeding with cattle at "their feed rack in the bush" at Makinak in 1940-1941 (G. Coutts); and small numbers visiting feeders at various locations in the 1940s.[10] By the 1950s, starlings were no longer noteworthy in Manitoba, except perhaps as a nuisance.

Northward range extent in Manitoba

While starlings are much more numerous in southern agricultural and urban areas than elsewhere in Manitoba, they also nest sparsely across the boreal forest to the Hudson Bay coast.[16-20] This population is mostly associated with human habitation, including many First Nation communities, as illustrated by recent findings for the Manitoba Breeding Bird Atlas (BBA).[21] Occasionally nesting occurs far from human settlement; for example, a pair of starlings occupied a flicker nesting cavity in burned forest near Highway 6, 38 km N of Grand Rapids in June 2010 (Figure 5).

The 1931 York Factory vagrant was a forerunner of the sparse northern population, which became established more rapidly than Johnson and Cowan's map suggests.[6, 12] At Norway House, near the north end of Lake Winnipeg, seven starlings arrived on May 5, 1939, increasing to 13 by July, and declining to four by mid-December.[16] Other early records in remote Manitoba communities include two starlings accompanying eight unidentified blackbirds at Pikwitonei on May 31, 1946.[10] A single starling

FIGURE 5: European Starling nest and habitat at a remote location 38 km north of Grand Rapids, Manitoba (53.5229° N, 99.3430° W), June 16, 2010. The area is recovering from the Norris Lake fire of 2008. Arrow indicates nest; inset of starling at nest hole. Photo credit: Randall D. Mooi

was observed in Churchill by R. S. Palmer on or about June 4, 1940.[17] Breeding was first recorded at Churchill in 1952, when at least eight pairs nested high on this northern port's huge grain elevator.[18, 19] Such records continue with varying numbers today; the fate of the very few that attempt to overwinter so far north is unknown.[20]

The most northerly Manitoba starling records are in the Nejanilini Lake region, 220 km WNW of Churchill near 59.4° N latitude. The mummified remains of three starlings were found at the former Duck Lake post of the Hudson's Bay Company on July 26, 1965, one of which is preserved at The Manitoba Museum.[10, 22] The Manitoba BBA database includes a confirmed nesting record by K. De Smet in the same area in 2012.[21]

Current status and recent trends in Manitoba

There is little information on starling numbers in Manitoba between the early 1950s, when sightings had become routine, and the late 1960s, when the Breeding Bird Survey (BBS) and an increasing number of Christmas Bird Counts (CBCs) started to provide systematic information on bird numbers.[23, 24] Many authors refer to long-term, overall decline in starling numbers (or perhaps stabilization after overshooting sustainable levels) since the original population explosion; indeed, there was a suggestion of decline in Ontario as early as 1951.[25]

The following discussion of BBS data from the late 1960s to 2013 is based on statistical analyses available at the BBS website.[23] Continent-wide trend maps for starlings show a patchwork of long-term regional increases (mostly in the western U.S.A. and Newfoundland) and decreases (mostly in the eastern U.S.A. and much of Canada). Analysis at the state and provincial level for Manitoba and nearby regions is summarized in Table 1. In Manitoba, the 1.25 per cent annual rate of decline is not quite significant (*i.e.*, there is a statistical probability of ~0.05 of an actual increase). The overall downward trend was punctuated by a temporary, partial recovery around 2008.[23]

The following discussion of CBC data is based on the authors' analysis of data from the CBC website.[24] The Winnipeg CBC dates back to 1925, with the first starlings (six birds) being recorded in 1935, and as many as 400 in 1947, but unfortunately there are many gaps in the published record prior to the 1960s. Winnipeg CBC totals during the 1960s and 1970s were mostly in the hundreds, exceeding 1,000 for the first time in 1981 and reaching a peak of 5,317 starlings in 1988. This and other high counts over the following decade included concentrations at a former urban roost on the Disraeli Freeway bridge, 1.5 km NE of the city centre (R.F. Koes, personal communication). Winnipeg counts have been much lower in recent years, varying

TABLE 1: Breeding Bird Survey trends and confidence intervals for starlings in Manitoba and nearby regions.

PERIOD	REGION	ANNUAL CHANGE, %	2.5%	97.5%	COMMENT
1967-2013	Manitoba	-1.25	-3.20	0.32	Almost significant decline
1967-2013	Ontario	-2.00	-2.50	-1.51	Significant decline
1968-2013	Saskatchewan	-4.47	-6.03	-2.87	Significant decline
1968-2013	Alberta	-1.35	-2.48	-0.36	Barely significant decline
1967-2013	Minnesota	-1.69	-2.41	-1.02	Significant decline
1967-2013	North Dakota	0.17	-0.84	1.15	No significant trend
1967-2013	South Dakota	-0.47	-1.68	0.82	No significant trend
1968-2013	Montana	-0.07	-1.09	1.00	No significant trend

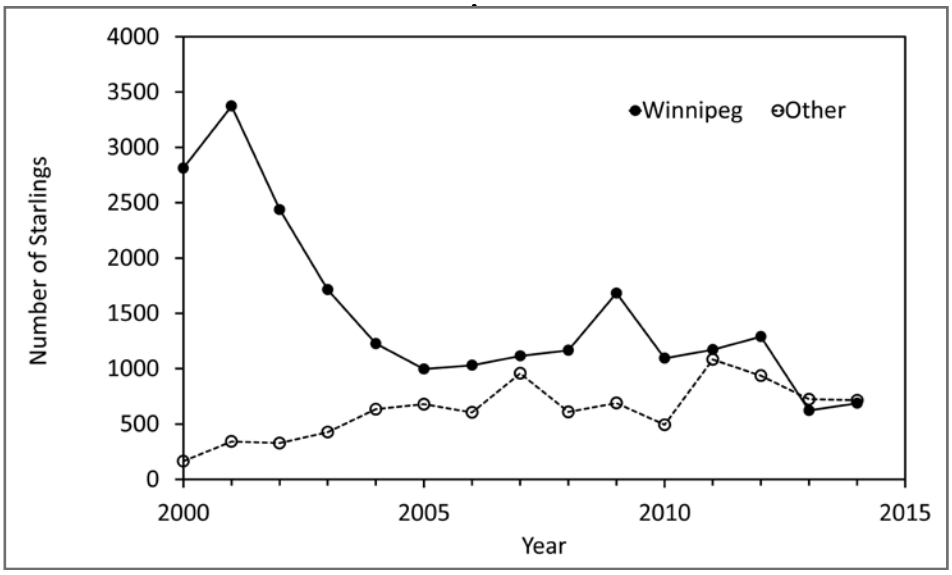

FIGURE 6: Christmas Bird Count totals of European Starlings for Winnipeg and the sum of five other Manitoba counts (Brandon, Glenboro – Spruce Woods, Delta Marsh, Oak Hammock Marsh, and Pinawa – Lac du Bonnet) between 2000 and 2014. Here, "2000" refers to counts held in December 2000 or early January 2001, and so forth.

between 997 and 1,714 (4.73 to 8.61 per party-hour of effort) over the decade from 2003 to 2012, with a subsequent dip to just 623 starlings (3.32 per party-hour) in 2013. This may have been partly due to cold conditions on the day, as well as the preceding month of exceptionally cold weather, reported in local media to be the second-coldest December in Winnipeg since 1893. In 2014, however, just 688 starlings were tallied under much milder conditions. While some of the Winnipeg totals around 1990 were impressive, they are much lower than many in the core winter range, which sometimes exceed 10,000 and occasionally 100,000 or even one million birds.[24]

Rural Manitoba CBC totals are generally much lower than for Winnipeg, partly due to lower effort, though a few are comparable to recent Winnipeg counts, *e.g.*, Seine Valley (60 km southeast of Winnipeg) 1,259 in 2006, Red River – St. Adolphe (just south of Winnipeg) 926 in 2007. If the relative urban and rural land areas are taken into account, however, it appears likely that wintering birds in Winnipeg are outnumbered by those in farmland and smaller centres as a whole. Detailed comparison is difficult because of high year-to-year variability of individual counts, and because relatively few locations have long unbroken runs of consecutive annual counts. Figure 6 compares the annual count totals for the period 2000 to 2014 for Winnipeg and for the sum of five other counts scattered across southern Manitoba (from west to east, Brandon, Glenboro – Spruce Woods, Delta Marsh, Oak Hammock Marsh, and Pinawa – Lac du Bonnet). Similar trends are observed when data are expressed as detection rate (birds per party-hour), rather than total birds, because the party-hours of observer effort do not vary much from year to year (188 to 236 for Winnipeg; 188 to 250 for the five combined counts).

The trends for Winnipeg and the five other combined counts are strikingly different; in particular, the steep decline in Winnipeg CBC totals between 2001 and 2004 coincides with a gradual increase in numbers found elsewhere in southern Manitoba (Figure 6). Care is needed in interpreting these data, because there are no close parallels among the individual counts; for example, the highest totals for each locality within the 14-year period occurred in six different years. This is partly because rural count totals tend to be dominated by one or a few local concentrations at sites such as cattle feedlots, grain handling and processing facilities, and landfill sites, which may vary in both their attractiveness to starlings and accessibility to observers from year to year. In addition, variations in overwintering starling numbers may not reflect changes in the breeding population (see discussion of migration patterns, below). Furthermore, CBC totals are likely affected by prevailing weather conditions in late autumn and early winter, as well as on the count day itself.

Variation of Christmas Bird Count totals is evidently complex, difficult to interpret at the local or provincial level, and perhaps less clearly indicative of population trends than are Breeding Bird Surveys. This does not diminish the value of CBCs in elucidating winter distribution patterns, not to mention their educational value and sporting aspect. The following section includes some CBC comparisons with other regions.

There is little information on overwintering survival, but overall impressions are of dwindling numbers through the winter months, suggesting either high mortality or southward withdrawal, until the spring influx begins (usually in March, sometimes before the end of February). Starlings are not especially common feeder visitors, except where fat or table scraps are provided. Small numbers frequent ornamental fruit trees, especially crab apples, mostly in early winter. Supplemental

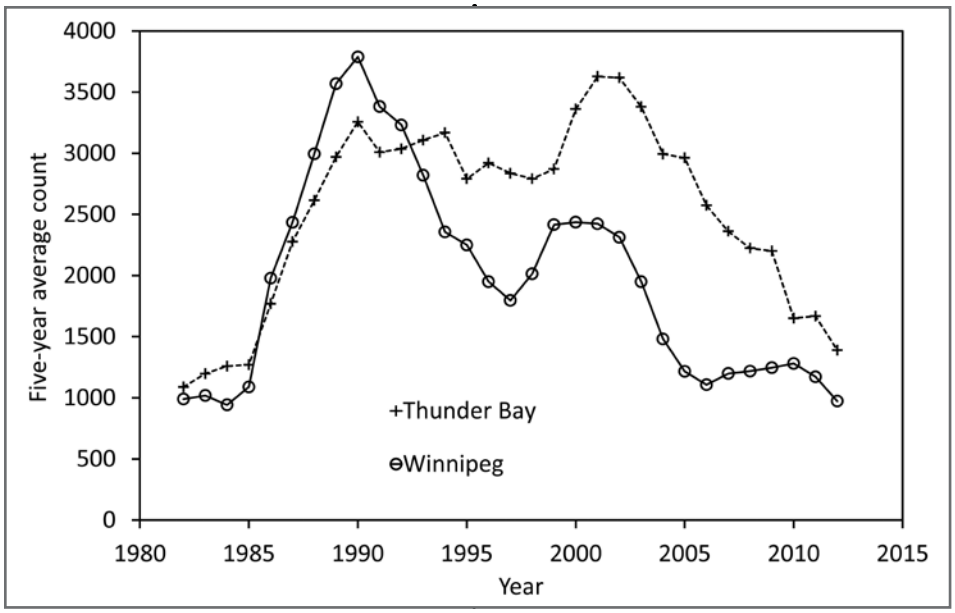

FIGURE 7: Christmas Bird Count totals of European Starlings for Winnipeg and Thunder Bay. The plotted values are five-year average counts based on data from 1980 to 2014, *e.g.*, the 1982 values are averages of annual counts from 1980 to 1984.

warmth from household chimneys, burning garbage, livestock, or other sources seems to be an important survival factor for starlings during cold spells. Communal roosting in manmade structures also appears to favour winter survival.[26] It is possible that improved thermal efficiency and physical sealing of buildings, and improved garbage disposal practices, have caused a reduction of starling numbers, especially in urban areas, by reducing sources of warmth and food.

Establishment and current trends in nearby provinces

The following summaries provide a broader regional context for the Manitoba starling records, with emphasis on Saskatchewan.

Northwestern Ontario – Starlings apparently reached northwestern Ontario in the 1930s, roughly concurrent with their establishment in Manitoba.[25] Some mortality during a cold snap was noted at Sault Ste. Marie in December 1929.[10] Four or five starlings survived the 1932-1933 winter at Port Arthur (Thunder Bay), but others apparently disappeared after heavy snowfalls there in January 1934.[10] The Ontario BBA indicates low breeding density in this region as a whole, and especially localized occurrence north of about 50° N latitude.[25, 27] The first nesting record for the Hudson Bay coast of Ontario was at Winisk in 1967, 15 years after breeding was first recorded at Churchill.[18, 19, 25]

Christmas Bird Count totals at Thunder Bay are usually well in excess of 1,000 birds, but dropped dramatically to 405 in 2014. Lesser numbers (sometimes exceeding 100) are tallied at smaller communities such as Kenora and Dryden.[24] Figure 7 reveals similar CBC trends for Thunder Bay and Winnipeg. Totals are depicted as five-year averages to reduce year-to-year fluctuations while elucidating medium-term trends. The figure shows synchronous rapid increases in the late 1980s, a broad double-peak extending into the early 21st century, then a marked decline (a few years later at Thunder Bay than at Winnipeg). Combined counts for Dryden and Kenora (not depicted) do not parallel these trends, but show a gradual increase since 2000, similar to that for Manitoba communities outside Winnipeg (Figure 6).

Saskatchewan – The overall status of starlings in Saskatchewan, as summarized by Smith, is similar to that in Manitoba: "...a common summer resident throughout the settled south, and uncommon and local in the boreal forest".[28] As in Manitoba, wintering birds occur mainly in urban areas and farmsteads.[28] Leighton *et al*., however, commented that the starling is mostly a rural bird in the Saskatoon area, with relatively few in the city except at the municipal landfill.[29]

As noted above, the first Saskatchewan starling sighting at Gainsborough in 1922 was also the first for the Prairie Provinces.[10] Overall, however, the species became established slightly later in Saskatchewan than Manitoba, with a flurry of records between 1937 and the early 1940s (C.S. Houston, pers. comm.). Table 2 compares various milestone dates for the two provinces, which suggest an overall lag in establishment of about five years. The lag time of a decade or more between the first sighting and the first nesting record for a province is not unusual (*cf*. Ontario, sighting 1914, nest 1922; Nova Scotia,

TABLE 2: Comparison of starling milestone years for Manitoba and Saskatchewan

EVENT	MANITOBA	SASKATCHEWAN	LAG TIME (YEARS)
First reported sighting	1925	1922	-3
First northern record	1931	1963	+32
Onset of regular, annual sightings	1934	1937	+3
First wintering report	1934	1941	+7
First nest found	1935	1939	+4
First record of more than 100 birds	1938	1947	+9

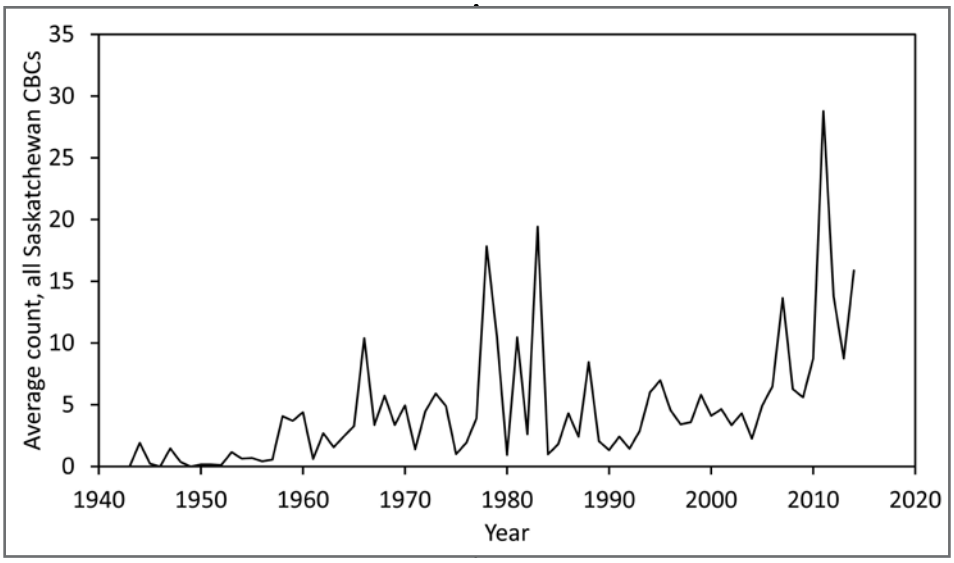

FIGURE 8: Average Christmas Bird Count totals of European Starlings for all Saskatchewan counts published in *Blue Jay* (zero counts are included in the averages).

sighting 1915, nest 1928).[25, 30] In Alberta, however, the first provincial record involved a nesting attempt, albeit perhaps by an unmated female (see below).[8]

Records published in *Blue Jay* in 1957 indicate that starlings were becoming widespread in Saskatchewan, especially in the Saskatoon region, by the mid-1940s, but remained noteworthy in some southern areas well into the 1950s.[31, 32] Northward progress seems to have been slower than in Manitoba (Table 2), but this may be an artifact of sparse records. The BBS records for Saskatchewan show a statistically significant, average annual rate of decline of 4.47 per cent between 1970 and 2013 (Table 1).[23]

Saskatchewan CBC results, compiled annually in *Blue Jay* since 1942, provide more information than the National Audubon Society (NAS) database.[24] The number of count locations varied between eight in 1942 and 105 in 2001 (plus one submitted to NAS but not *Blue Jay*), increasing from the 1950s to the 1980s, and fluctuating between 75 and 105 (+1) since 1985. While individual counts vary greatly in observer effort, overall they provide well-distributed coverage of the southern two-fifths of Saskatchewan, plus a few northern localities. The following discussion is based on starling records for all Saskatchewan CBCs from 1942 to 2014, as published annually in *Blue Jay* and summarized in Figures 8 and 9.

The first starlings appeared on Saskatchewan CBCs in 1944: one at Indian Head, two well north at Nipawin, and no fewer than 20 at Wolseley. The species has been recorded annually since 1950, and began to approach current numbers by 1960 (Figure 8). Since 1985, the proportion of counts reporting starlings has varied between 15 and 39 per cent. Numbers are generally low compared with some Manitoba counts. Even in major urban areas (Saskatoon, Regina, and Moose Jaw), totals exceed 100 birds for less than 20 per cent of counts since 1958. The highest-ever single count total was 1,000 birds at Saskatoon in 1983, presumably an estimate of one or a few flocks at landfill sites, and oddly coinciding with a zero count in Regina the same year. The second-highest Saskatchewan count total was a more precise 822 starlings at Pike Lake in 2011. These maxima contributed to the peak provincial totals of 1204 on 13 of 62 counts in 1983 and 2,619 on 35 of 91 counts in 2011. In general, provincial totals are often dominated by one or a few high counts, contributing to the "spiky" plot of average counts in Figure 8. In this case, multi-year averaging only tends to broaden the spikes without clarifying long-term trends.

Figure 9 illustrates an attempt to tease out differences between the

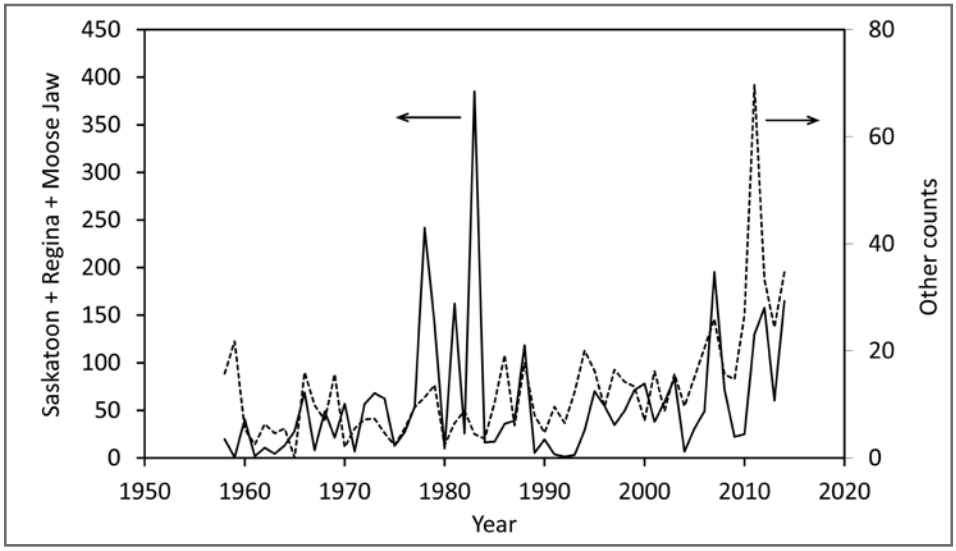

FIGURE 9: Average Christmas Bird Count totals of European Starlings since 1958 for Saskatoon, Regina and Moose Jaw combined (left axis, solid line), and for all other non-zero Saskatchewan counts (right axis, dashed line). Note that the Moose Jaw count was not held in 2002, 2003, and 2008, and the 1983 Regina count recorded zero starlings.

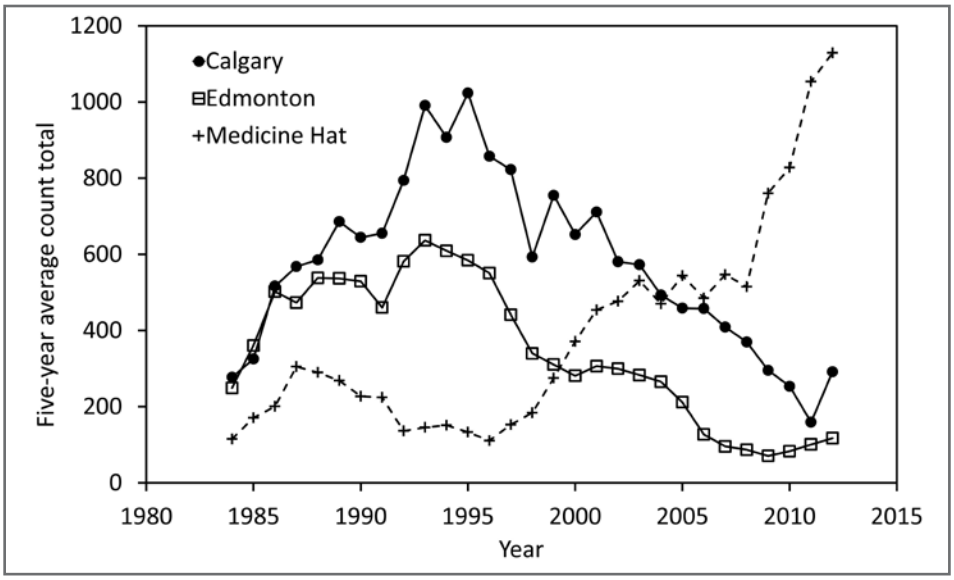

FIGURE 10: Five-year average Christmas Bird Count totals of European Starlings for Edmonton, Calgary, and Medicine Hat, Alberta, based on data from 1982 to 2014.

three counts at urban centres, noted above, and all other counts. Again, long-term trends are masked by the spiky data, but there is a suggestion of an underlying, slight increasing trend in rural, but not urban, count totals since 2000.

Alberta – The starling's story in Alberta commenced in 1934 with a then-extralimital nesting record at Hartland, 22 km east of Camrose.[8] The nest was discovered in a school building and reported by a teacher, Mr. Blades, who took one egg prior to June 12; six remaining eggs were collected on June 25, 1934 by F. Crossley, then submitted to the Canadian Museum of Nature by F.L. Farley.[8] The eggs were apparently infertile, consistent with Farley's remarks that no male starling was ever seen in the vicinity.[8] Just 10 years later, starlings were breeding over the southern half of Alberta and westward into the Rocky Mountains.[33] By 1952 their nesting range extended north to the Peace River district and Fort Chipewyan.[32] The BBS data for Alberta show a statistically significant, long-term annual rate of decline of 1.35 per cent (Table 1).[23]

Our discussion of Alberta CBC totals is limited to comparisons of smoothed-average data for three major communities – Edmonton, Calgary, and Medicine Hat (see Figure 10).[24] These show parallel trends for Calgary and Edmonton, with broad peaks in the 1990s and recent declines, resembling the trends for Winnipeg and Thunder Bay (Figure 6), but contrasting with a recent, strongly increasing tendency at Medicine Hat. More detailed analysis of these data, and any changes in rural Alberta counts, requires detailed local knowledge of land use related to starling concentrations. Nevertheless, Figure 10 (like Figure 6) illustrates how opposing trends may exist for different localities within a given state or province.

Nunavut and Northwest Territories – The starling's sparse breeding range in the northern Prairie Provinces extends into southerly portions of Nunavut and the Northwest Territories (NWT), especially in the Fort Smith and Yellowknife areas, with accidental occurrence northward to the Arctic coast and islands.[34-36] The first NWT record was about 42 km west of Fort Smith, April 27, 1954.[37] The species' scarcity in Nunavut is illustrated by Staniforth's unsuccessful searches during three July visits to Baker Lake in 1997 to 1999.[38] Starlings are only occasionally reported on either CBCs or BBS routes in the NWT.

Establishment in nearby states

Starlings first appeared in Minnesota in 1929, were found breeding in 1931, and were widely distributed throughout the state by the end of the 1930s, albeit not abundant until the 1940s.[7, 39] The first South Dakota record was in 1933, and starlings were well established there by 1939, reaching the Black Hills in 1946.[40] Arrival in North Dakota at Fairmont in 1935 was followed by a flurry of records between 1938 and 1942; by the 1960s starlings were fairly common in the eastern third of the state, but remained relatively scarce and local elsewhere.[10, 41] Their spread in North Dakota was perhaps constrained by relatively dry conditions and low human population density in central and western portions of the state.

The long-term BBS trends for these three states and Montana (stable except for a decline in Minnesota) are included in Table 1.[23] North Dakota CBC totals, which are dominated by the Grand Forks (ND) – East Grand Forks (MN) count, show an increasing trend since about 1997, and a peak in 2007-2010, but with large year-to-year fluctuations.[24] South Dakota CBC totals also fluctuate widely, with an underlying increasing trend since the late 1990s.[24]

Migration patterns

Starlings are partial migrants throughout their North American range; that is, some individuals of both sexes and various age categories are migratory, and individual birds may migrate in

some years but not others.[1] Kessel described the species' migratory habits as "exceptionally plastic".[1] Movements of young birds are particularly unpredictable. Migration to and from the Prairie Provinces occurs mainly in February or March to April and September to October.

Starling migration in North America tends to follow a NE-to-SW axis, *i.e.*, wintering areas are often southwest of breeding areas, possibly mimicking ancestral European migration patterns.[1, 3, 5, 42-46] This directional preference is continent-wide, but is most pronounced in eastern North America.[44] Migration distances are quite large, with banding and recovery sites often more than 1,000 km, and sometimes more than 2,000 km apart.

Analysis by Houston of 52 Saskatchewan recoveries of starlings banded on their wintering grounds between 1938 and 1977 shows migratory movements concentrated along an axis from California and Nevada to Saskatchewan, with outlying banding localities north to British Columbia and east to Colorado.[42] California banding yielded more recoveries in Alberta than either Saskatchewan or British Columbia.[45, 46] South Dakota banding returns extend east to southwestern Minnesota, north to North Dakota, west to Utah, and south to Oklahoma and New Mexico, indicating substantial migratory movements within the Great Plains.[40] Records (up to 1995) mapped in the Canadian Atlas of Bird Banding indicate that Ontario breeders rarely migrate farther west than the Mississippi River.[43] The small number of Manitoba band recoveries in this atlas span the continent from Oregon to upstate New York, illustrating the starling's potential for long-range dispersal and for mixing between eastern, central, and western North American populations.[43]

Nearly 10,000 starlings banded in winter in N. Texas, central Kansas, and E. Nebraska between 2005 and 2010 yielded returns northeastward to eastern South Dakota, Minnesota, and Wisconsin, but not Manitoba.[3] In contrast, 26,000 birds banded farther west in north-central Colorado between 1960 and 1974 yielded nine Manitoba and two Saskatchewan recoveries that surprisingly include one winter recovery in each province.[5]

Comparison with other invasive species

The starling's arrival and establishment is one of many dramatic changes in prairie bird populations, involving both European and North American species, since European settlement. The closest parallels are found with the House Sparrow (*Passer domesticus*) and House Finch (*Haemorhous mexicanus*).

With the exception of some Asian populations, House Sparrows are non-migratory. The Canadian Atlas of Bird Banding notes only three records of movements greater than 25 km from banding sites, with a maximum of 175 km (St. Thomas to Etobicoke, Ontario).[43] At one bird observatory in northeast England, nearly 600 House Sparrows were banded between 1951 and 1955, but not one was rediscovered more than about 2 km away.[47] This contrasted with starling recoveries throughout the British Isles and eastward to Scandinavia and several Baltic nations, including 13 in Norway alone, based on over 3000 birds banded at the same observatory.[47] It is therefore remarkable that the house sparrow has been almost as successful as the starling at occupying the Prairie Provinces, and even more successful worldwide.

Expanding rapidly from multiple introductions in the eastern U.S.A., House Sparrows were first noted in Manitoba at Carberry in 1892 and Winnipeg in 1894, and by 1909 were found throughout the settled portions of Manitoba and northwest as far as Athabasca Landing, Alberta.[48, 49] Houston noted in 1978 that in northern Saskatchewan, House Sparrows were still restricted to the immediate vicinity of human settlements, and that their initial spread coincided closely with the arrival of European settlers.[48] Percy Criddle's diaries, as summarized by Houston, indicate establishment of a population nucleus at Brandon by 1897, followed by rapid dispersal throughout nearby farming country, such that house sparrows were no longer noteworthy after 1908.

It is likely that House Sparrows benefited from directly assisted travel by railway freight or supply wagon trains, as well as commensalism with settlers and their livestock. In particular, it seems unlikely that house sparrows could have arrived by 1930 at Churchill, where a breeding population persists today, without "riding the rails". Intriguingly, they preceded the first full export shipload of grain by a year, suggesting that they may initially have followed railway construction camps and supply trains northward. Jehl and Smith describe their presence as "an accidental benefit of the railroad", with their survival closely linked to food and shelter at the grain elevator.[50] F. B. Anderson, a 1931 correspondent to the *Wild Wings* newspaper column, mentioned that freight cars from the east had been seen to "disgorge several sparrows" when opened at Winnipeg.[10] Wing remarked: "The belief that the sparrow was spread to some extent by riding in railroad cars hardly seems justifiable as an assumption for the

starling".[9] It is telling that House Sparrows, unlike starlings, are largely absent from isolated communities in the Manitoba boreal forest.[11, 20, 21]

House Finches are native to western North America, including southern British Columbia (at least since the 1930s), but those in the Prairie Provinces are descended from birds released at Long Island, New York in 1940.[51, 52] While these birds are almost as closely tied to human habitation as are house sparrows, their spread has been facilitated by significant mobility and migratory behaviour – more so than in the British Columbia population.[43] Key dates in the House Finch's Manitoba history are 1983 (first sighting), 1991 (first nest record), and 1992 (first CBC record). Their status was described as "still rapidly evolving" in 1995.[53] The situation is now more stable, as indicated by Winnipeg CBC totals fluctuating between about 200 and 600 birds (1 to 3 per party-hour of observer effort) since 2000.[24] They are largely restricted to urban areas and smaller communities within the agricultural portion of Manitoba, with the boreal forest forming a substantial barrier to further expansion.[11, 21] There is some indication of migratory behaviour in outlying populations, and at least local seasonal movements within urban populations, but detailed analysis is beyond the scope of this paper.

Another exotic species, the Eurasian Collared-Dove (*Streptopelia decaocto*) has recently arrived in the Prairie Provinces, following rapid north-westward expansion from Florida after introduction in the Bahamas.[54] Range expansion seems to be linked to strong dispersal movements by immature birds, whereas adults appear to be sedentary. After an unconfirmed record in Winnipeg in 2000, this species was first confirmed in Manitoba at Holland in 2003, with the first nesting record for the province at Lyleton in 2005.[55] The dove's arrival in Saskatchewan was slightly earlier, in 1998, with CBC records annually since 1999, and the first breeding record in 2001.[54] Detailed discussion would be premature, beyond noting that this dove is currently more firmly established as a year-round resident in Saskatchewan and Alberta than in Manitoba, based on recent seasonal reports in *North American Birds*, Manitoba BBA records, and CBC data.[21, 24]

The stories of other exotic species in Manitoba are complicated by multiple introductions (Gray Partridge, *Perdix perdix*; Ring-necked Pheasant, *Phasianus colchicus*; Wild Turkey, *Meleagris gallopavo*), supplemental feeding and artificial shelter (Wild Turkey), and a combination of obscure history and partial domestication (Rock Pigeon, *Columba livia*).[11]

Summary

This article provides the first detailed account of the arrival, establishment, and current status of the European Starling in Manitoba, discussed in a broader regional context. The species became established rapidly across the Prairie Provinces and beyond, despite early predictions that "the area of the Great Plains, with its scarcity of suitable nesting sites, will undoubtedly retard the westward advance."[56] Following plausible but unconfirmed reports in the 1920s, starling records in Manitoba became increasingly frequent in the mid-to-late 1930s, with the first confirmed nesting in 1935 and the first count of more than 100 birds in 1938. By about 1950, the species had attained something close to its current status of range and abundance in Manitoba. Breeding Bird Survey and Christmas Bird Count data reveal a patchwork of increasing and decreasing trends and fluctuations at local and regional levels. Wintering numbers are linked in part to variations in winter severity and to agricultural and waste-disposal practices that provide supplementary food and warmth.

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