

Report on the Status of

# Purple Martin

in Quebec



REGROUPEMENT  
Québec Oiseaux

## PROJECT TEAM

### EDITING AND MAPPING

Simon Bédard, Project Manager

### PROJECT MANAGEMENT

Jean-Sébastien Guénette

### COVER PAGE PHOTO CREDITS

Left: ©Marcel Gauthier

Top right: ©Marcel Gauthier

Bottom right: ©Robert Noël

THIS PROJECT WAS UNDERTAKEN WITH THE FINANCIAL SUPPORT OF THE GOVERNMENT OF CANADA.



### NOTE TO THE READER

This document may contain sensible information, notably on the location of special status species. Consequently, the reader is encouraged to exercise discretion and limit the distribution of this document.

### CORRECT CITATION FOR THIS PUBLICATION:

Bédard, S. (2016). Report on the Status of Purple Martin in Quebec. Regroupement QuébecOiseaux, Montréal, v + 42 pages.

ISBN 978-2-9814107-0-2 (PDF)

Legal Deposit – Bibliothèque et Archives nationales du Québec, 2017

Legal Deposit – Library and Archives Canada, 2017

## SPECIAL THANKS

We would like to thank those individuals in charge of the Quebec Breeding Bird Atlas (i.e. Regroupement QuébecOiseaux, Canadian Wildlife Service of Environment Canada and Bird Studies Canada) for having provided us with Atlas data, not to mention the thousands of participants that collected data for the project. We would also like to thank those who have helped orchestrate the Étude des populations d'oiseaux du Québec, in particular its author, Mr. Jacques Larivée, as well as the thousands of birders and ornithologists who have submitted their day-to-day observations for over 50 years. Recent data from the Breeding Bird Survey were provided by Adam C. Smith (Senior Biostatistician, Species Abundance and Distribution, Canadian Wildlife Service, Environment Canada, Government of Canada). We are grateful to the hundreds of volunteers across Canada who have participated in this survey over the years as well as those who have served as provincial or territorial coordinators.

We also thank Simon Duval (McGill Bird Observatory – The Migration Research Foundation), Marilyn Labrecque (Nature Québec) and Maxime Tremblay (Association des amateurs d'hirondelles du Québec) who, through their comments, participated in the revision of this document. Maxime Tremblay also provided unpublished data on the number of nesting pairs in Quebec.

## Table of Contents

---

List of Figures.....	iv
List of Tables.....	v
List of Abbreviations and Acronyms.....	v
Objective .....	1
Summary.....	2
Information on the Species.....	4
Range.....	5
North American Range and Wintering Grounds.....	5
Distribution in Quebec.....	6
Habitat.....	7
Biology.....	8
Reproduction.....	8
Diet.....	10
Movements and Dispersal .....	11
Breeding Site Fidelity and Philopatry .....	15
Population Size and Trends .....	16
Abundance .....	16
Trends .....	17
Threats and Limiting Factors .....	27
Declining Insect Availability and Climate Conditions.....	27
Habitat Loss and Coloniality.....	28
Interspecific Competition .....	28
Maintaining Martin Housing.....	29
Parasitism .....	29
Predation.....	30
Importance of the Species .....	33
Current Protection and Other Designations.....	33
Proposed Next Steps.....	34
Objective 1: Raising Awareness and Guiding Stewardship.....	34
Objective 2: Expanding Understanding of the Species .....	35
Objective 3: Enhancing the Coordination of Efforts .....	37
Bibliography .....	39

## List of Figures

---

Figure 1: Range Map – Purple Martin.....	5
Figure 2: Range Map – Purple Martin Subspecies .....	6
Figure 3: Potential Changes in the Purple Martin's Range – 2041-2070 .....	7
Figure 4: Purple Martin Frequency in Quebec – 1970-2016.....	12
Figure 5: Average Annual Arrival Date of Purple Martin in Quebec – 1970-2012.....	13
Figure 6: Average Annual Departure Date of Purple Martin in Quebec – 1970-2012 .....	14
Figure 7: Estimated Purple Martin Relative Abundance Map for Summer Period (number of individuals) – 2007-2013.....	16
Figure 8: Map of Annual Purple Martin Population Trends [%/year] – 1966-2013 .....	18
Figure 9: Average Number of Individuals per Purple Martin Record in Quebec – 1970-2012 .....	19
Figure 10: Purple Martin Consistency in Quebec – 1970-2012.....	19
Figure 11: Distribution of Purple Martin Records in Quebec between May 15 and July 15 – 1980-1999 .....	21
Figure 12: Distribution of Purple Martin Records in Quebec between May 15 and July 15 – 2000-2015 .....	22
Figure 13: Distribution Map of Possible, Probable or Confirmed Purple Martin Nesting in Quebec in the First (1984-1989) and Second (2010-2014) Quebec Breeding Bird Atlas.....	23
Figure 14: Positive and Negative Variations in Occupation Rates in Purple Martin Colonies (number of nesting pairs / number of compartments available) in Quebec – 2005-2015 ...	25
Figure 15: Positive and Negative Variations in Occupation Rates in Purple Martin Colonies (number of nesting pairs / number of compartments available) in Four Regions of Quebec – 2005-2015 .....	26
Figure 16: Distribution Map of Possible, Probable or Confirmed Cooper's Hawk Nesting in Quebec in the First (1984-1989) and Second (2010-2014) Quebec Breeding Bird Atlas.....	32
Figure 17: Distribution Map of Possible, Probable or Confirmed Merlin Nesting in Quebec in the First (1984-1989) and Second (2010-2014) Quebec Breeding Bird Atlas .....	32

## List of Tables

---

Table I: Long- and Short-term Variations in Population [%] and Estimated Abundance of Purple Martin Populations in Different Regions.....	17
Table II: Long-term and Short-term Change [%] in Cooper's Hawk, Merlin and Sharp-shinned Hawk Populations by Region.....	31

## List of Abbreviations and Acronyms

---

<b>AAHQ</b>	Association des amateurs d'hirondelles du Québec
<b>BCR</b>	Bird Conservation Region
<b>COSEWIC</b>	Committee on the Status of Endangered Wildlife in Canada
<b>ÉPOQ</b>	Étude des populations d'oiseaux du Québec
<b>IUCN</b>	International Union for Conservation of Nature
<b>PMCA</b>	Purple Martin Conservation Association

## Objective

---

The objective of this report is to present an overview of the status of the Purple Martin, primarily in Quebec. This overview reveals a decline in the species' population and a contraction of its range in Quebec. This undertaking can also be used to identify areas in Quebec where colonies still exist. Consequently, these areas should be prioritized for conservation projects for the species. Moreover, without going so far as to perform an exhaustive literature review, this report attempts to compile relevant information on the species' biology, population trends as well as threats and limiting factors. Lastly, it proposes actions that should be undertaken to promote the recovery of the species in Quebec.



## Summary

---

The breeding range of the Purple Martin lies mainly in the eastern United States. In Canada, it is mostly found from central Alberta to northwestern Nova Scotia. The species winters mainly in the Andes. In Quebec, breeding pairs are currently concentrated in the southern St. Lawrence Lowlands (rare or absent east of Québec City) as well as the Ottawa Valley. A few extensions are also present in the Upper Richelieu (along the Richelieu River) as well as in the Upper St. Lawrence.

Breeding populations in the East frequent almost exclusively artificial nest sites in the form of multiple-compartment martin houses or hollowed-out gourds. The species nests in colonies that can number up to several dozen pairs.

Although the Purple Martin is known as being monogamous, extra-pair copulation seems to be rather common. Females typically lay 3 to 6 eggs, while the number of birds fledged varies between 2 and 4. In terms of diet, Purple Martins feed exclusively on flying insects and spiders.

According to data from Étude des populations d'oiseaux du Québec (ÉPOQ), the average arrival date of the first individuals in Quebec is April 23 and the average departure date is September 4. After the young fledge and before they depart for pre-migratory roosts, several movements of variable distance from the colony are observed. Moreover, reliable data for estimating philopatry in Purple Martins are scarce, though it seems to be widely agreed that there exists a high degree of breeding site fidelity.

The working group *Partners in Flight* estimates the current Canadian population to number some 200,000 individuals, while Environment Canada considers that there are somewhere between 50,000 and 500,000 adults. The species is believed to be more abundant in Saskatchewan (80,000 individuals), Manitoba (60,000 individuals) and Ontario (40,000 individuals). In Quebec, there are thought to be approximately 2,200 to 3,000 individuals.

According to the Breeding Bird Survey, between 1970 and 2014 the North American population of the species is thought to have declined by 28.5% and the Canadian population, by 48.2%. In Canada, a pronounced dichotomy seems to exist, however, between population trends in the West and in the East. The magnitude of this decline is particularly important (over 90%) in the Lower Great Lakes / St. Lawrence Plain Bird Conservation Region (BCR 13), where the population density of this species is highest. In Quebec, as per the Breeding Bird Survey, the population suffered a decline of 93.6% over the long term (1970 to 2014) and 43.5% over the short term (2004 to 2014). Additionally, the ÉPOQ database shows that the reliability coefficient for the species fell by 85% between 1970 and 2012.

Potential threats and limiting factors for the species include, but are not limited to, the decline of insect availability, climate conditions, habitat loss, interspecific competition with the European Starling and House Sparrow, poor maintenance of martin housing, parasitism and predation (mainly by birds of prey).

The Purple Martin is not designated a special status species at global, federal or provincial levels. The most recent review of its conservation status in Quebec was made in 2015, at which time it was classed S2 ("Imperiled"). Despite the situation, the Quebec Ministry of Forests, Wildlife and Parks has yet to grant the Purple Martin special status under the *Act Respecting Threatened or Vulnerable Species*. In order to foster Purple Martin conservation work, this overview proposes 17 action items, which are broken down into the following three objectives: 1) raising awareness and guiding stewardship, 2) expanding our understanding of the species, and 3) enhancing the coordination of efforts.

## Information on the Species

---

**English name:** Purple Martin

**Scientific name:** *Progne subis*

**French name:** Hirondelle noire

The Purple Martin is the largest swallow both in Quebec (Gauthier and Aubry, 1995) and North America (Tarof and Brown, 2013). It measures approximately 20 cm long, has a wingspan of 46 cm and weighs around 56 g (Sibley, 2006). Although both males and females have an iridescent bluish back, they do show sexual dimorphism. In males, the Purple Martin is the only swallow species in North American with a dark belly, while females have a lighter belly and a brownish-gray nape (Tarof and Brown, 2013). The colour pattern of juvenile males and females resembles that of adult females, but shows variable blue colouring on the head and upper parts. Additionally, the plumage of the lower parts is usually lighter and the nape is generally less clearly delineated than in adult females (Sibley, 2006; Tarof and Brown, 2013). In flight, the Purple Martin alternates rapid flapping and gliding.



Three subspecies are distinguishable on the basis of differences in size and plumage: *P. s. subis* Linnaeus, 1758; *P. s. arboricola* Behle, 1968 and *P. s. hesperia* Brewster, 1889. Breeding populations in eastern North America are not believed to show any noteworthy variability and are thought to all belong to the sub-species *P. s. subis* (Tarof and Brown, 2013) (see Figure 2 for a range map of each of the sub-species).

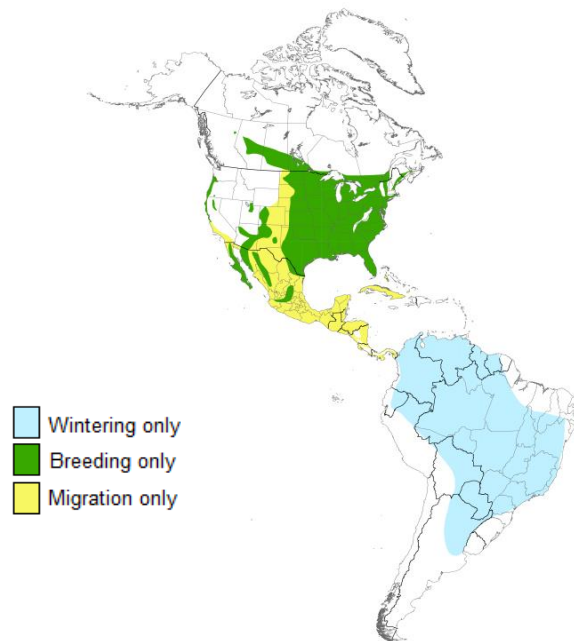
## Range

---

### North American Range and Wintering Grounds

During the breeding season, the species is present throughout most of the eastern United States, beginning roughly at the 102<sup>nd</sup> meridian of west longitude (Figure 1). In Canada, its breeding range stretches from central Alberta to northwestern Nova Scotia and includes central Saskatchewan, southern Manitoba, extreme southwestern and southeastern Ontario, extreme southern Quebec and eastern New Brunswick (Figure 1). The species is also present in extreme southwestern British Columbia, including the southeastern part of Vancouver Island (Tarof and Brown, 2013). This British Columbia population belongs to the sub-species *P. s. arboricola*, however (Figure 2).

The Purple Martin winters in the lowlands east of the Andes. The primary wintering sites seem to be located in eastern Bolivia and southern Brazil (Tarof and Brown, 2013) (Figure 1). No information is available on wintering site fidelity (Tarof and Brown, 2013). However, populations nesting all across eastern North America could very well find themselves sharing the same wintering grounds, as individuals tagged at a single wintering site in the province of São Paulo have been found breeding in Texas, Louisiana, Missouri, Wisconsin, Kansas, Virginia, Maryland, Pennsylvania, New Jersey and Ontario (Coulson, 1985).



**Figure 1: Range Map – Purple Martin**

Source: image taken from BirdLife International/NatureServe, Ridgely et al. (2012), [www.ec.gc.ca/soc-sbc/dist-dist-eng.aspx?sY=2014&sl=e&sB=PUMA&sM=c&sD=4032](http://www.ec.gc.ca/soc-sbc/dist-dist-eng.aspx?sY=2014&sl=e&sB=PUMA&sM=c&sD=4032)



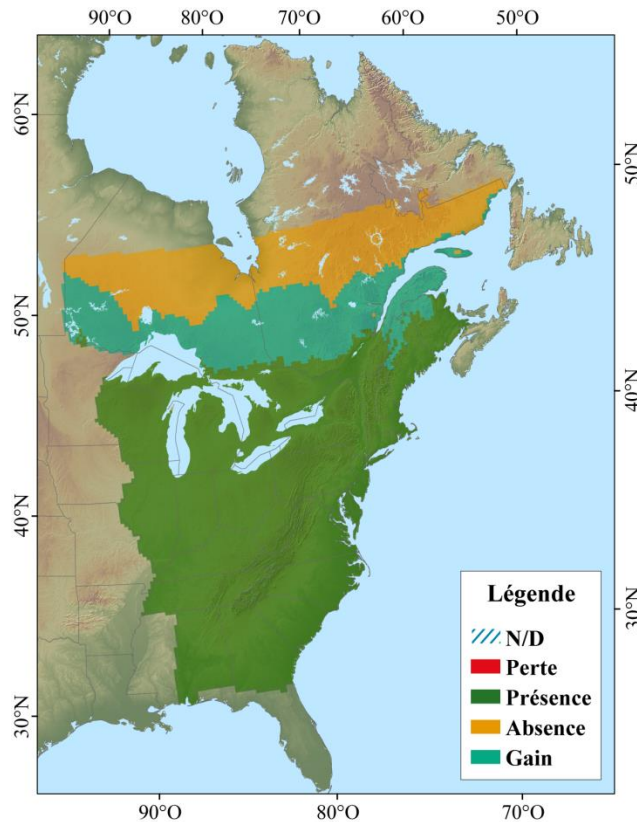
**Figure 2: Range Map – Purple Martin Subspecies**

Source: image taken from Wiggins (2005). The author notes that the exact ranges of subspecies is problematic in several areas. [http://www.fs.usda.gov/Internet/FSE\\_DOCUMENTS/stelprdb5182038.pdf](http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5182038.pdf)

### Distribution in Quebec

Purple Martin observations recorded in the ÉPOQ and eBird databases show that between 2000 and 2015, individuals identified in the breeding season (between May 15 and July 15) (n=1,090 observations) were particularly concentrated in the St. Lawrence Lowlands (though rare east of Québec City) as well as in the Ottawa Valley. The species' nesting range also features a few extensions into the Upper Richelieu (along the Richelieu River) as well as the Upper St. Lawrence (Figure 12).

Climate conditions are likely one of the factors why the species' range in Quebec is limited to the southern part of the province (Gauthier and Aubry, 1995). However, climate envelope models developed by a team of international researchers predict that, for the period from 2041 to 2070, the Purple Martin's range will extend northward with respect to its current boundary (CC-Bio, 2015) (Figure 3). Although criticized on various grounds, this type of modelling exercise based on the climate-species relationship can provide an indication of the possible impact of climate change, albeit without representing a definitive prediction (CC-Bio, 2015).



**Figure 3: Potential Changes in the Purple Martin's Range – 2041-2070**

Source: CC-Bio, Effects of Climate Change on Quebec Biodiversity, [http://cc-bio.uqar.ca/english/en\\_atlas.html](http://cc-bio.uqar.ca/english/en_atlas.html)

## Habitat

Historically, the Purple Martin nested in hollow trees, woodpecker cavities, crevices in cliffs (Gauthier and Aubry, 1995) and in narrow gaps in the cornices of some buildings (Maxime Tremblay, pers. comm.). To this day, some breeding populations in the West, where the species is less common, nest in natural sites in montane forests, deserts and coastal areas (Tarof and Brown, 2013). However, breeding populations in the East frequent almost exclusively artificial nest sites in the form of multiple-compartment martin houses or hollowed-out gourds. The species nests in colonies that can number up to several dozen pairs. This adaptation to artificial nesting sites in the eastern part of its breeding range was already complete before the dawn of the 20<sup>th</sup> century, with just a handful of records in natural sites after this period (Tarof and Brown, 2013). Very few species of birds exhibit such a profound geographic dichotomy in their choice of nesting sites.

This adaptation to artificial sites seems to have driven eastern populations to opportunism in their choice of nesting sites at the landscape level. Likewise, they frequent martin housing found in towns, urban parks, farms and other man-made structures (Gauthier and Aubry, 1995; Tarof and Brown, 2013). Nevertheless, the species seems to favour the presence of a

proximate water source (Gauthier and Aubry, 1995) and appears to avoid the higher elevations of the Appalachians (Tarof and Brown, 2013).

Moreover, although populations in the East live in colonies, those in the West seem to nest more commonly in isolated pairs (Stutchbury, 1991; Tarof and Brown, 2013). The reasons behind the evolution of this species to colonial nesting are not clear, but are most probably attributable to nesting sites as a limiting factor (Tarof and Brown, 2013) or to favour extra-pair copulation (Morton et al., 1990; Wagner et al., 1996).

Lastly, the variably elaborate nest is composed of a base of mud and twigs, which is lined with green leaves before the eggs are laid (Gauthier and Aubry, 1995).

---

## Biology

---

### Reproduction

#### *Reproductive Age and Lifespan*

Both yearling males and females are able to reproduce (Tarof and Brown, 2013). However, older males arrive at the nesting sites earlier than their first-year counterparts (Gauthier and Aubry, 1995). Lifespan is approximately 2 to 5 years (Purple Martin Conservation Association, 2015), with the greatest longevity reported for an individual, the sex of which is unknown, being 13 years, 9 months (United States Geological Survey, 2015).

#### *Number of Broods*

Purple Martins generally produce a single brood (Gauthier and Aubry, 1995). Literature does mention, however, that the species may produce a second replacement clutch following a failed breeding attempt early in the season (Tarof and Brown, 2013). This is most likely less plausible in the northern portions of its breeding range considering the later start of the reproduction season compared to southern areas. Moreover, reliable records of second broods are very rare (Tarof and Brown, 2013).

#### *Clutch Size*

Females typically lay one egg a day (Gauthier and Aubry, 1995) for a total of 3 to 6 eggs (between 1 and 8) (Tarof and Brown, 2013). Individuals in their first year of reproduction seem to produce smaller clutches than older adults (Tarof and Brown, 2013). In Quebec, reports from the 1960s indicate an average clutch size of 4.72 eggs and a hatching success of 75% (Tardif and Darveau, 2006). Incubation begins as soon as the last egg has been laid (Gauthier and Aubry, 1995). Eggs are incubated by the female only, with incubation typically lasting from 15 to 18 days (Tarof and Brown, 2013).

### ***Productivity***

The average number of young per nest varies between 1.2 (Michigan; cold and wet climate conditions) and 4.17 (Pennsylvania) (Tarof and Brown, 2013). On the other hand, the number of young fledged per nest varies between 3.42 (North Carolina) and 4.24 (Texas) for adults parents, while this figure varies between 2.00 (North Carolina) and 3.83 (Texas) for yearling parents (Tarof and Brown, 2013). In Quebec, Tardif and Darveau (2006) indicate a figure of 3.54 fledged juveniles in the 1960s.



### ***Reproduction Strategy***

The Purple Martin is recognized as being monogamous. However, although true polygyny is rather rare, extra-pair copulation seems to be rather common. In this regard, more experienced males are believed to tolerate the presence of younger males (which arrive later) in order to copulate with the females of these young males (Gauthier and Aubry, 1995; Tarof and Brown, 2013).

### ***Territorial Defence***

As mentioned above, older males arrive at the nesting sites before yearling males. These experienced males will then defend several cavities within a single nesting site. Early in the season, a single male can defend tens of cavities at a given site. It will usually defend one compartment and the adjacent cavities, but not the top of the nesting structure (Tarof and Brown, 2013). Vacant cavities will be defended by younger males, which arrive later. These young males will thus defend a smaller number of cavities and individual males of all ages, collectively, will gradually defend fewer cavities as the season progresses (Tarof and Brown, 2013).

### ***Care of Young***

Purple Martin young remain in the nest for 26 to 31 days. Both the male and female participate in feeding and caring for the young (Gauthier and Aubry, 1995). The parents stop

caring for the young 7 to 10 days after they fledge (Brown, 1978) and individuals of all ages subsequently congregate in late summer at pre-migratory roosting sites (Allen and Nice, 1952; Morton and Patterson, 1983).



### ***Survival Rate***

A Program MARK analysis conducted in Pennsylvania between 1998 and 2002 of 3,990 banded nestlings shows that the apparent annual juvenile survival probability is 0.87 ( $\pm 0.03$  SE) for the period between fledging and pre-migratory roosting. This probability falls to 0.32 ( $\pm 0.04$  SE) between fall migration and the return to the nesting site (including overwintering and spring migration). Overall, the probability of annual juvenile survival was 0.27 ( $\pm 0.027$  SE) for the period between fledging and one year old (Tarof et al., 2011). The authors of this study suggest that juvenile mortality occurs mainly after the start of fall migration and that recruitment rates might be more affected by threats faced during migration and/or on the wintering grounds. It should be noted that annual survival probability declined in cases of earlier fledging dates and increased brood size (Tarof et al., 2011).

### **Diet**

Throughout the year, the Purple Martin feeds exclusively on flying insects as well as spiders. This is probably one of the reasons why this species is not well adapted to the climate conditions of northern latitudes. Its insect-based diet varies throughout the breeding season and from region to region, and probably reflects what is available locally at any given time. This diet consists of beetles, dipterans, dragonflies, damselflies, leafhoppers, grasshoppers, crickets, butterflies, mites, wasps, bees, caddisflies, cicadas, termites, mayflies and spiders (Gauthier and Aubry, 1995; Tarof and Brown, 2013).

Due to their insectivorous nature, it is commonly believed that the presence of a Purple Martin colony might help reduce local mosquito populations. However, there are no credible

studies that demonstrate that it might feed on such substantial quantities of mosquitoes. Moreover, the Purple Martin is a diurnal insectivore and feeds high above ground level (at least 50 metres and up to 150 metres) (Tarof and Brown, 2013). On the other hand, mosquitoes are mainly nocturnal and fly closer to the ground (Kale II, 1968).



As Purple Martins most often feed high above the ground, observing their feeding behaviour is difficult. It is noted that although they rarely feed in groups, they do often feed in pairs. This swallow sometimes consumes small quantities of gravel to help it digest the exoskeletons of the insects that it ingests (Tarof and Brown, 2013). It is believed to feed in the vicinity of martin housing, in open terrain and above watercourses, though no information is available on the average distance it travels from the nesting structure (Tarof and Brown, 2013). Prior to egg-laying and after the fledging of juveniles, adults are believed to feed beyond the immediate vicinity of the martin housing for long periods and may sometimes spend the entire afternoon far from the nest site. Once egg-laying has begun, feeding increases in frequency and absences from the vicinity of the colony are shorter in duration (Tarof and Brown, 2013).

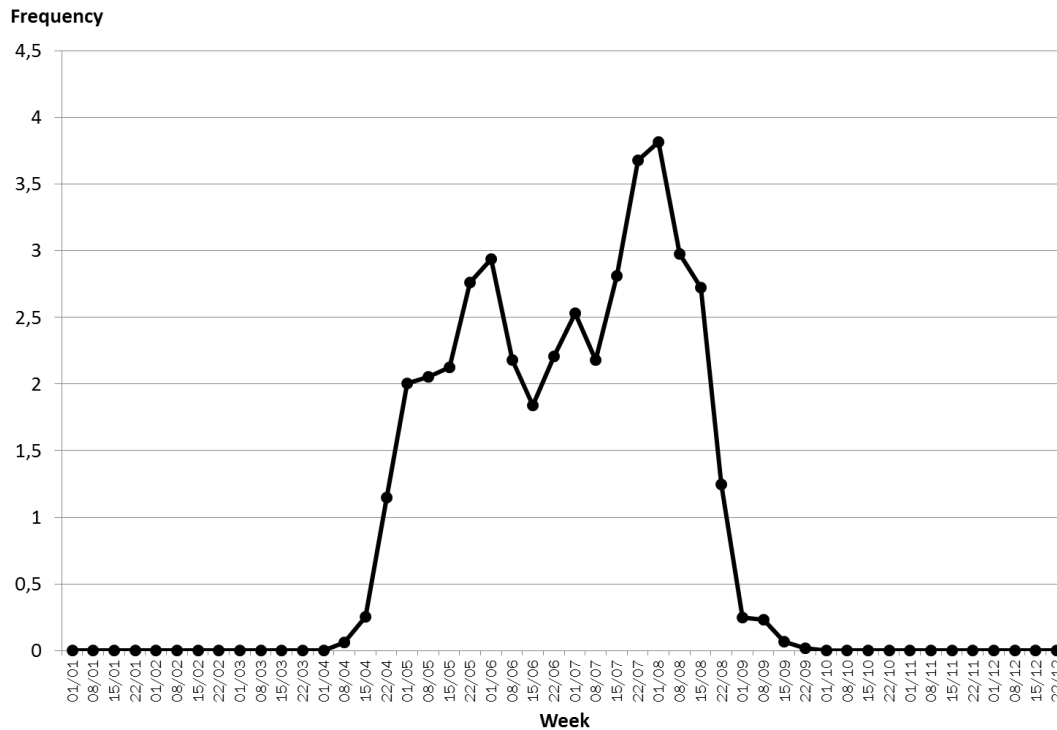
## **Movements and Dispersal**

### ***Spring Migration***

The Purple Martin is one of the first migratory species to reach its nesting grounds in North America. Based on records of individuals arriving in the southern United States in mid-January, the first migrants probably leave their wintering grounds in late December or early January (Tarof and Brown, 2013). These first migrants are often experienced males that arrive between a few days and a few weeks (Morton and Derrickson, 1990; Tarof and Brown, 2013) earlier than females and yearling males. This early migration probably represents an advantage in terms of nest site competition with members of its own species, but especially with House Sparrows (*Passer domesticus*) and European Starlings (*Sturnus vulgaris*) (Tarof and Brown, 2013). These two species are also anthropophilous, but are year-round residents.

The migratory routes of the Purple Martin are poorly known (Tarof of Brown, 2013). A study by Fraser et al. (2013) using geolocators shows however that the spring migration flyways taken by 52 individuals to Pennsylvania and Virginia passed mainly over the Gulf of Mexico.

eBird data show that the Purple Martin is present in Quebec between the second week of April and the last week of September (Figure 4).



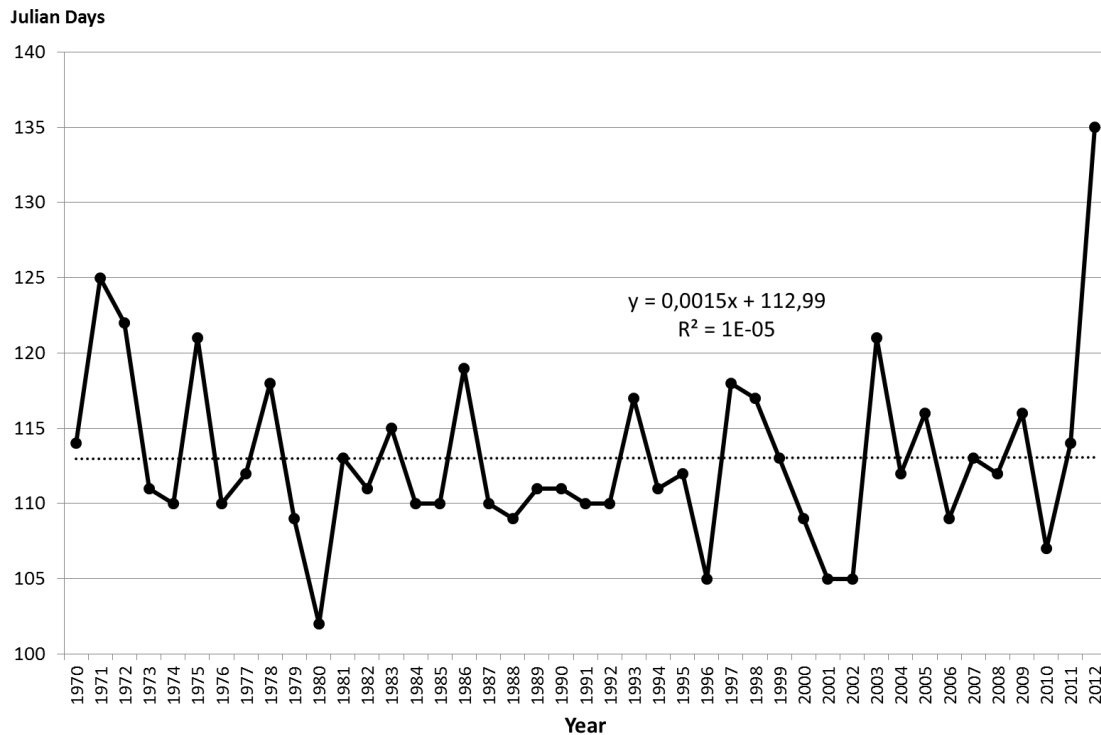
**Figure 4: Purple Martin Frequency in Quebec – 1970-2016**

Frequency = relative occurrence = percentage of field checklists mentioning the species.  
Source: eBird (2016).

According to ÉPOQ records from Quebec between 1970 and 2012 (n=5,972), the average annual arrival dates of individuals vary, depending on the year, between April 12 and May 15 for a 43-year average of April 23. Despite an obvious inter-annual fluctuation, no upward or downward trend is observed ( $p = 0.9838$ ) (Figure 5).

Moreover, in a study tracking 52 individuals using geolocators, Fraser et al. (2013) show that higher temperatures at nesting sites in Pennsylvania and Virginia did not cause individuals to leave earlier for their wintering grounds, nor to increase their migration speed in order to reach their nesting grounds more quickly. The authors thus suggest that an adjustment to the migration period in response to annual temperature variations on the breeding grounds would be phenotypically limited for the Purple Martin and that a potential adjustment would, in the longer term, be based more on natural selection (Fraser et al., 2013). In light of this study, it therefore seems that the inter-annual fluctuation observed in Quebec in average

arrival dates is not likely attributable to individuals responding to annual temperature variations.



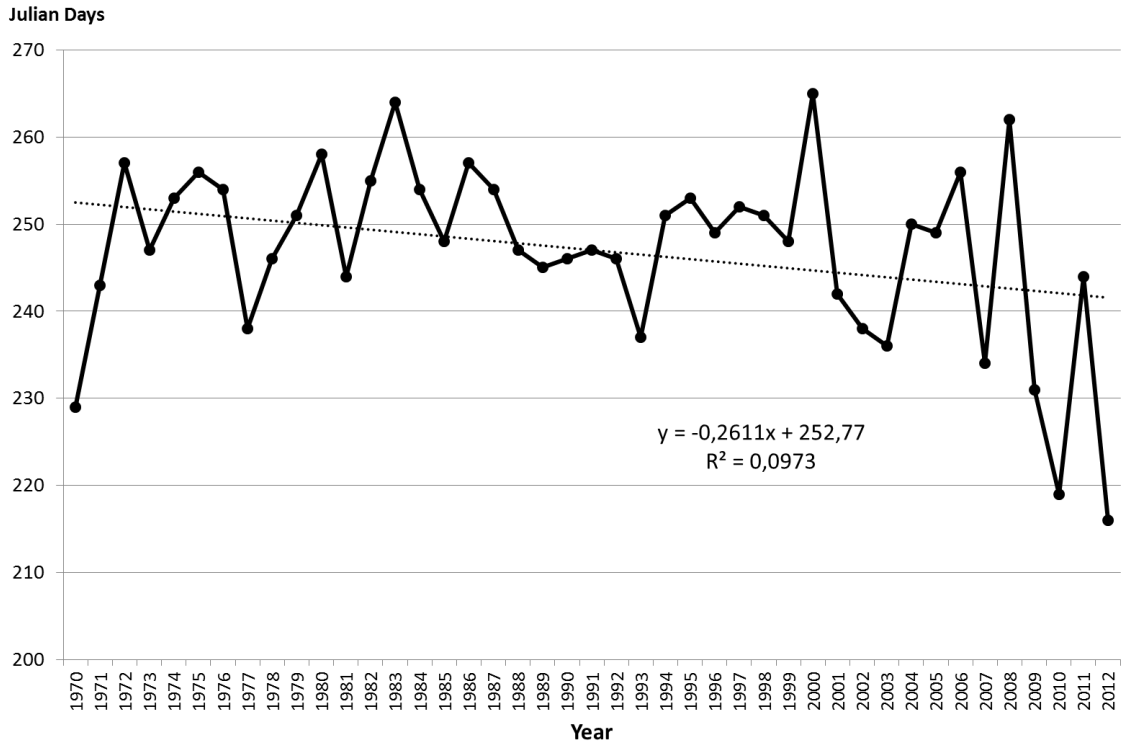
**Figure 5: Average Annual Arrival Date of Purple Martin in Quebec – 1970-2012**

Source: Larivée, J. (2016). Étude des populations d’oiseaux du Québec (ÉPOQ).

### *Fall Migration*

Most individuals of this long-distant migrant probably reach their wintering grounds in South America by flying over the Gulf of Mexico (Tarof and Brown, 2013).

According to ÉPOQ records collected in Quebec between 1970 and 2012 (n= 5,972), average annual departure dates of individuals vary depending on the year between August 4 and September 22, for a 43-year average of September 4. Despite an obvious inter-annual fluctuation, these data indicate a weak trend toward an earlier departure over the years ( $R^2$ : 0.0973;  $p = 0.0417$ ) (Figure 6). This trend should be the subject of further studies, however. Moreover, according to autumn observations made between 2005 and 2014 at the McGill Bird Observatory (n= 240 individuals) in Ste-Anne-de-Bellevue, peak abundance varies from year to year between August 1 and August 22, for a 10-year average of August 13 (Gahbauer, 2016).



**Figure 6: Average Annual Departure Date of Purple Martin in Quebec – 1970-2012**

Source: Larivée, J. (2016). Étude des populations d'oiseaux du Québec (ÉPOQ).

### *Juvenile Dispersal*

Following fledging and before leaving for pre-migratory roosts, a number of movements of variable distance from the colony are observed. Tarof et al. (2011) have shown that on the day of fledging, juveniles venture an average of 939 metres from the colony. According to the same study, the majority of young were detected in a 2 km radius of the colony up to Day 13 after fledging and in a 6 km radius between Days 13 and 18. After Day 18, they probably make their way to pre-migratory roosts.

Parents thus lead their young away from the colony immediately after they fledge, probably due to harassment by other non-breeding martins (Tarof and Brown, 2013). Young from the same brood then roost in a relatively fixed area, where they often remain for several days (Brown, 1978). Parents are generally able to gather their entire brood, and juveniles generally perch on wires, dead tree limbs, television antennas or other types of open perches where they can be easily observed and censused (Tarof and Brown, 2013). For example, shortly before their fall departure, 198 individuals were tallied on power lines near a nest site on Île du Grand-Calumet in the Outaouais region (Réal Bisson, pers. comm.).

Despite this dispersal in family groups, several families return to the colony each night to roost for some time after the young fledge ( $\mu = 4.8$  days, Brown, 1978). When multiple

broods of similar age return simultaneously to nests in the evening, parents seem to compete in order to coax any juvenile they encounter toward their own nest. Consequently, juveniles from different broods sometimes mix. Likewise, approximately one-fourth of all broods contain a juvenile from another brood (Tarof and Brown, 2013). Parents feed these adopted juveniles as if they were their own. It should be noted that this lack of parent-offspring recognition is a characteristic of swallows that nest solitarily (Beecher et al., 1986). As juveniles progressively develop their flight skills, the entire family will leave the family roosting area, generally within 1 to 5 days of fledging (Tarof and Brown, 2013).

In the study conducted by Tarof et al. (2011), juveniles are first detected in pre-migratory roosts 11 to 16 days after fledging. Juveniles remain in these roosts for an average of 14.7 nights before leaving to migrate. Clearly, young martins can cover great distances (e.g. Texas: 80 km) to reach the pre-migratory roosts and, from these locations, can also cover considerable distances in their daily feeding activities (e.g. Texas: at least 48 km) (Tarof and Brown, 2013).

### **Breeding Site Fidelity and Philopatry**

Literature often suggests that entire colonies return to the same nesting site year after year. In a Maryland study, 55% of 527 nesting individuals bred at the same site as the previous year (Davidar and Morton, 1993). In another study, in Texas, 86% of the adults were recaptured or seen again at the same nesting site as the previous year (Tarof and Brown, 2013). Additionally, data on the apparent annual survival probability of known-age adults also supports the consensual hypothesis that the Purple Martin exhibits a high degree of breeding site fidelity (Stutchbury et al., 2009).

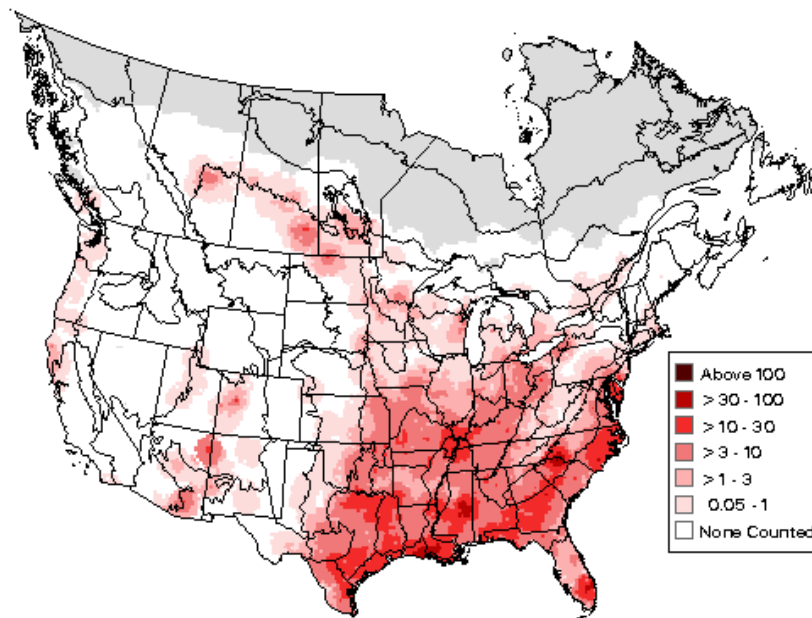
Moreover, few reliable data exist that can be used to estimate philopatry in Purple Martins (Tarof and Brown, 2013). It appears however that hatch-year juveniles disperse considerably (Allen and Nice, 1952) and that relatively few individuals return to their hatch site. In Ohio, 5% of nestlings ( $n=20$ ) (Hicks, 1933) and in Texas, 1% of nestlings ( $n=203$ ) (Tarof and Brown, 2013) returned to their original nesting site. Of those birds banded and recaptured in their first nesting season, 61% were found between 0 and 1.6 km from their hatch site, 15.3% between 1.6 and 40 km, 13.0% between 40 and 80 km, 4.3% between 80 and 160 km, 4.3% between 160 and 320 km, and 2.1% more than 320 km from their hatch site (Allen and Nice, 1952).

## Population Size and Trends

---

### Abundance

The *Partners in Flight* working group estimates the breeding population at 7 million individuals, with a breakdown of 90% in the United States, 7% in Mexico and 3% in Canada (Partners in Flight Science Committee, 2012) (Figure 7). Environment Canada estimates the Canadian population to number between 50,000 and 500,000 adults (Government of Canada, 2014). This is consistent with the estimate of 3% in Canada (200,000 individuals) made by *Partners in Flight*.



**Figure 7: Estimated Purple Martin Relative Abundance Map for Summer Period (number of individuals) – 2007-2013**

Source: Breeding Bird Survey, Patuxent Wildlife Research Center, [www.mbr-pwrc.usgs.gov/bbs/bbs.html](http://www.mbr-pwrc.usgs.gov/bbs/bbs.html)

In Canada, the Purple Martin is believed to be most abundant in Saskatchewan (80,000 individuals), Manitoba (60,000 individuals) and Ontario (40,000 individuals). The Quebec population is believed to number approximately 3,000 individuals (Partners in Flight Science Committee, 2013) (Table I).

## Trends

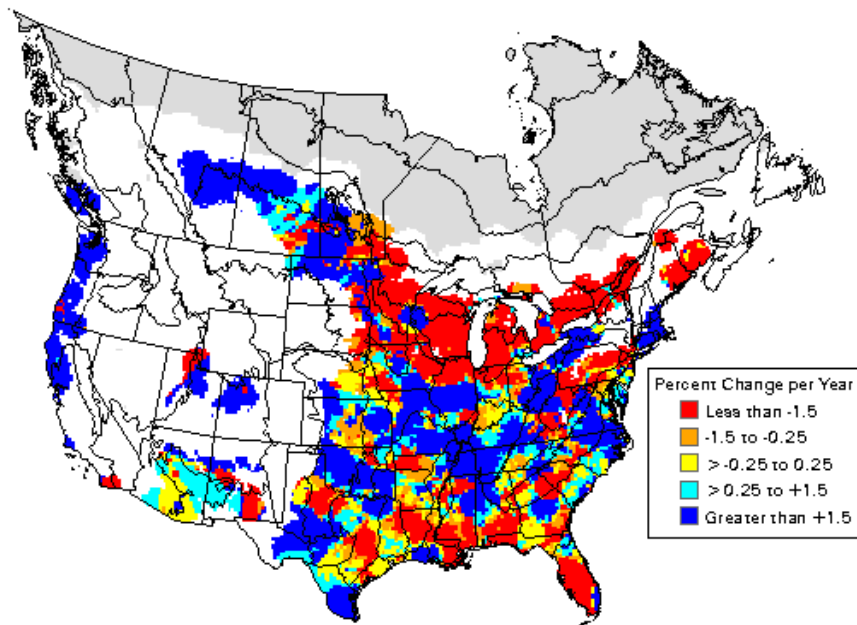
### *In Canada*

The 1980s show a negative shift in Breeding Bird Survey trends for populations of swallows, swifts and nightjars nearly throughout North America (Government of Canada, 2014). The Purple Martin was no exception. Long-term trends in the Breeding Bird Survey (between 1970 and 2014) show a 28.5% decline in the population throughout North America (Table I). In Canada, this trend represents a population decline of 48.2%. However, Table I and Figure 8 illustrate the dichotomy that exists between the populations of western and eastern Canada. While the populations of British Columbia, Alberta and Saskatchewan show strong positive trends, those in the East exhibit pronounced negative trends, particularly in Ontario, Quebec and New Brunswick. It should be noted that these trends, particularly those in the West, may not be accurate (see Table I: Overall Reliability). In this regard, differences throughout the country may be a reflection of limited and/or sparse data in the West (Adam C. Smith, pers. comm.). The magnitude of the decline (over 90%) is particularly significant in the Lower Great Lakes / St. Lawrence Plain Bird Conservation Region (BCR 13), where the species has the highest density (Government of Canada, 2014). Lastly, comparing the three provinces where the species is most abundant (Saskatchewan, Manitoba and Ontario), it is particularly interesting to note the difference in positive and negative trends beginning in Manitoba (see Table I and Figure 8).

**Table I: Long- and Short-term Variations in Population [%] and Estimated Abundance of Purple Martin Populations in Different Regions**

Region	LONG-TERM Change [%]		SHORT-TERM Change [%]		Estimated abundance**		
	1970-2014*		2004-2014*		(Reliability good = 1, to very poor = 5) [% of overall population]		
	(overall reliability)		(overall reliability)				
North America	- 28.5	(high)	- 6.4	(high)	6,000,000	(2)	[N/A]
United States	- 27.1	(high)	- 7.5	(high)	6,000,000	(2)	[90%]
Canada	- 48.2	(high)	+ 21.1	(low)	200,000	(2)	[3%]
British Columbia	+ 219	(low)	+ 117	(low)	5,000	(4)	[0.1%]
Alberta***	+ 242	(low)	+ 37.8	(low)	18,000	(3)	[0.3%]
Saskatchewan	+ 390	(medium)	+ 72.6	(low)	80,000	(3)	[1.2%]
Manitoba	-77	(medium)	-45.2	(low)	60,000	(3)	[0.8%]
Ontario	-92.3	(high)	-43.9	(medium)	40,000	(3)	[0.6%]
Quebec	-93.6	(medium)	-43.5	(low)	3,000	(4)	[0.0%]
New Brunswick	-98.1	(low)	-12.4	(low)	1,700	(4)	[0.0%]
BCR 13	-92.8	(high)	-44.5	(medium)	70,000	(3)	[1.1%]

Source: \*Breeding Bird Survey, 2014 data version of the Canadian Wildlife Service's annual analysis, obtained from Adam C. Smith, Senior Biostatistician, Species Abundance and Distribution, Canadian Wildlife Service, Environment Canada, Government of Canada. \*\*Partners in Flight Science Committee (2013). \*\*\*For Alberta, data available from 1971 onward.



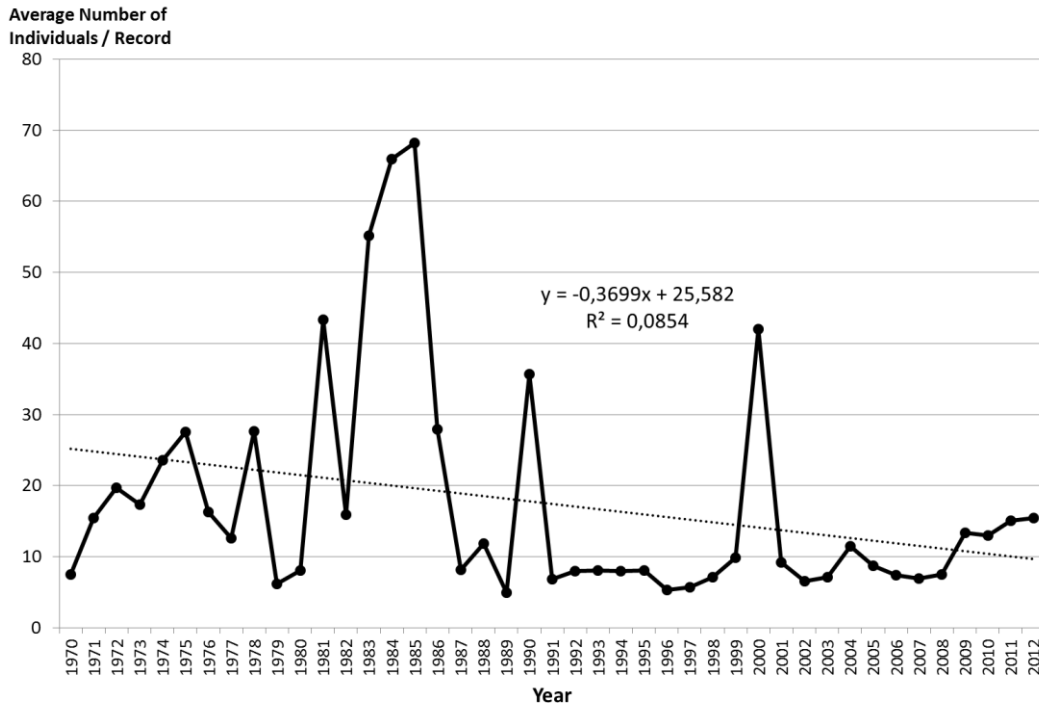
**Figure 8: Map of Annual Purple Martin Population Trends [%/year] – 1966-2013**

Source: Breeding Bird Survey, Patuxent Wildlife Research Center, [www.mbr-pwrc.usgs.gov/bbs/bbs.html](http://www.mbr-pwrc.usgs.gov/bbs/bbs.html)

### *In Quebec*

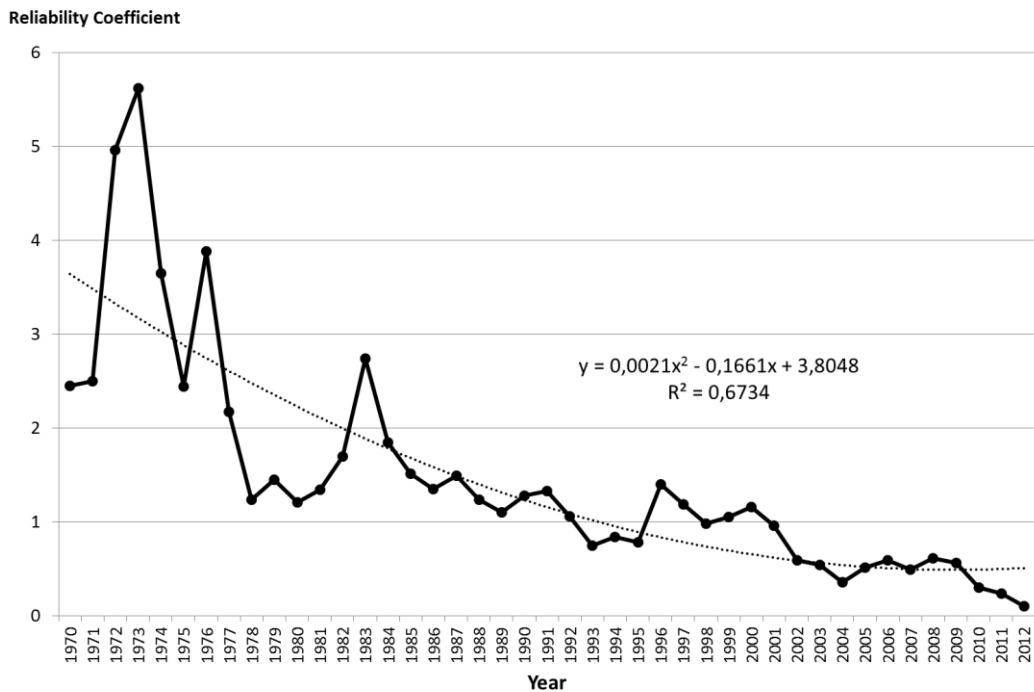
The ÉPOQ database indicates that between 1970 and 2012, the average number of individuals observed per record (total number of individuals / number of records) did not change significantly in Quebec ( $R^2$ : 0.0854;  $p = 0.057$ ), despite large inter-annual fluctuations (Figure 9). However, the reliability coefficient (i.e. number of records of the species\*100 / total number of field checklists) diminishes quite obviously ( $R^2$ : 0.6734;  $p < 0.001$ ) (Figure 10). In other words, this seems to indicate that there are nearly as many individuals tallied for each record, despite a significant drop-off in the number of records. This might be an indication of a concentration of individuals in certain areas or colonies.

According to the Breeding Bird Survey, the Quebec population sustained significant declines over both the long term (-93.6% between 1970 and 2014) and the short term (-43.5% between 2004 and 2014) (Table I). Further, the ÉPOQ database shows that the reliability coefficient for the species fell by 85% between 1970 and 2012 ( $n=5,972$  records) (Figure 10).



**Figure 9: Average Number of Individuals per Purple Martin Record in Quebec – 1970-2012**

Source: Larivée, J. (2016). Étude des populations d'oiseaux du Québec (ÉPOQ).



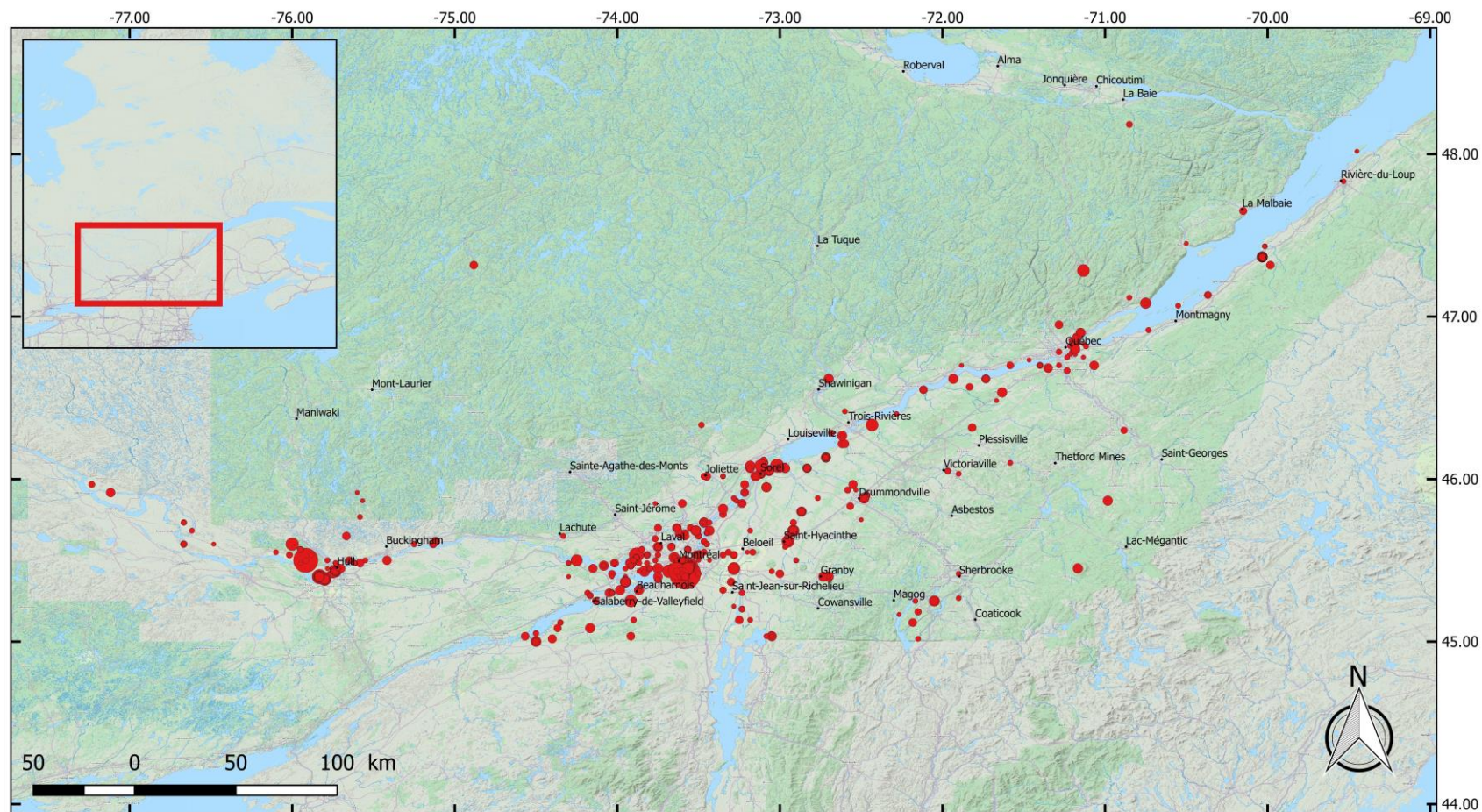
**Figure 10: Purple Martin Consistency in Quebec – 1970-2012**

Consistency = Frequency of observation of species = Number of records of the species \* 100 / Number of daily field checklists.

Source: Larivée, J. (2016). Étude des populations d'oiseaux du Québec (ÉPOQ).

Figures 11 and 12 present the distribution of sightings reported in ÉPOQ and eBird according to two distinct periods: from 1980 to 1999 (1,707 records) and from 2000 to 2015 (1,090 records). Given that the Purple Martin nests exclusively in artificial nesting structures and that only observations made during the breeding season were retained (May 15 to July 15), this distribution provides a good portrait of the presence and use of martin housing in Quebec. Comparing the species' range between the two periods, the following observations can be noted:

- ① A concentration of the range in the St. Lawrence Lowlands;
- ② A sharp decline of the species' presence east of Ste-Croix-de-Lotbinière;
- ③ A sharp decline and disappearance from several locations in the Centre-du-Québec and Estrie regions;
- ④ A pronounced decline in the vicinity of the Sorel islands;
- ⑤ A decline on the south shore of Montréal Island;
- ⑥ Stability or increase in the Upper Richelieu (along the Richelieu River) as well as in the Upper St. Lawrence;
- ⑦ Stability or a redistribution in the Ottawa Valley.



Distribution of Purple Martin Records in Quebec between May 15 and July 15 — 1980-1999

Map produced by:  
Simon Bédard

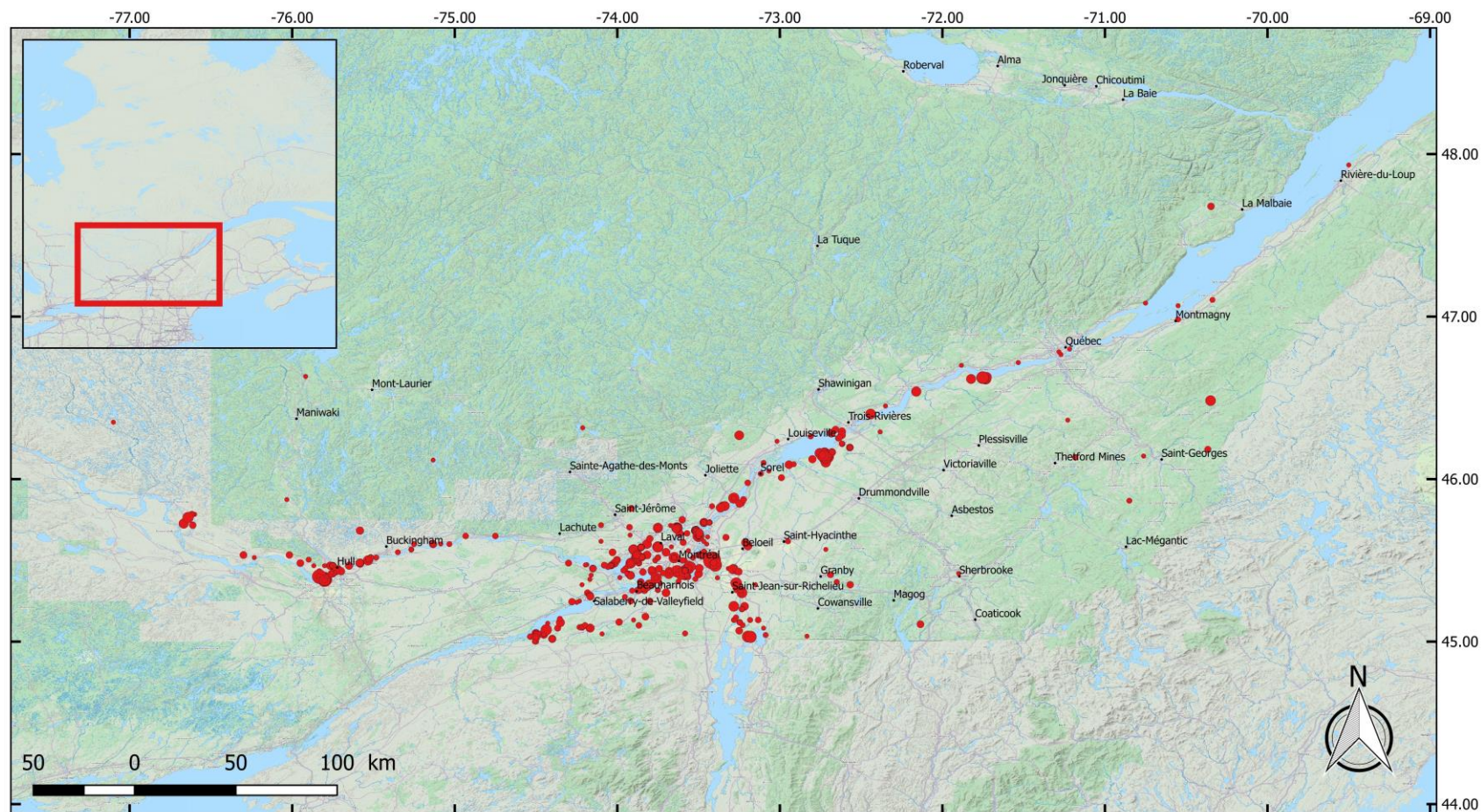


© August 2015

Note: The surface area of the points represents the square root of the NUMBER OF INDIVIDUALS PER RECORD divided by 1.2. Geographic coordinate system: NAD83.

**Figure 11: Distribution of Purple Martin Records in Quebec between May 15 and July 15 – 1980-1999**

Source: Larivée, J. (2016), Étude des populations d'oiseaux du Québec (ÉPOQ); eBird, version: EBD\_reIMay-2015.



## Distribution of Purple Martin Records in Quebec between May 15 and July 15 — 2000-2015

Map produced by:  
Simon Bédard

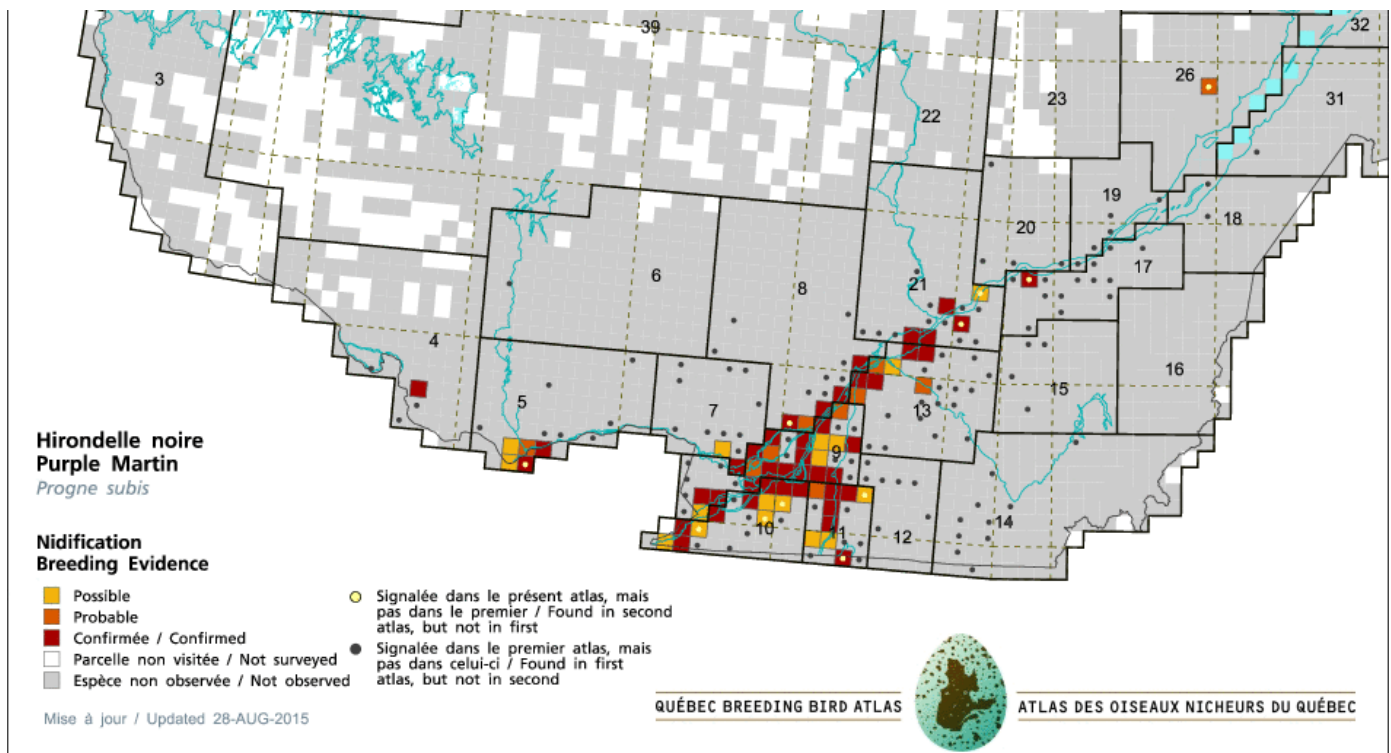


© August 2015

Note: The surface area of the points represents the square root of the NUMBER OF INDIVIDUALS PER RECORD divided by 1.2. Geographic coordinate system: NAD83.

**Figure 12: Distribution of Purple Martin Records in Quebec between May 15 and July 15 – 2000-2015**  
Source: Larivée, J. (2016), Étude des populations d'oiseaux du Québec (ÉPOQ); eBird, version: EBD\_relMay-2015.

Moreover, data from the second Quebec Breeding Bird Atlas (2010 to 2014) indicate an absence of breeding colonies in 128 of the 186 10 km<sup>2</sup> parcels where the species had been recorded in the first Atlas (1984-1989) (Figure 13). Conversely, in the second Atlas, the species was detected in only 11 parcels where it had not been recorded in the first Atlas (Figure 13). These 11 parcels are essentially located in the St. Lawrence Lowlands. The portrait that emerges from Quebec Breeding Bird Atlas data (Figure 13) coincides with that of ÉPOQ/eBird (Figures 11 and 12) and reveals a clear decline or disappearance of the species in areas located away from the southern St. Lawrence Lowlands, Ottawa Valley and Upper Richelieu.



**Figure 13: Distribution Map of Possible, Probable or Confirmed Purple Martin Nesting in Quebec in the First (1984-1989) and Second (2010-2014) Quebec Breeding Bird Atlas**

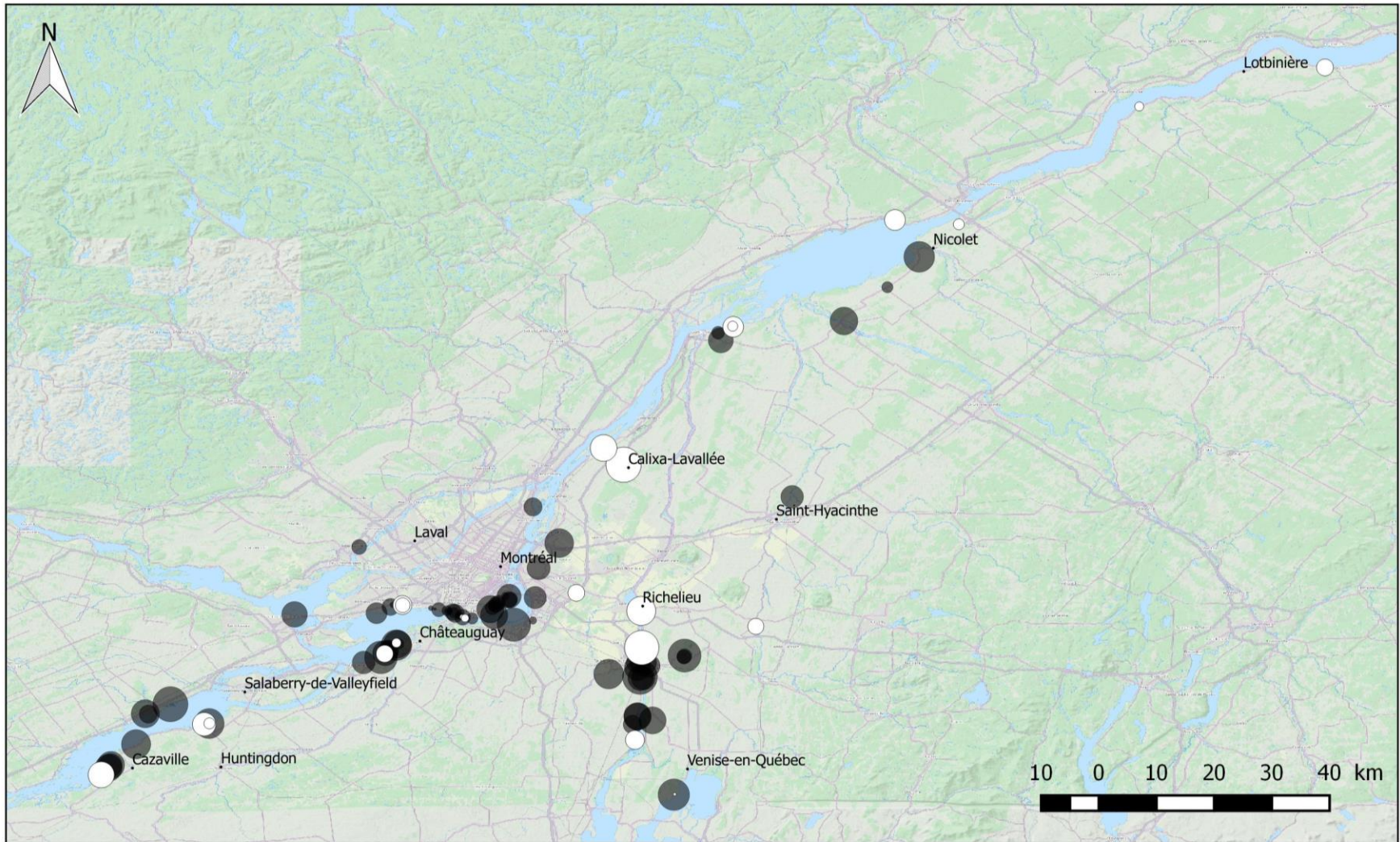
Source: Quebec Breeding Bird Atlas (2015). [www.atlas-oiseaux.qc.ca/index\\_en.jsp](http://www.atlas-oiseaux.qc.ca/index_en.jsp)

On the other hand, between 2005 and 2015, unpublished data on the number of breeding pairs were collected by Mr. Maxime Tremblay from a significant portion of the active martin housing in Quebec (1,525 annual follow-ups of 217 nesting structures in 97 colonies). These data show that of the 97 colonies monitored, 54 (56%) are now abandoned, including 39 (72%) within the last five years. Further, in 2015, 22 of the 43 remaining colonies (51%) hosted 15 or fewer nesting pairs for an average of 20.5 nesting pairs / colony (SD±18.7). It should be noted that the standard deviation suggests a high concentration of individuals in certain colonies (see also Figures 14 and 15). Consequently, small colonies numbering just a few individuals are also probably bound to disappear in the very short term.

Using these unpublished data, we know that the minimum number of nesting pairs in Quebec in 2015 was 881 (i.e. total number of nesting pairs in the 59 colonies recorded in 2015 by Mr. Tremblay). We estimate that in 2015, between 5 and 10 colonies were not discovered or censused in this survey. This estimate is based on Mr. Tremblay's field experience as well as a visual assessment of the map. In this manner, we compared the locations of the 59 surveyed colonies to those of eBird database records from 2015. Consequently, the maximum number of nesting pairs might be in the order of 1,086 pairs (i.e. 881 pairs + (maximum of 10 non-recorded colonies multiplied by an average of 20.5 pairs/colony)). In fact, this estimate is in same order of magnitude as that made by the working group *Partners in Flight*, i.e. 2,855 individuals (Partners in Flight Science Committee, 2013).

Figures 14 and 15 show the positive and negative variations in average annual occupation rates between 2005 and 2015 (i.e. number of nesting pairs / number of available compartments) for each of the colonies recorded by Mr. Tremblay.

Lastly, a total of 240 Purple Martins were observed in the fall between 2005 and 2014 at the McGill Bird Observatory. With comparable observation efforts each year, 82% of the 240 individuals were observed between 2005 and 2008 ( $\mu = 49$  individuals/year), vs. a mere 18% between 2011 and 2014 ( $\mu = 11$  individuals/year). No observations of Purple Martins were recorded in 2009 and 2010 (Gahbauer, 2016).



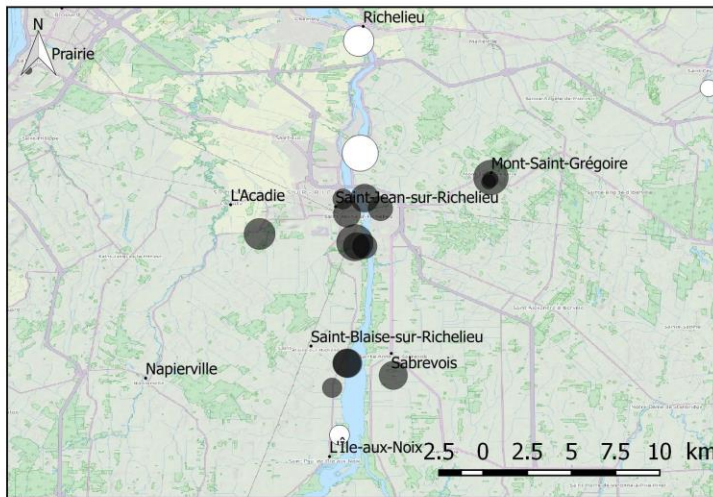
Entire Quebec range

- Negative variation in occupation rate
- Positive variation in occupation rate

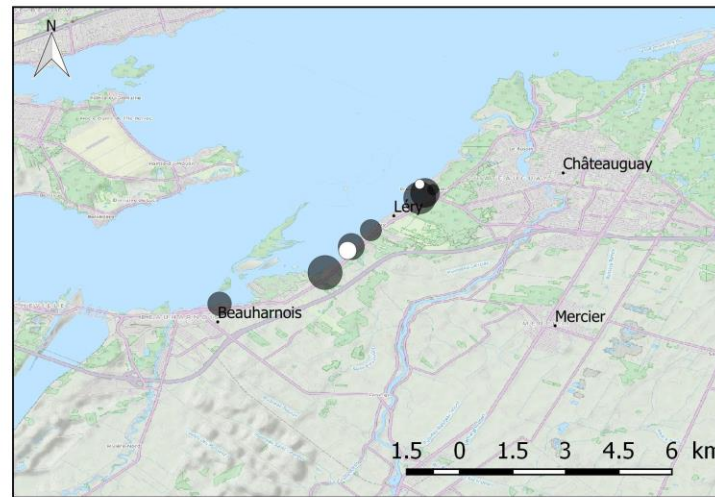
Note: the size of the circles represents the magnitude of the variation (between 2005 and 2015) in the occupation rate of a given colony. Darker shaded circles are the result of an overlap of multiple colonies with negative trends. Geographic coordinate system: NAD83. Mapping by Simon Bédard, © Regroupement QuébecOiseaux.

**Figure 14: Positive and Negative Variations in Occupation Rates in Purple Martin Colonies (number of nesting pairs / number of compartments available) in Quebec – 2005-2015**

Source: Martin house survey data from Mr. Maxime Tremblay (AAHQ)



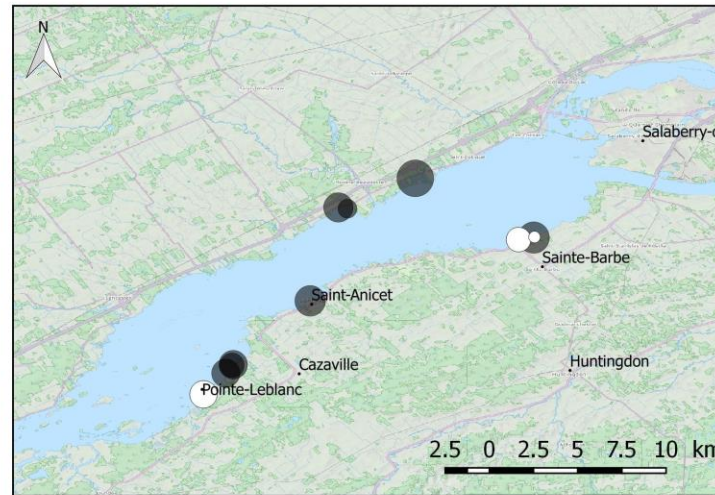
Richelieu River



Beauharnois-Salaberry



Montréal



Upper St.Lawrence

- Negative variation in occupation rate
- Positive variation in occupation rate

Note: the size of the circles represents the magnitude of the variation (between 2005 and 2015) in the occupation rate of a given colony. Darker shaded circles are the result of an overlap of multiple colonies with negative trends. Geographic coordinate system: NAD83. Mapping by Simon Bédard, © Regroupement QuébecOiseaux.

**Figure 15: Positive and Negative Variations in Occupation Rates in Purple Martin Colonies (number of nesting pairs / number of compartments available) in Four Regions of Quebec – 2005-2015**

Source: Martin house survey data from Mr. Maxime Tremblay (AAHQ)

## Threats and Limiting Factors

---

The dwindling Purple Martin population in eastern North America suggests that it might be affected by certain factors that are also responsible for the declines in populations of other aerial insectivores such as changes in the dynamics of flying insect populations, the use of toxic chemicals and climate change (Government of Canada, 2014). Other factors unrelated to the species' diet might also be at play. Thus, the decline is not likely attributable to a single factor, but rather a combination of factors. Notably, in Quebec, predation by birds of prey seems to represent a serious threat. In the absence of a well-orchestrated and sustained conservation effort, further declines in eastern populations might be anticipated, particularly those that are most isolated (Tautin, 2013).

### Declining Insect Availability and Climate Conditions

On one hand, in light of its diet, it can be assumed that the Purple Martin may be suffering from the overall decline in the populations of flying insects. Indeed, birds that forage on flying insects are experiencing a more pronounced decline than any other bird group (NABCI, 2012). These declines are probably the result of a combination of various factors, both in Canada and in their wintering grounds, notably reduced abundance of insects, habitat loss, pesticide use and climate change (NABCI, 2012).

On the other hand, the Purple Martin is particularly sensitive to climatic variations in spring and early summer. Indeed, given that the species arrives relatively early in the spring, it is more prone to falling victim to adverse climate conditions (late cold snaps, heavy rain) (Gauthier and Aubry, 1995). Such extreme weather kills a greater number of individuals than all other sources of mortality combined (Government of Canada, 2014; Tarof and Brown, 2013).

Therefore, in addition to probably being affected by the overall decline in insect populations, Purple Martins are believed to have difficulty finding insects when feeding in such inclement meteorological conditions (Gauthier and Aubry, 1995). Below 9°C, the Purple Martin probably struggles to feed due to the scarcity of flying insects and may require temperatures of at least 13°C to survive over extended periods (Brown, 1976). In cold weather, Purple Martins have on rare occasions been recorded feeding in urban areas, darting between cars and perching on wires, buildings and traffic lights (Tarof and Brown, 2013). This behaviour might be attributable to the heat generated by cars and asphalt, which is believed to attract insects, and in turn, martins. When adverse conditions persist for several days, mortalities can be significant.

Mass die-offs are relatively common in northern North America, particularly in New England, the Ohio Valley and the Appalachians. In recent times, the greatest mass mortality dates back to late June 1972, when a hurricane decimated populations from Virginia to Massachusetts and the western Great Lakes (Tarof and Brown, 2013).

## Habitat Loss and Coloniality

The loss of snags and other cavity trees due to logging can harm populations in western North America that use these forest features for nesting (Tarof and Brown, 2013).

In eastern North America, the species' relatively recent switch to an artificial substrate has probably resulted in certain changes in its social behaviour. However, certain behaviours characteristic of colonial populations remain similar to martin populations nesting solitarily. Little is known about the advantages, disadvantages and cost-benefit ratio of colonial nesting in this species (Tarof and Brown, 2013). It can be assumed that Purple Martins greatly benefit from the presence of artificial housing and that the availability of man-made nesting sites can represent a limiting factor. For example, the size of a colony can increase with an increase in the number of compartments (Tarof and Brown, 2013), suggesting that the number of artificial structures is a limiting factor. However, colonies containing more than 35 nesting pairs are rather rare (Tarof and Brown, 2013), which suggests that there is a limit to how much benefit can be obtained by increasing the number of structures. Moreover, neither clutch size nor the number of nestlings is known to vary with the size of the colony (Davis and Brown, 1999). Known disadvantages of colonial nesting in this species include increased agonistic interactions, male mate-guarding effort and increased exposure to mites as a function of colony size (Davis and Brown, 1999).

## Interspecific Competition

The European Starling and the House Sparrow are two species introduced in North America that compete with the Purple Martin for artificial nest sites (Tarof and Brown, 2013). These two species are recognized as being serious competitors by expropriating favourable or already active nest sites. They render them unavailable by stuffing them with plant matter as well as by destroying or tossing out eggs and nestlings (Tarof and Brown, 2013). It appears that the Purple Martin is generally incapable of efficiently coping with these two competitors (Tarof and Brown, 2013). Starlings (and more rarely, House Sparrows) can also cause death to adult martins (Tarof and Brown, 2013). Other species that can potentially compete for nesting sites such as the House Wren (*Troglodytes aedon*) are believed to have an overall negligible impact on Purple Martin populations (Tarof and Brown, 2013).



## Maintaining Martin Housing

Building, installing and looking after a martin house as well as establishing and maintaining a colony represent a considerable challenge and often entail a sustained and dedicated effort. Underestimating this challenge can be counter-productive and may cause harm to the martins. Poorly designed, installed or maintained martin houses increase the risk of usurpation, mortality by suffocation, predation, presence of ectoparasites and intra- and interspecific competition (Tarof and Brown, 2013). Fortunately, literature contains an abundance of advice and tips of all sorts to promote the nesting and maintenance of colonies in artificial structures (e.g. PMCA).



In order to facilitate nesting for this species, a number of factors should be taken into consideration, including the general design, colour, paint, and type of material used for the martin housing, offering additional food in the spring, the installation site, the absence of trees or other structures in proximity, the opening and closing of entrance holes in the spring and fall, cleaning, installation of predator guards, etc. (Tarof and Brown, 2013).

Any measures taken for artificial nesting structures can be effective at the local scale, while appropriate management measures at the global scale are not as clear and may be rather limited. Recent declines suggest, however, that global efforts should be undertaken in order to educate individuals, groups, associations and organizations regarding best practices for managing martin housing and colonies (Tarof and Brown, 2013).

## Parasitism

Although occasional cases of Brown-headed Cowbird parasitism have been reported, there is no tangible proof that interspecific brood parasitism represents a real threat to Purple Martins (Tarof and Brown, 2013). Even if House Sparrow eggs are sometimes found in Purple Martin nests, this is probably simply the result of the high density of compartments in the nesting structures occupied by the two species; there are no known records of House Sparrow eggs or nestlings being incubated or raised by Purple Martins (Tarof and Brown, 2013).

Moreover, known parasites of the Purple Martin include cimicid bugs, ticks, fleas, dipterans, dermestid beetles, lice, mites, nematodes, trematodes, and protozoans (Tarof and Brown, 2013). A parasitic infestation can lead to serious adverse effects, including notably clutch size, fledgling mass, fledgling mortality, colony abandonment and adult mortality (Moss and Camin, 1970; Davidar and Morton, 1993; Davidar and Morton, 2006; Tarof and Brown, 2013). Besides the mere existence of the records, very little is known about the impacts of different parasites on individual health and colony dynamics. However, a study performed in Pennsylvania has demonstrated higher productivity in breeding pairs in nesting structures in which all ectoparasites had been eliminated (1.98 young fledged / nest) than in naturally parasited pairs (1.08 young fledged / nest) (Tarof and Brown, 2013).

### **Predation**

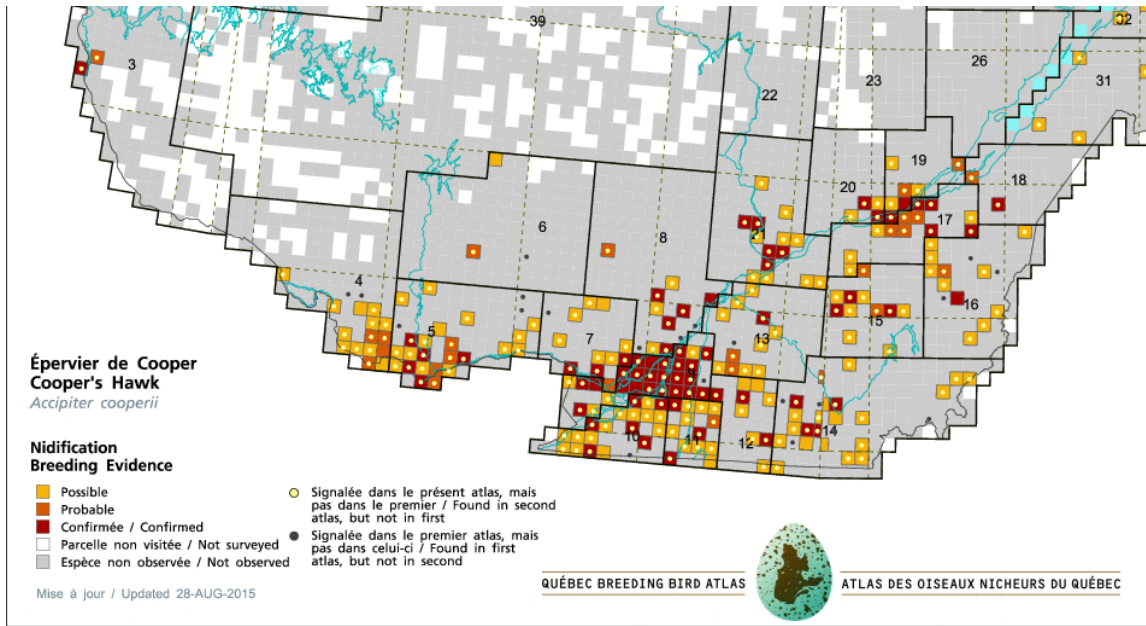
Known predators of the Purple Martin include birds, snakes, domestic cats (*Felis domesticus*), raccoons (*Procyon lotor*) and squirrels (Tarof and Brown, 2013). Snakes, squirrels and raccoons climb up the support posts of nest structures to reach the nests and prey on adults, young and eggs (Tarof and Brown, 2013). Blue Jays (*Cyanocitta cristata*), American Crows (*Corvus brachyrhynchos*), European Starlings and birds of prey, especially Sharp-shinned Hawks (*Accipiter striatus*) and Cooper's Hawks (*Accipiter cooperii*), can attack adults and young directly at the nest site.

According to a number of owners of martin housing in Quebec, birds of prey represent the primary threat to maintaining their colonies. According to Maxime Tremblay, president of the Association des amateurs d'hirondelles du Québec (AAHQ), birds of prey were present and represented a potential danger at roughly one-third of the 59 colonies that he visited in the summer of 2015. In fact, Breeding Bird Survey and ÉPOQ data (Table II) as well as the results of the second Quebec Breeding Bird Atlas (Figures 16 and 17) show impressive population increases in birds of prey across the Purple Martin's breeding range. Considering the relatively low number of remaining colonies in Quebec, predation by birds of prey could be a serious threat to maintaining the Quebec population. It is therefore urgent that studies be conducted to better quantify and grasp the issue and that solutions be proposed.

**Table II: Long-term and Short-term Change [%] in Cooper's Hawk, Merlin and Sharp-shinned Hawk Populations by Region**

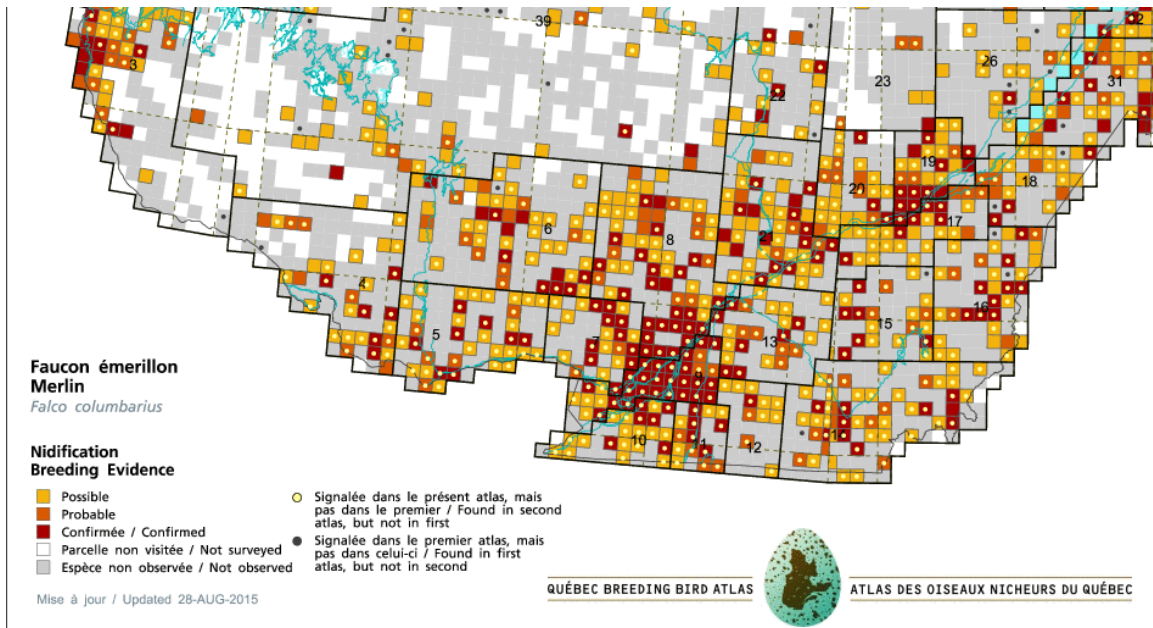
Species – Region		LONG-TERM Change [%] 1970-2014* (overall reliability)	SHORT-TERM Change [%] 2004-2014* (overall reliability)	LONG-TERM Change [%] 1980-2011** (N records)
Cooper's Hawk –	Canada	+ 37.2 (high)	+ 16.5 (low)	–
	Quebec	+ 708 (low)	+ 66.7 (low)	+ 2952 (5,136)
	BCR 13	+ 500 (medium)	+ 45 (low)	–
Merlin –	Canada	+ 312 (medium)	+ 40.8 (low)	–
	Quebec	+ 647 (low)	+ 44.6 (low)	+ 110 (24,443)
	BCR 13	+ 1260 (medium)	+ 77.1 (low)	–
Sharp-shinned Hawk –	Canada	+ 101 (low)	+ 16.9 (low)	–
	Quebec	+ 85.1 (low)	+ 12 (low)	+ 73.4 (26,822)
	BCR 13	+ 144 (medium)	+ 28.8 (low)	–

Source: \*Breeding Bird Survey, 2014 data version of the Canadian Wildlife Service's annual analysis, obtained from Adam C. Smith, Senior Biostatistician, Species Abundance and Distribution, Canadian Wildlife Service, Environment Canada, Government of Canada. \*\* Larivée, J. (2016), Étude des populations d'oiseaux du Québec (ÉPOQ). In this case, the percentage change was calculated using the abundance index = Total number of individuals of the species / Number of daily field checklists.



Note: White points indicate that the species was identified in the second Atlas but not in the first.  
Source: Quebec Breeding Bird Atlas (2015). [www.atlas-oiseaux.qc.ca/index\\_en.jsp](http://www.atlas-oiseaux.qc.ca/index_en.jsp)

Figure 16: Distribution Map of Possible, Probable or Confirmed Cooper's Hawk Nesting in Quebec in the First (1984-1989) and Second (2010-2014) Quebec Breeding Bird Atlas



Note: White points indicate that the species was identified in the second Atlas but not in the first.  
Source: Quebec Breeding Bird Atlas (2015). [www.atlas-oiseaux.qc.ca/index\\_en.jsp](http://www.atlas-oiseaux.qc.ca/index_en.jsp)

Figure 17: Distribution Map of Possible, Probable or Confirmed Merlin Nesting in Quebec in the First (1984-1989) and Second (2010-2014) Quebec Breeding Bird Atlas

## Importance of the Species

---

In North America, there has long been a strong interest in Purple Martins both in popular culture and in the scientific community. Even before the arrival of Europeans, certain Native American tribes in the southern United States provided nesting structures for this species in the form of hollowed-out gourds (Gauthier and Aubry, 1995). The species probably greatly benefited from its association with humans and the presence of artificial nesting structures installed throughout most of North America. In the eastern part of its breeding range, the species now probably nests exclusively in these artificial structures. In conclusion, the Purple Martin lives in close association with humans. In this sense, humans can have a significant influence on the recovery of populations through the use of artificial nesting structures.

## Current Protection and Other Designations

---

The Purple Martin is not designated a special status species at global, federal or provincial levels. In this regard, the species is not given any special status under the *Species at Risk Act* in Canada, nor under the *Act Respecting Threatened or Vulnerable Species* in Quebec. It is protected however by the *1994 Migratory Birds Convention Act*, which prohibits its capture, destruction and possession.

In Quebec, the Purple Martin was identified by Environment Canada as a conservation priority in the BCR 13 (Lower Great Lakes / St. Lawrence Plain) bird conservation strategy (Environment Canada, 2013). This consideration was justified by regional experts due to the sharp decline of the species in Quebec. The objective for the Purple Martin population in BCR 13 is the "maintenance/evaluation" of the species (Environment Canada, 2013). This would entail monitoring populations, acquiring knowledge and implementing conservation measures.

According to the most recent review of its conservation status in Quebec (2015), the species was ranked S2 ("Imperiled") (Canadian Wildlife Service, 2015). Despite this situation, the Quebec Department of Forests, Wildlife and Parks has yet to grant it any status under the *Act Respecting Threatened or Vulnerable Species*.

In the rest of Canada, according to data from *NatureServe* (2015), the species is also considered "Vulnerable", "Imperiled" or "Critically Imperiled" in the provinces of British Columbia (S2S3B), New Brunswick (S1S2B) and Nova Scotia (S1B). It is also considered to be at least "Vulnerable" in 16 U.S. states. Again according to data from *NatureServe* (2015), the Canadian ranking is N5B ("Secure"); the most recent review dates back to February 2012.

Moreover, *NatureServe* (2015) attributes it the global ranking of G5 ("Secure"); the most recent revision was conducted in 2014. The International Union for Conservation of Nature (IUCN) designated the species as LC ("Least Concern") in its most recent assessment in 2012).

## Proposed Next Steps

---

Despite the fact that this report does not represent a strategic planning exercise, we felt the need not only to propose certain actions that should certainly be undertaken, but also to identify organizations that could potentially carry out these measures. This list of action items is not exhaustive; however, it does pave the way for actions and partnerships pending more elaborate strategic planning. This list has notably been enhanced by two work sessions held with leaders of Regroupement QuébecOiseaux, AAHQ, Nature Québec and the McGill Bird Observatory. We present below 17 action items grouped under three objectives.

### **Objective 1: Raising Awareness and Guiding Stewardship**

Regardless of the reasons for the decline in Purple Martin populations, recruiting a large number of individuals capable of providing high-quality nesting sites year after year is critical for the species' recovery (Tautin, 2013). In this regard, restoring Purple Martin numbers depends to a great extent on active citizen participation. Conservation organizations also play a critical role in order to disseminate relevant information as well as to promote and support projects for managing artificial nesting structures. In British Columbia, following an effort to install artificial nesting structures, the number of nests went from as low as 6 in 1983 to 146 in 1998, and to 600 in 2006. Similar success stories also exist in Washington State (Tarof and Brown, 2013).

Even if best practices for managing martin housing and colonies are rather well known and information is readily accessible in the United States, such documentation is currently lacking in French and undoubtedly represents an obstacle for conservation of the species in Quebec. Suitable installation of martin housing is one thing, but regular and adequate upkeep is also critical. In this regard, we see an urgent need to equip and inform the owners and managers of martin housing of the best practices to adopt in order to attract and maintain healthy colonies.

Moreover, in an effort to help establish new colonies, it will be important to promote the installation of martin housing in strategic locations: most likely near colonies that still appear to be healthy and that have the best chance of representing source colonies (Maxime Tremblay, pers. comm.). However, characterization, identification and mapping work of optimal reproduction sites remains to be completed (see Objective 2).

### ***Actions***

- 1- Advise the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Comité avisur sur la faune menacée ou vulnérable du Québec of the importance of considering the Purple Martin in upcoming assessments.
- 2- Develop partnerships with land use decision-makers (e.g. RCMs, boroughs, municipalities), community groups and landowners for the adequate maintenance of breeding sites and nesting structures.

- 3- Produce and distribute an informative pamphlet on the status of the species in Quebec.
- 4- Produce and distribute an evaluation grid to determine whether the location of new nesting structures is suitable.
- 5- Produce and distribute a guide on martin housing maintenance that would include the following information:  
(ALREADY INITIATED BY QUÉBÉCOISEAUX)
  - General information on the species.
  - Production and installation of martin housing.
  - Maintenance and management of martin housing and colonies.
  - Nest monitoring in martin housing.
- 6- Develop, organize and hold information meetings with interest groups (birding or natural science organizations) and public land managers hosting or able to host nesting structures (RCMs, municipalities, conservation organizations, schools, etc.).
- 7- Liaise with various media to raise awareness about the status of the species and promote actions that can contribute to its recovery.
- 8- Identify and promote concrete solutions to reduce predatory pressure by birds of prey.
- 9- Develop a program to relocate unoccupied nesting structures.

## **Objective 2: Expanding Understanding of the Species**

The lack of knowledge of Purple Martins in Quebec undoubtedly represents an obstacle to planning effective and targeted conservation actions. In fact, little is known about population dynamics in Quebec and across Canada. Scientific literature is rather limited in this regard and gray literature is currently fragmented, sparse, and difficult to access. Our current knowledge is essentially limited to incomplete data on the species' distribution and the number of individuals. More in-depth knowledge on reproduction success, survival rates, philopatry, predation and competition pressure, etc. is nearly inexistent. It is becoming increasingly urgent to better understand Purple Martin colony dynamics in Quebec in order to optimize objectives and conservation strategies.

## **Actions**

10- Solicit the participation of researchers from universities, government organizations and conservation organizations in Quebec in implementing research projects that might encompass the following topics:

- Characterization of reproduction sites
- Development of a Habitat Quality Index (HQI) for recovery of the species
- Identification and mapping of optimal sites for installing martin housing
- Survival rate
- Reproduction success
- Recruitment rate
- Productivity
- Philopatry and breeding site fidelity
- Male/female ratio
- Number of nesting pairs
- Advantages, disadvantages and cost-benefit ratio of coloniality and colony size
- Colony and population dynamics (e.g. source/sink population)
- Pre-migratory roosting site and staging area
- Migratory routes
- Dispersal
- Habitat use (e.g. foraging distance around the nest)
- Threats (birds of prey, decline of flying insects, etc.)
- Intra-and interspecific competition
- Predation pressure from birds of prey

11- Recover, compile and process existing nesting data for the species.

12- Equip and inform parties responsible for maintaining martin housing on how to collect and transfer breeding data into the centralized database *nestwatch.org*, the data of which are readily accessible, including to the scientific community.

13- Translate into French all pages on nest monitoring and those providing information on Purple Martins on the website *nestwatch.org*.

14- Implement an annual volunteer-based colony censusing program.

### Objective 3: Enhancing the Coordination of Efforts

Small, local-scale projects have existed in Quebec for the past few years. Most often, these projects entail the installation of nesting structures. Some cursory data gathering (number of individuals, number of nesting pairs, arrival date of scouts) has also been initiated (e.g. hironbec.com, aahq.qc.ca). In the majority of cases, the continued pursuit of these projects depends on the time and energy that the project lead can dedicate and is not part of a broader coordination effort. In Quebec, a number of nesting structures installed with good intentions are now abandoned or poorly maintained. At this stage of Purple Martin conservation work, it would be most favourable to develop a network of human resources, establish a strategic plan and coordinate actions to be undertaken with a global vision of the issue.

#### **Actions**

15- Maintain a pan-Canadian and American network of contacts with all key players involved in the conservation of the species.

16- Create and coordinate a conservation committee for the species with the following mission and objectives:

(ALREADY INITIATED BY QUÉBÉCOISEAUX)

**Mission:** Develop an approach based on the most current scientific data in order to safeguard Quebec's Purple Martin population by integrating research, conservation and awareness-raising activities.

#### **Objectives:**

- ensure no further net loss in the distribution of Purple Martins on their breeding grounds;
- stabilize, then increase Quebec's Purple Martin population by approximately 90% (i.e. on par with the 1980 population) over the next twenty years;
- identify the most serious threats to the recovery of the species;
- identify and implement research actions;
- identify and implement conservation actions;
- identify and implement awareness-raising actions.

17- Carry out strategic planning in order to guide conservation, research and awareness-raising efforts for the species.

**Potential Lead or Partner Organizations** (in alphabetical order):

- Academic researchers
- Association des amateurs d'hirondelles du Québec
- Bird Studies Canada
- Canadian Wildlife Service
- Cornell Lab of Ornithology
- Department of Forests, Wildlife and Parks
- Long Point Bird Observatory
- McGill Bird Observatory – The Migration Research Foundation
- Ministry of Sustainable Development, Environment and the Fight against Climate Change
- Nature Canada
- Nature Québec
- Purple Martin Conservation Association
- QuébecOiseaux
- Regional- and local-scope organizations (e.g. municipalities, Nature-Action Québec, CIME Haut-Richelieu, Parc de la Rivière-des-Mille-Îles, Héritage Saint-Bernard, ZIP (zones d'intervention prioritaires, or areas of prime concern) committees, watershed organizations (OBV), Regional Environment Councils (CRE), etc.)

## Bibliography

---

- Allen, R.W. and M.M. Nice (1952). A study of the breeding biology of the Purple Martin (*Progne subis*). *Am. Midl. Nat.*, 47, 606–665.
- Atlas des oiseaux nicheurs du Québec [Québec Breeding Bird Atlas] (2015). Data consulted on the Quebec Breeding Bird Atlas website ([www.atlas-oiseaux.qc.ca](http://www.atlas-oiseaux.qc.ca)). Regroupement QuébecOiseaux, Canadian Wildlife Service (Environment Canada) and Bird Studies Canada. Québec City, Quebec, Canada.
- Beecher, M.D., M.B. Medvin, P.K. Stoddard and P. Loesche (1986). Acoustic adaptations for parent-offspring recognition in swallows. *Experimental Biology*, 45(3), 179–193.
- Brown, C.R. (1976). Minimum temperature for feeding by Purple Martins. *Wilson Bulletin*, 88, 672–673.
- Brown, C.R. (1978). Post-fledging behavior of Purple Martins. *Wilson Bulletin*, 90(3), 376–385.
- Canadian Wildlife Service – Quebec Region (2015). Évaluation des rangs de priorité pour les oiseaux du Québec, working document. Work performed for the Centre de données sur le patrimoine naturel du Québec.
- CC-Bio. (2015). Effects of Climate Change on Quebec Biodiversity. Online. <[cc-bio.uqar.ca](http://cc-bio.uqar.ca)>. Consulted October 6, 2015.
- Coulson, T. (1985). First Canadian recovery is identified in search for UV marked martins. *Nature Society News*, 20(8), 1–2.
- Davidar, P. and E.S. Morton (1993). Living with parasites: prevalence of a blood parasite and its effect on survivorship in the Purple Martin. *The Auk*, 110(1), 109–116.
- Davidar, P. and E.S. Morton (2006). Are multiple infections more severe for Purple Martins (*Progne subis*) than single infections? *The Auk*, 123(1), 141–147.
- Davis, J.A. and C.R. Brown (1999). Costs of coloniality and the effect of colony size on reproductive success in Purple Martins. *The Condor*, 101, 737–745.
- eBird (2016). eBird: An online database of bird distribution and abundance [web application]. eBird, Cornell Lab of Ornithology, Ithaca, New York. Online. <[www.ebird.org](http://www.ebird.org)>. Consulted February 16, 2016.
- eBird Basic Dataset. Version: EBD\_relMay-2015. Cornell Lab of Ornithology, Ithaca, New York. May 2015.

- Environment Canada (2013). Stratégie de conservation des oiseaux pour la région de conservation des oiseaux 13 de la région du Québec : Plaine du Saint-Laurent et des lacs Ontario et Érié [Bird Conservation Strategy for Bird Conservation Region 13 in Quebec Region: Lower Great Lakes/St. Lawrence Plain]. Canadian Wildlife Service, Environment Canada. Québec City, Quebec, 156 pages + appendices.
- Fraser K.C, C. Silverio, P. Kramer, N. Mickle, R. Aeppli and B.J.M. Stutchbury (2013). A trans-hemispheric migratory songbird does not advance spring schedules or increase migration rate in response to record-setting temperatures at breeding sites. *PLoS ONE* 8(5): e64587.
- Gahbauer, M.A., S. Duval and D. Davey (2016). McGill Bird Observatory Ten-Year Report: 2005-2014. Migration Research Foundation, Ste-Anne-de-Bellevue, Quebec, 326 pages.
- Gauthier, J. and Y. Aubry (1995). Les oiseaux nicheurs du Québec : Atlas des oiseaux nicheurs du Québec méridional [The Breeding Birds of Québec: Atlas of the Breeding Birds of Southern Québec]. Association québécoise des groupes d'ornithologues, Province of Quebec Society for the Protection of Birds, Canadian Wildlife Service, Environment Canada, Quebec Region, Montréal, xviii + 1,302 pages.
- Government of Canada (2014). Status of Birds in Canada. Online. <[www.ec.gc.ca/soc-sbc](http://www.ec.gc.ca/soc-sbc)>. Consulted December 8, 2015.
- Hicks, L.E. (1933). Returns of banded Purple Martins. *Bird-Banding*, 4, 113-114.
- IUCN (2015). The IUCN red list of threatened species. Online. <[www.iucnredlist.org](http://www.iucnredlist.org)>. Consulted December 9, 2015.
- Kale II, H.W. (1968). The relationship of Purple Martins to mosquito control. *The Auk*, 85, 654-661.
- Larivée, J. (2016). Étude des populations d'oiseaux du Québec (Version 2016-01-15) [database]. Rimouski, Quebec: Regroupement QuébecOiseaux.
- Morton, E.S. and K.C. Derrickson (1990). The biological significance of age-specific return schedules in breeding Purple Martins. *The Condor*, 92, 1040-1050.
- Morton, E.S., L. Forman and M. Braun (1990). Extrapair fertilization and the evolution of colonial breeding in Purple Martins. *The Auk*, 107, 275-283.
- Morton, E.S. and R.M. Patterson (1983). Kin association, spacing, and composition of a post-breeding roost of Purple Martins. *J. Field Ornithol.*, 54, 36-41.

- Moss, W.W. and J.H. Camin (1970). Nest parasitism, productivity, and clutch size in Purple Martins. *Science*, 168, 1000-1003.
- NatureServe (2015). NatureServe Conservation Status. Online. <[explorer.natureserve.org/ranking.htm](http://explorer.natureserve.org/ranking.htm)>. Consulted December 9, 2015.
- North American Bird Conservation Initiative (NABCI) (2012). État des populations d'oiseaux du Canada [State of Canada's Birds], 2012. Environment Canada, Ottawa, Canada, 36 pages.
- Partners in Flight Science Committee (2012). Species Assessment Database, version 2012. Online. <[rmbo.org/pifassessment](http://rmbo.org/pifassessment)>. Consulted December 8, 2015.
- Partners in Flight Science Committee (2013). Population Estimates Database, version 2013. Online. <[rmbo.org/pifpopestimates](http://rmbo.org/pifpopestimates)>. Consulted February 17, 2016.
- Purple Martin Conservation Association. (2015). Purple Martins. Online. <[www.purplemartin.org](http://www.purplemartin.org)>. Consulted November 10, 2015.
- Ridgely, R.S., T.F. Allnutt, T. Brooks, D.K. McNicol, D.W. Mehlman, B.E. Young, J.R. Zook and BirdLife International (2012). Digital Distribution Maps of the Birds of the Western Hemisphere, version 5.0. in BirdLife International and NatureServe (2012), Bird species distribution maps of the world. Version 2.0 BirdLife International, Cambridge, UK and NatureServe, Arlington, USA.
- Sibley, D.A. (2006). Le guide Sibley des oiseaux de l'est de l'Amérique du Nord [The Sibley Field Guide to Birds of Eastern North America]. Éditions Michel Quintin. Waterloo, Quebec, 433 pages.
- Stutchbury, B.J. (1991). Coloniality and breeding biology of Purple Martins (*Progne subis hesperia*) in saguaro cacti. *The Condor*, 93, 666-675.
- Stutchbury, B.J.M., J.R. Hill III, P.M. Kramer, S.A. Rush, and S.A. Tarof (2009). Sex and age-specific annual survival in a Neotropical migratory songbird, the Purple Martin (*Progne subis*). *The Auk*, 126(2), 278-287.
- Tardif, J. and M. Darveau (2006). La science citoyenne à la rescousse d'une espèce en déclin : Observations sur l'hirondelle noire en 1972 par Pierre Ducas. *Le Naturaliste Canadien*, 130(2), 33-36.
- Tarof, S. and C.R. Brown (2013). Purple Martin (*Progne subis*). *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology. Online. <[bna.birds.cornell.edu/bna/species/287](http://bna.birds.cornell.edu/bna/species/287)>. Consulted December 11, 2015.

- Tarof, S.A., P.M. Kramer, J.R. Hill, J. Tautin and B.J.M. Stutchbury (2011). Brood size and late breeding are negatively related to juvenile survival in a Neotropical migratory songbird. *The Auk*, 128(4), 716-725.
- Tautin, J. (2013). The Purple Martin, A Classic Aerialist. Connecticut State of the Birds 2013: The Seventh Habitat and the Decline of Our Aerial Insectivores, 34 pages.
- United States Geological Survey (2015). Longevity Records of North American Birds. Online. <[www.pwrc.usgs.gov/bbl/longevity/Longevity\\_main.cfm](http://www.pwrc.usgs.gov/bbl/longevity/Longevity_main.cfm)>. Consulted December 8, 2015.
- Wagner, R.H., M.D. Schug and E.S. Morton (1996). Condition-dependent control of paternity by female Purple Martins: implications for coloniality. *Behav. Ecol. Sociobiol.*, 38, 379-389.
- Wiggins, D. (2005). Purple Martin (*Progne subis*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region, 44 pages.