ONTARIO BIRDS

VOLUME 31 NUMBER 3
DECEMBER 2013

JOURNAL OF THE ONTARIO FIELD ORNITHOLOGISTS

ONTARIO BIRDS

VOLUME 31 NUMBER 3
DECEMBER 2013
PAGES 121 — 176

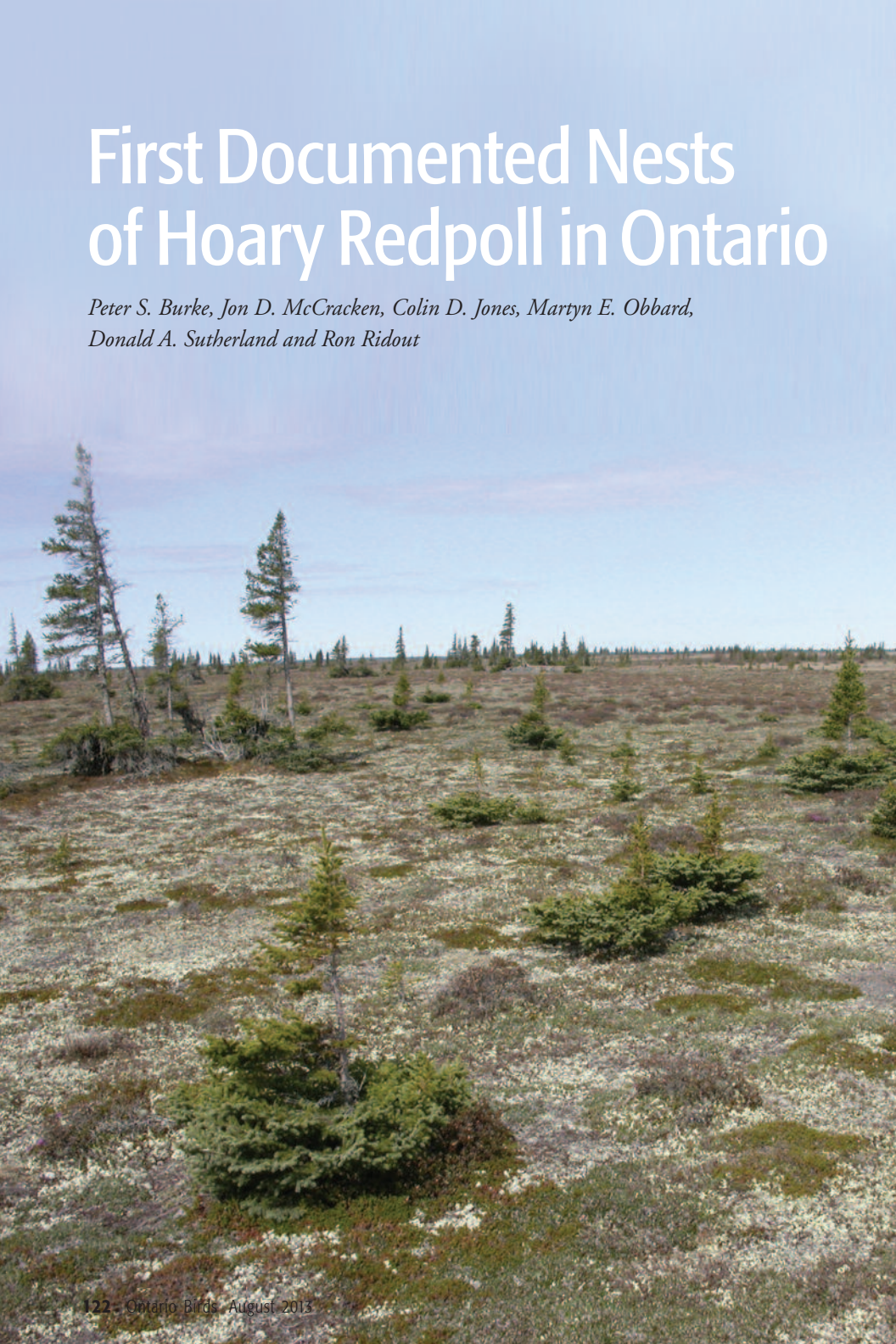
ARTICLES

Cover Illustration: *Hoary Redpolls by Barry Kent MacKay*

ISSN 0822-3890
Publications Mail Agreement No. 40046348

First Documented Nests of Hoary Redpoll in Ontario

Peter S. Burke, Jon D. McCracken, Colin D. Jones, Martyn E. Obbard, Donald A. Sutherland and Ron Ridout



Left: **Figure 1. Habitat where Hoary Redpoll nests were located, West Pen Island vicinity, Kenora District, 5 July 2004. All three nests were in low *krummoltz* form White Spruce, 300 cm or less in height, along narrow beach ridges parallel to the Hudson Bay coastline.** *Photo: Donald A. Sutherland*

Above: **Figure 2. Female Hoary Redpoll from nest 2, captured at nest, West Pen Island, Kenora District, 5 July 2004. The bird was incubating four eggs and showed a prominent brood patch. Note the blocky, flat-headed appearance combined with the short bill and extensive nasal tufts. The sides are fairly heavily marked with wispy streaks, not broad markings.** *Photo: Colin D. Jones*

The Hoary Redpoll (*Acanthis hornemanni*) has a Holarctic breeding distribution and is one of only a small number of birds capable of surviving year-round in the Arctic (Knox and Lowther 2000). In the Palaearctic, its breeding range extends from northern Scandanavia eastwards to eastern Siberia (AOU 1998) and in the Nearctic from western Alaska across Arctic Canada to Greenland (Godfrey 1986). In Canada, the subspecies *exilipes* nests in the northern Yukon, mainly on the north slope (Sinclair *et al.* 2003), in northern and central-eastern Mackenzie, on southern Victoria Island, in the Keewatin district of Nunavut, on Southampton Island, in northern Manitoba (Churchill; Jehl and Smith 1970) and in northern Quebec (Ungava Bay;

Lanoue and Seutin 1996). The larger, paler subspecies *hornemanni* breeds farther north on the Nunavut islands of Ellesmere, Axel Heiberg (Parmelee and MacDonald 1960), Devon, Bylot and Baffin (Godfrey 1986).

The taxonomy of redpolls remains incompletely known and subject to debate. Proposals vary from one species known as Common Redpoll (*A. flammea*) with large phenotypic variability (Salomonsen 1951, Troy 1985, Marthinsen *et al.* 2008) to as many as four species (*A. flammea, A. exilipes, A. rostrata, A. hornemanni*) as suggested by Herremans (1990). Currently, two polytypic species, each with two subspecies, are recognized in North America (AOU 1998, Chesser *et al.* 2009): Common Redpoll (*A. f. flammea, A. f. rostrata*) and Hoary Redpoll (*A. h. hornemanni, A. h. exilipes*). In Britain, an additional former subspecies of the Common Redpoll (*A. cabaret*, Lesser Redpoll) recently gained specific status (Lifjeld and Bjerke 1996, Sangster *et al.* 2001).

In areas of sympatry between *A. h. exilipes* and *A. f. flammea*, a continuum of phenotypes from the palest *exilipes* to the darkest *flammea* led Troy (1985) to conclude that there is actually one highly variable species involved. However, by re-examining the variation and taking into account sexual and age-specific dimorphism, others have shown that dark *exilipes* (usually female or first-year birds) can appear much like *flammea*, and light *flammea* (older males) can appear much like *exilipes*. Thus, any true intermediates may be examples of convergence of two distinct species (Molau 1985, Knox 1988).

Evidence for hybridization between *flammea* and *exilipes* lies mainly in individuals showing intermediate characters; no known mixed-pair nests have been described (Knox 1988). Further, differences in the timing of migration, breeding habitat, diet, calls, physiology and behavior exist between the two taxa (Knox 1988, Knox and Lowther 2000). Seutin *et al.* (1995) found relatively little genetic differentiation among the redpolls, but suggested this was not surprising given a large population size, nomadic breeding strategy and recent evolutionary divergence. Marthinsen *et al.* (2008) also found low genetic differentiation and suggested the need for field work in areas of sympatry to help resolve several competing hypotheses which could account for the low genetic separation between the two taxa.

James (1991) considered Common Redpoll to be a common summer resident along the Hudson Bay coast of Ontario. Conversely, he regarded Hoary Redpoll as a "rare (and occasional?)" summer resident there, based largely on field work from the first Ontario Breeding Bird Atlas (OBBA1:1981-1985; Cadman *et al.* 1987). In July 1985, D. Shepherd and G. Poole found probable breeding evidence for Hoary Redpoll in two 10 x 10 km squares in the vicinity of West Pen Island. They observed what appeared to be a mated pair and captured three adults that exhibited breeding condition characters. During the same month, an adult Hoary Redpoll was observed in willow scrub 40 km west of Cape Henrietta Maria by D. Evered and E. Kiviat (Middleton 1987). In 1990, three birds were observed at the mouth

Until 2004, no nesting of the Hoary Redpoll had been confirmed for Ontario.

of the Little Shagamu River on 31 May (Wilson and McRae 1993); however, these birds were possibly migrants, as the date is somewhat earlier than the earliest known egg dates at Churchill, Manitoba (6 June – 12 July; Jehl 2004). There have been a number of subsequent summer records of Hoary Redpoll in the northern Hudson Bay Lowlands of Ontario. These include three other records from the second Ontario Breeding Bird Atlas (OBBA) (Cadman *et al.* 2007) farther east along the Hudson Bay coast near Burntpoint Creek (55 14.56' N 84 19.12' W) and Cape Henrietta Maria (55 03.28' N 82 16.65' W) where evidence of probable breeding was found, and near the Sutton River (55 01.9' N 82 48.11' W) where evidence of possible breeding was found (OBBA2: 2001-2005, database; Cadman *et al.* 2007).

Compared to Ontario, the Hoary Redpoll breeds more commonly farther north at Cape Churchill, Manitoba. However, its numbers fluctuate widely from year to year, such that it may comprise as much as 50% to as little as 10% of the total redpoll population (Cooke *et al.*1975). Similarly, Middleton (1987) proposed that in Ontario Hoary Redpoll probably breeds in low numbers farther south on the coastal tundra, based on breeding evidence from the first OBBA.

Until 2004, no nesting of the Hoary Redpoll had been confirmed for Ontario (Peck and Peck 2006). Here, we present information on Ontario's first three nests of Hoary Redpoll found in the vicinity of West Pen Island, Kenora District, with discussion of the species' identification and comments on its local abundance.

From 24 June to 7 July 2004, we conducted field work in the vicinity of the Pen Islands in support of the second OBBA. Our base camp was located on a narrow marine beach ridge running parallel to the Hudson Bay coast, approximately 8 km SSW of West Pen Island (56 47.8' N 88 57.7' W). The immediate area is maritime sub-Arctic wet tundra dominated by sedges (*Carex aquatilis, C. chordorrhiza, C. scirpoidea*) and interspersed with low willow (*Salix* spp.) and Bog Birch (*Betula pumila*) thickets, numerous shallow lakes and ponds, and a parallel series of old, low gravel beach ridges extending inland. These ridges support a lichen-heath community (Johnson 1987) dominated by lichens (*Cladonia* spp.), Mountain Avens (*Dryas integrifolia*), Black Crowberry (*Empetrum nigrum*), Alpine Blueberry (*Vaccinium uliginosum*), Mountain Cranberry (*Vaccinium vitis-idaea*) and Lapland Rosebay (*Rhododendron lapponicum)*. Approximately 7 km inland from the coast, widely scattered trees or small copses of 'krummholz' White Spruce (*Picea glauca*) become increasingly frequent on the ridges, giving way to lichen-spruce woodland approximately 10 km inland from the coast.

We observed Hoary and Common redpolls the entire duration of our visit, with up to 6 pairs of Hoaries observed and three nests discovered. Behaviour of one or both of the adults led the observers to the nests; birds were followed at various distances until they visited the nest site.

Several days prior to the discovery of nest #1, a pair of Hoary Redpolls had been observed in the vicinity. Nest #1 was found in a small spruce on the edge of a willow thicket by McCracken on 28 June 2004, less than 100 m south of our base camp. The nest was under frenetic construction entirely by the female, under the very close attention of the male. Within about 5 minutes of discovering the nest, nest building was interrupted by the arrival of a Northern Shrike (*Lanius excubitor*) that flew into the adjacent willow thicket. This prompted immediate mobbing and agitated behaviour on the part of the pair of Hoary Redpolls, plus what was presumed to be a male Common Redpoll that arrived in the company of several American Tree Sparrow (*Spizella arborea*), a White-crowned Sparrow (*Zonotrichia leucophrys*), and a Yellow Warbler (*Setophaga petechia*).

Nest #2 was found by Jones and Burke on 29 June, 6 km northeast of the base camp. It was visited only twice due to constraints of time and distance. Nest #3, which was found by Burke roughly 300 m east of camp on 6 July, escaped detection until the second last day of fieldwork, despite nearly daily passes of the nest tree by all observers.

Nest construction (nests #1 and #2) and brooding of young (nest #3) were ongoing when the nests were discovered. Characteristics for each nest are given in Table 1 and nest chronologies are in Table 2. Dimensions are missing from nest #1 due to its destruction by a predator (presumed Arctic fox [*Vulpes lagopus*]) and were not taken from nest #2.

Figure 3. Same female Hoary Redpoll, West Pen Island, Kenora District, 5 July 2004. Again, the broad, flat crown and fluffy nasal tufts that cover the base of the bill are apparent here.
Photo: Colin D. Jones

Figure 4. The same female from West Pen Island, Kenora District, 5 July 2004, showing the rump pattern. Although somewhat obscured by wear, the extensive white rump is apparent. Note the amount of wear on the primary and tail feather tips. In comparison Common Redpolls, which were also observed daily, lacked the obvious pale rump. *Photo: Colin D. Jones*

Table 1: Characteristics of three Hoary Redpoll nests at West Pen Island vicinity, 28 June –7 July 2004.

Nest #	1	2	3
UTM Georeference (NAD 83)	379849 E 6296225 N	384184 E 6301335 N	381148 E 6295924 N
Date Found	28 June (JDM)	29 June (CDJ, PSB)	6 July (PSB)
Description of nest site	Beach ridge, 6 km inland, heath-covered with occasional krummoltz form White Spruce. Large thicket of willow immediately adjacent to nest tree. Ridge bordered to north by wet sedge fen and small tundra lake to south.	Raised beach ridge, 500 m inland, with 5 isolated krummholtz White Spruce bordering willow/birch scrub and wet sedge; 100 m from large Snow Goose (*Chen caerulescens*) colony. Overgrazed sedge flats 25 m to south.	Beach ridge, 6 km inland, heath-covered and interrupted by standing water/willow/birch swale approx. 3 m tall. Occasional krummholtz White Spruce, reaching 10 m in height. Ridge bordered both sides by wet sedge fen (?) with standing water bodies, 15 m and 35 m to north and south edges of ridge, respectively.
Tree species, Height/Nest Height/Distance from trunk	White Spruce krummholtz form ~250 cm/60 cm/15cm	White Spruce krummholtz form 200 cm/125 cm/ 15 cm	White Spruce krummholtz form 300 cm/ 100 cm/ 43 cm
Inner/ Outer Diameter	N/a		5.2 cm/ 10.1 cm
Inner/ Outer Depth	N/a		4.0 cm/5.7 cm
Outer material	Bulky cup constructed of fine grasses, very fine dead twigs and lichen.	Bulky cup constructed of dead willow twigs and dead grass stalks (Fig. 6).	Bulky cup constructed of dead twigs, lichens and some *sphagnum*, much like nest 2 (Fig. 7).
Lining	Willow catkins, alternate female Willow Ptarmigan (*Lagopus lagopus*) feathers, white feathers and feather down	Finer grasses, thickly lined with willow catkins and white and black feathers	Finer grasses thickly lined with white feathers and willow catkins.

Each nest and its contents were photographed and both sexes were carefully identified as Hoary Redpoll. The female at nest #2 was captured by mist-net, measured, photographed and released (Figs. 2-4). Measurements taken were: wing chord (relaxed) = 72 mm; tarsus = 17 mm; exposed culmen = 5.5 mm. A large brood patch was visible. Only the male at nest #2 was photographed (Fig. 5). The presumed male of nest #3 was determined to be in first basic (formative) plumage and thus appeared darker than the 'expected' classic exilipes male. Females of the other two nests were also photographed and were also *exilipes*. In these and other separate sightings, key Hoary Redpoll features such as: a mainly clear white rump, relatively

Figure 5. Three photos of a male Hoary Redpoll at nest 2, West Pen Island, Kenora District, 29 June 2004. Although poor quality, the photos show an extensively pale, chunky male redpoll that clearly lacks the deep crimson chest and prominent side streaking of a Common Redpoll. *Photos: Peter S. Burke*

Table 2. Chronology of three Hoary Redpoll nests found in West Pen Island vicinity, 28 June –7 July 2004.

Nest	Visit 1	Visit 2	Visit 3	Visit 4
1	28 June; female building nest (about 80% complete); female closely attended by male; copulation observed.	1 July; 1 egg in mid-morning. Pair present.	2 July; 4 eggs in early morning (presumed evidence of egg dumping); 3 eggs were whitish, 1 egg had a light bluish cast.	3 July; nest depredated by presumed Arctic Fox (*Vulpes lagopus*)
2	29 June; female at nest, male attending, nest empty, almost fully lined.	5 July; female incubating 4 eggs; female caught, photographed and released. Male present briefly.		
3	6 July; female brooding 3 nestlings approx. 3 days old. Presumed male feeding female on nest.	7 July; female brooding 3 nestlings. Presumed male feeding female on nest.		

faint streaking on the sides and flanks, unstreaked (or nearly so) undertail coverts, fluffy nasal tufts covering a short, thick-based conical bill and a flat-headed and bull-necked appearance (Czaplack 1995, Brinkley *et al.* 2011) were observed. In addition, the Common Redpoll was regularly observed during our expedition and was available for comparison against presumed Hoary Redpoll individuals to ensure identification.

Other species of birds confirmed nesting in close proximity to our Hoary Redpoll nests included American Robin (*Turdus migratorius)*, American Tree Sparrow, Horned Lark (*Eremophila alpestris*), Least Sandpiper (*Calidris minutilla*), Dunlin (*Calidris alpina*), Canada Goose (*Branta canadensis*), Smith's Longspur (*Calcarius pictus*) and Savannah Sparrow (*Passerculus sandwichensis*).

Figure 6. Nest of Hoary Redpoll, nest 2, West Pen Island, Kenora District, 5 July 2004. The bulky cup is constructed of dead willow twigs and grass stalks while the deep cup is lined with willow catkins and feathers. The nest tree and several others nearby, sat atop a long gravel beach ridge, isolated by several kilometers from any other trees. *Photo: Colin D. Jones*

Figure 7. Nest of Hoary Redpoll, nest 3, vicinity of West Pen Island, Kenora District 6 July 2004. The nestlings are only a few days old and covered with extensive dark grey down. This nest contained more moss and lichen in the cup's construction than nests # 1 or #2, possibly due to availability.
Photo: Colin D. Jones

Discussion

This note documents the southernmost known nestings of Hoary Redpoll in North America. Since annual breeding populations of Hoary Redpoll are believed to fluctuate widely at a given location (Cooke *et al.* 1975, Jehl 2004), we suggest that these three nests do not represent an expanding southward population into Ontario. Instead, breeding occurrences of the Hoary Redpoll in Ontario likely fluctuate in concordance with regional climate and local availability of food resources. It is noteworthy that spring and summer 2004 were exceptionally cold in the Hudson Bay Lowlands; the average April-June monthly temperature (-5.9 C) was the coldest for the 12 years: 1996-2007 (Environment Canada 2013). This may well have prompted a more southerly influx of Hoary Redpolls than what otherwise might normally occur.

Though limited to only three nests, our descriptions of nest morphology, placement and height agree with previous studies for Hoary Redpoll (Lanoue and Seutin 1996, Knox and Lowther 2000). First nests in May and June are typically in conifers at Churchill and

Figure 8. Female Hoary Redpoll incubating at nest #3, vicinity of West Pen Island, Kenora District, 6 July 2004. The male of this pair was in its first alternate plumage and looked very similar to the female, not exhibiting the pale pink wash and completely unmarked underparts of an older male.
Photo: Colin D. Jones

Ungava Bay and later in deciduous trees/shrubs (and even on the ground) in July (Lanoue and Seutin 1996). Redpolls can nest twice in a summer due to short nest-building (4 days), incubation (minimum of 10 days) and fledging stages (9 days) (Lanoue and Seutin 1996). Nest #3 would have been initiated on about 17-19 June (at the latest), which is still several weeks later than the earliest nests typically reported in Quebec and Manitoba. A delayed spring in 2004 probably accounted for a late start for almost all birds nesting in the West Pen Island area, since snow covered much of the northern lowlands until about mid-June (L. Walton, Ontario Ministry of Natural Resources (OMNR), pers. comm.; Burke *et al.* 2006). Moreover, despite our late expedition dates, we found very few passerine nests with young and no instances of adults carrying food to fledglings.

In at least some regions, the Hoary Redpoll is not highly territorial and is known to breed in loose aggregations, sometimes with several pairs nesting in the same thicket (Lanoue and Seutin 1996). Though we did not observe any evidence of such loose coloniality in the Pen Islands region, we found at least six pairs scattered in the study area and it seems reasonable that more nests were present.

Although the Common Redpoll was found in greater numbers than Hoary Redpoll in our study area, we could not detect any differences in habitat use, which is typical in areas of sympatry (Knox and Lowther 2000). The observation of a male Common Redpoll very close to nest #1 on 28 and 29 June and an American Tree Sparrow less than half a metre from nest #3 on 7 July is probably explained by the redpolls' lack of territoriality both inter- and intra-specifically (Knox and Lowther 2000).

The increase from 1 to 4 eggs in one day at nest #1 is perplexing (Table 2). Since there was a very noticeable difference in color in at least one of the eggs (Table 2), coupled with other circumstances, we presume that egg dumping by a female Common Redpoll occurred. This is in keeping with our observations of a male Common Redpoll interacting with the pair of Hoary Redpolls at this nest on two occasions during the nest building phase.

For the most part, species identification was rather straightforward, especially when older males were part of a pair and exhibited classic Hoary field marks. The pair at nest #3 was more problematic, since the male was initially thought to be another female due to its more heavily marked flanks, darker mantle and lack of pink wash to the chest. However, males in first basic (formative) plumage typically lack the frostiness and pink to the breast of an older male (Knox 1988) and can appear quite dark in early summer due to feather wear. Other characteristics of Hoary Redpolls, such as the unmarked white rump, minimal undertail streaking, fluffy nasal tufts, flat-headed and bull-necked appearance and short conical bill, were noted on this bird.

Acknowledgements

Fieldwork at the Pen Islands in 2004 was made possible through funding to the OBBA by Canadian Wildlife Service (Ontario Region), Bird Studies Canada's James L. Baillie Memorial Fund for Bird Research and Preservation, Ontario Ministry of Natural Resources, and Ontario Nature. Mike Cadman and Nicole Kopysh (OBBA) arranged funding for the trip and assisted with logistical arrangements. Lyle Walton and Ken Abraham (OMNR) offered technical advice and logistical support. Special thanks to OMNR Twin Otter pilots Frank Aquino and Corey Burella who expertly delivered us to and from our field site safely.

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Peter S. Burke
13 McKenzie Avenue
London, ON N6C 1V1
E-mail: psburke@rogers.com

Jon D. McCracken
Bird Studies Canada
P.O. Box 160
Port Rowan, ON N0E 1M0

Colin D. Jones
Ontario Ministry of Natural Resources
Natural Heritage Information Centre
300 Water Street, 2nd Floor North
Peterborough, ON K9J 8M5

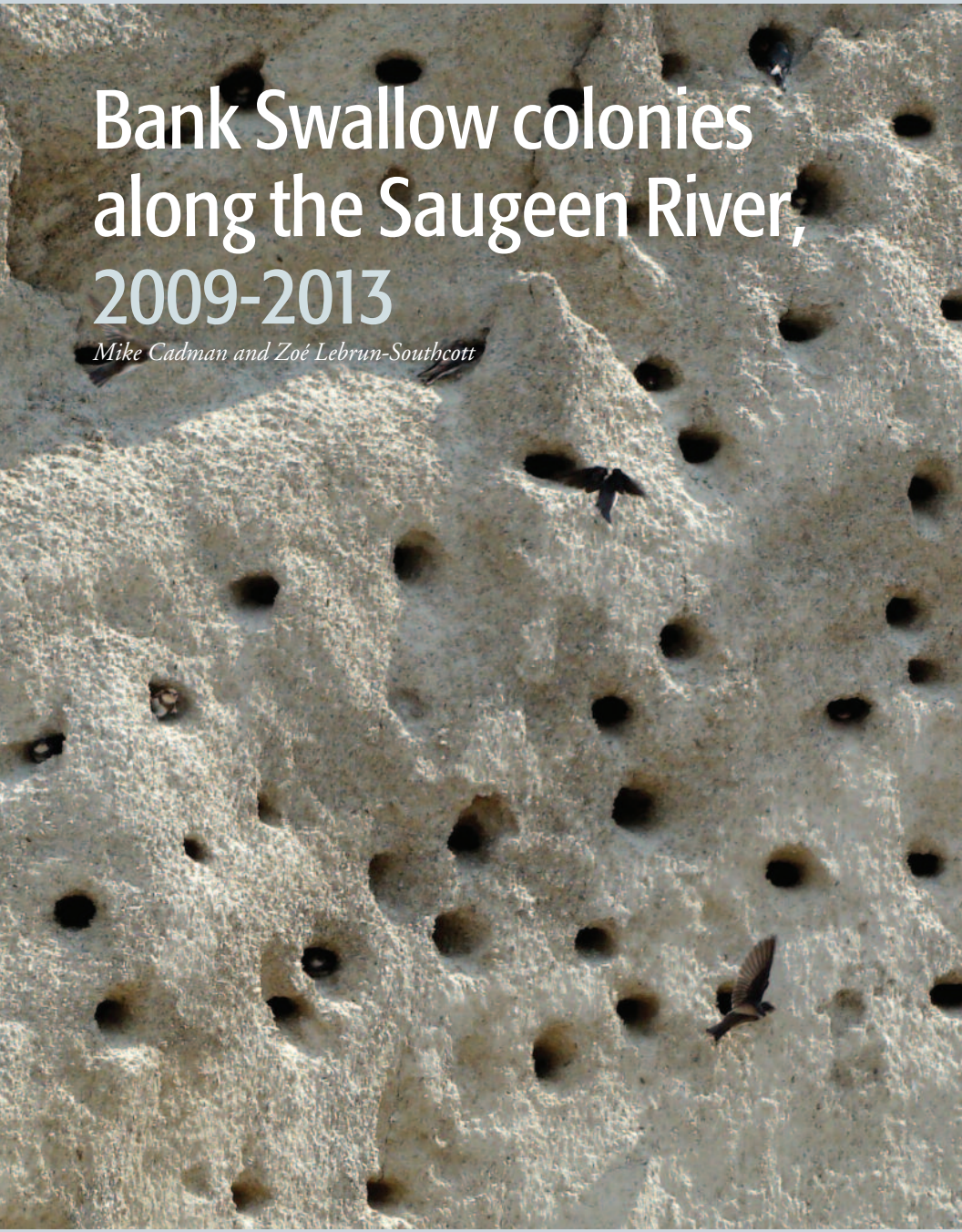
Martyn E. Obbard
Ontario Ministry of Natural Resources
Wildlife Research and Monitoring Section
Trent University, DNA Building
2140 East Bank Drive
Peterborough, ON K9J 7B8

Donald A. Sutherland
Ontario Ministry of Natural Resources
Natural Heritage Information Centre
300 Water Street, 2nd Floor North
Peterborough, ON K9J 8M5

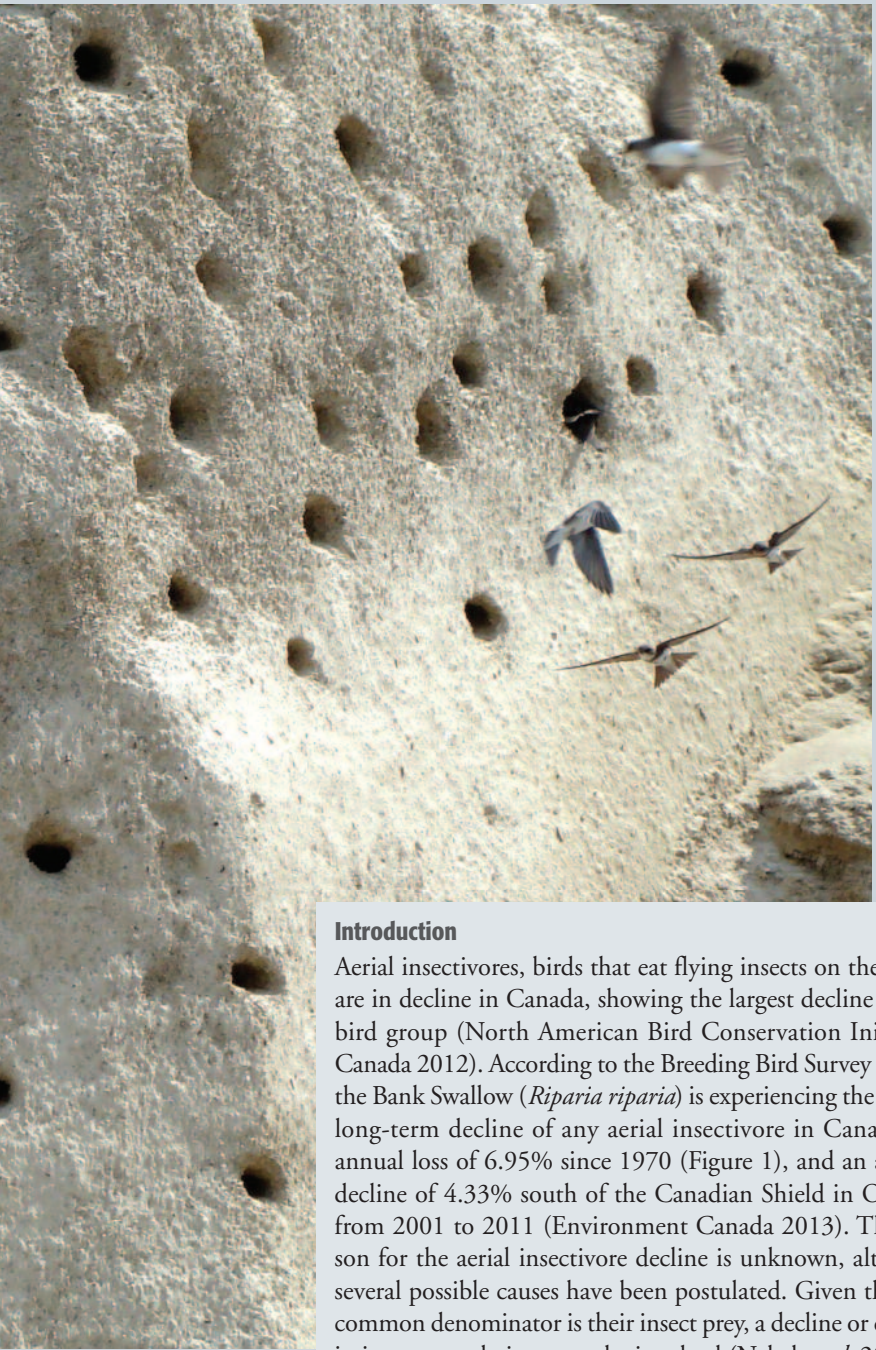
Ron Ridout
Bird Studies Canada
P.O. Box 160
Port Rowan, ON N0E 1M0

Bank Swallow colonies along the Saugeen River, 2009-2013

Mike Cadman and Zoé Lebrun-Southcott



Bank Swallows have declined considerably in Ontario, but their colonies, like this one in a pit near Guelph, are still hives of activity. *Photo: Zoé Lebrun-Southcott*



Introduction

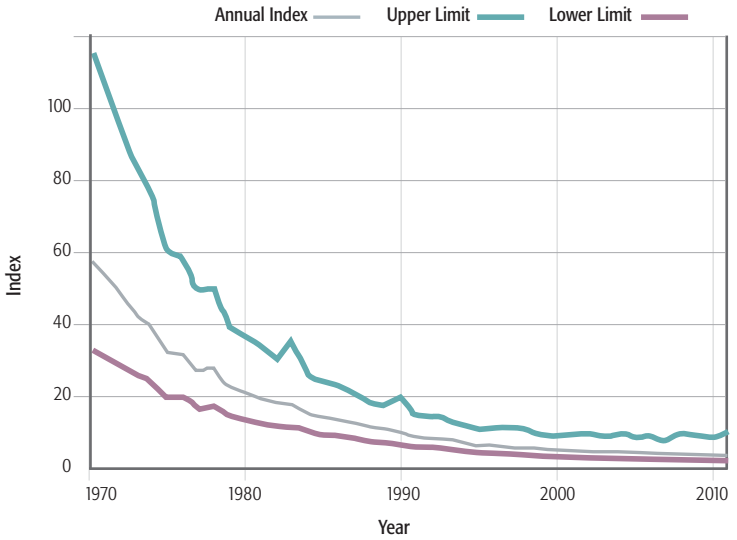
Aerial insectivores, birds that eat flying insects on the wing, are in decline in Canada, showing the largest decline of any bird group (North American Bird Conservation Initiative Canada 2012). According to the Breeding Bird Survey (BBS), the Bank Swallow (*Riparia riparia*) is experiencing the largest long-term decline of any aerial insectivore in Canada: an annual loss of 6.95% since 1970 (Figure 1), and an annual decline of 4.33% south of the Canadian Shield in Ontario from 2001 to 2011 (Environment Canada 2013). The reason for the aerial insectivore decline is unknown, although several possible causes have been postulated. Given that the common denominator is their insect prey, a decline or change in insect populations may be involved (Nebel *et al.* 2010).

Although Bank Swallows are well-known for nesting on river banks, little has been published on Bank Swallows nesting along rivers in Canada. This paper provides a summary of the results of a project that monitored the number of Bank Swallow burrows along a stretch of the Saugeen River in southern Bruce County, Ontario (Figure 2) from 2009 through 2013. The paper provides information on the number and size of colonies each year and establishes a baseline for future population surveys. It also examines whether the population trend along this stretch of river is consistent with that of the general Bank Swallow population as measured by the BBS.

Due to erosion, almost all of the burrows along this stretch of river disappear between years, so the number of burrows counted each year provides one measure of annual population size. The actual occupancy rate for Bank Swallow burrows is surprisingly difficult to obtain and changes considerably during the breeding season. Early in the season, males build a partial burrow and then try to attract a mate (Garrison 1999), but are sometimes unsuccessful, so some burrows remain incomplete and are not used for nesting. Later in the season, some burrows are abandoned, due, for example, to nest depredation or the death of one of the adults, while others are abandoned after young are raised successfully.

Occupancy can be assessed by counting, either visually in the field or by using video recordings, the proportion of a sample of burrows seen to be used by Bank Swallows, and some preliminary assessment of the Saugeen colonies has been done. However, the best approach, when burrows are accessible, is to inspect burrow contents to determine what proportion has a nest chamber, nest material, eggs, or young. Unfortunately, few of

Figure 1. Annual indices for Bank Swallow in Canada, 1970-2011, based on the Breeding Bird Survey (Environment Canada 2013).



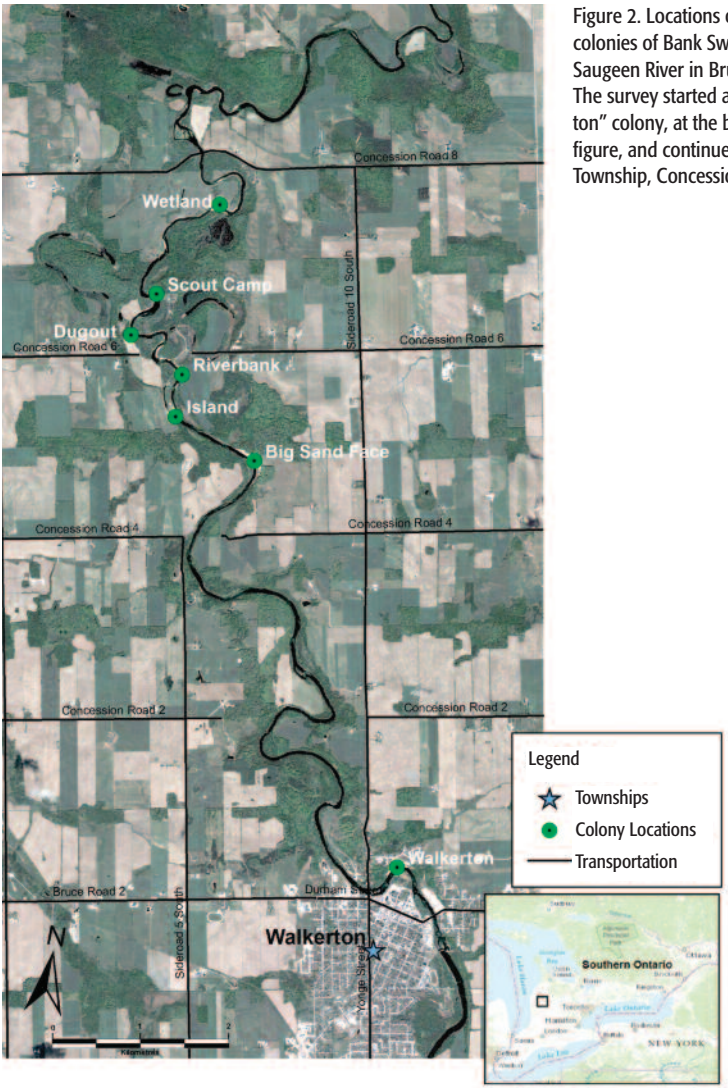


Figure 2. Locations of seven colonies of Bank Swallows on the Saugeen River in Bruce County. The survey started at the "Walkerton" colony, at the bottom of the figure, and continued until Brockton Township, Concession 8.

the burrows along this stretch of the Saugeen River are accessible. After reviewing several studies for the Sacramento River, California's Bank Swallow Technical Advisory Committee (2013) adopted a rate of 50% as roughly the ratio between the number of burrows and the number of nesting pairs along that river; a similar occupancy rate was obtained for Lake Erie colonies (M. Falconer, unpubl. data). Until further work is completed on Ontario river colonies, this estimate of occupancy is the best available and provides at least a general idea of what might be the situation along the Saugeen River.

Juvenile Bank Swallow
Photo: Zoé Lebrun-Southcott

Methods

In this paper, a colony is defined as a group of two or more burrows separated by more than 100 m from any other group of Bank Swallow burrows.

The study area extended from the "Walkerton" colony, within the city limits of Walkerton, downstream to the end of the surveyed section at Concession 8 (Brockton Township, Bruce County). This stretch of the river is 14.9 "river km" long, and 8.4 km as the crow flies (Figure 2).

From 2009 to 2013, this section of river was surveyed for Bank Swallow colonies at least once each year during the breeding season. The size of Bank Swallow colonies fluctuates greatly over the summer due in large part to the ephemeral nature of the banks in which they nest. Early in the season, colonies increase in size as birds return and burrows are established. Decreases occur due to erosion, bank collapse, and predation over the season, as well as slumping of burrows later in the season. In some cases, colony size increases due to re-nesting after erosion has destroyed burrows. In 2009, a single survey was conducted, three surveys were conducted in 2010, seven in 2011, three in 2012 and one in 2013. Results from these surveys show that the peak number of total burrows observed along this section of the Saugeen River usually occurs in June, with the highest numbers in mid-late June, though individual colonies may peak in number at different times. This paper compares burrow counts from one visit conducted during the height of the breeding season in each of the 5 years: 2 July 2009; 25 June 2010; 20 June 2011; 24 June 2012 and 13 June 2013.

The "Walkerton" colony mentioned above is road-accessible; the remaining colonies (Figure 2) were accessed by canoe, from an access point in Walkerton. Each survey was conducted by 2 to 4 researchers, from roughly 08:00 to 15:00. Researchers traveled downstream by canoe, stopping to observe all colonies encountered. Burrow counts were conducted mostly in the field, through binoculars, at a distance of five to 80 m.

Figure 3. Number of Bank Swallow burrows at colonies along the Saugeen River, from south to north, 2009-2013.

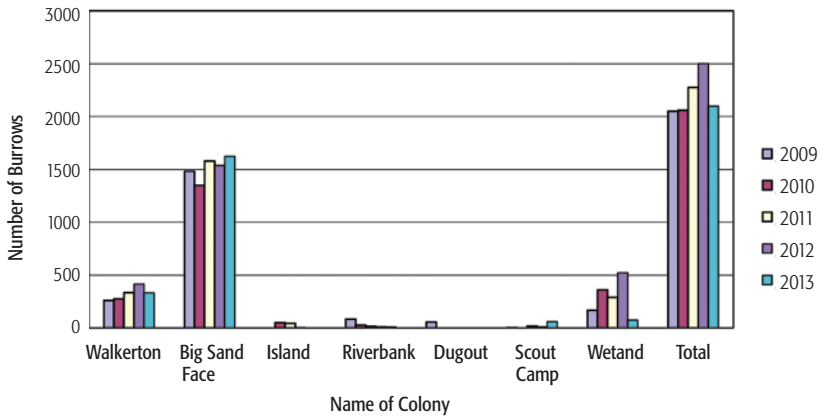


Figure 4. The central portion of the Big Sand Face colony. Most of the nests occur in the area shown, though the bank extends about 150 m further in each direction. *Photo: Zoé Lebrun-Southcott*

Counts were performed from land, except for one small colony where landing was difficult and counting could be done readily from a canoe. Burrows were counted individually and in most cases by two observers to ensure that counts were as accurate as possible. The largest colony, at "Big Sand Face", was photographed and later counted from digital photographs that were printed and magnified on screen as required.

Results

The number of burrows counted at each colony each year from 2009 to 2013 is shown in Figure 3. Seven colonies were located, and colony size ranged from three to 1624 burrows, although three colony sites had no burrows for at least one year when these banks appeared to be unsuitable for nesting. In each of the five years, the largest colony located was at "Big Sand Face" (Figure 4). The colonies were often at bends in the river and were on the outside of the bends in areas with large sand deposits.

The total number of burrows counted along the river peaked in 2012 at 2501 and averaged 2195. Numbers fluctuated considerably during the five year period, with changes of as much as 16% between subsequent years, but showed no evidence of decline over the five year study period.

Figure 5. A close up of part of the Big Sand Face colony. *Photo: Zoé Lebrun-Southcott*

Discussion

The number of burrows found indicates an exceptionally large population of Bank Swallows along this stretch of the Saugeen River, averaging 147 burrows per km over the entire stretch from the "Walkerton" colony to Concession 8, Brockton Township, and 397 per km over the 4.9 km from the "Big Sand Face" colony to the "Wetland" colony. A similar survey along the upstream section of the Saugeen River from Hanover to Walkerton in August 2013 found only 40 burrows in three small colonies, averaging 2.3 burrows per km. A downstream survey from Concession 8, Brockton Township to Bruce Road 17 east of Port Elgin tallied approximately 600 burrows along a 44 km stretch of river in June 2012, or 13.6 burrows per km (burrow numbers extracted from photographs provided by V. Martin, pers. comm.). The numbers from this study are also large compared to a similar survey completed in 2013 along a 12 km stretch of the Nottawasaga River which counted 245 burrows over 12.1 km, or 20.2 per km (Canadian Wildlife Service, unpubl. data).

The large number of burrows in this section of the Saugeen River is in large part due to the "Big Sand Face" colony, which held an average of 69% of the burrows along this entire 14.9 km stretch over the five year period. This is clearly an unusual and significant breeding site. The sand bank is approximately 400 m

in length and 30 m high at its highest point. Within this large sand face, the location of "subcolonies" (Figure 5) changes annually, depending on the availability of near-vertical sand faces within the larger bank. It may be the largest colony on a river in Ontario. No other river bank colonies of this size have been reported to the Ontario Nest Records Scheme (ONRS), though larger colonies have been reported in aggregate pits (ONRS data, pers. obs.) and along the shores of Lake Erie (M. Falconer, unpubl. data).

Given the large decline in Bank Swallows in Ontario (93% since 1970 according to BBS data), one might expect large areas of unused nesting habitat along the river; however, this was generally not the case. All of the banks that appeared to be suitable were occupied by nesting Bank Swallows each year, though not all of the suitable bank was necessarily filled to capacity with burrows. At the "Big Sand Face" colony there seemed to be considerable room for more burrows, even in years with large numbers of burrows (see Figure 5). Along the river, banks seemingly too small for Bank Swallows were occupied frequently by Belted Kingfishers (*Ceryle alcyon*) or Northern Rough-winged Swallows (*Stelgidopteryx serripennis*), the latter of which often nest in abandoned burrows.

Although this five year study provides only a small snapshot of localized data in comparison to the more than 40 years of BBS data, it is difficult to reconcile the huge decline in Bank Swallow populations illustrated by the BBS with the stable population shown along the Saugeen River since 2009. Presumably the removal of steep cut road-side banks due to changes in highway standards and an increased use of berms around aggregate pits make it harder to view Bank Swallows in roadside areas, so numbers from the roadside BBS might be expected to decline. The relatively stable numbers found along the Saugeen River, however, suggest that the river provides a comparatively stable environment for Bank Swallows, and that river banks in Ontario may be important for sustaining Bank Swallow numbers. Continued monitoring, and surveys along other rivers, should help clarify whether the pattern observed in this study is typical of the Saugeen River over the longer term and how it compares to other Ontario rivers.

At three of the colony sites, no burrows were found in some years. Small colonies appeared and disappeared depending on the state of the available bank at these locations. The banks changed considerably between years, due to erosion and bank collapse, and were sometimes obstructed by downed trees. On smaller banks, this meant that no suitable nesting habitat was available in some years. Similarly, along the Sacramento River in California, colony persistence was shown to be correlated with colony size (Garcia 2009).

Larger colonies were occupied during all five years of the study. Although the specific part of the large bank occupied may have varied from year to year, there was always some suitable bank for nesting in these locations. Nevertheless, some very large changes in burrow numbers occurred between years in large colonies. For example, the number of burrows

Figure 6. Dugout burrows at Dugout colony, 2 July 2009. The stones were dumped over the edge of the bank, presumably to help reduce erosion. They may have made it easier for mammalian predators to access the colony. *Photo: M. Cadman*

in the "Wetland" colony declined from 522 in 2012 to 74 in 2013, an 86% decline, due to a considerable reduction in the amount of vertical sand bank between years. This colony is on a very actively eroding cut bank on a curve of the river, and sometimes changed considerably even during one breeding season. For example, in 2010, we counted 360 burrows in this colony on 25 June, but on 29 July, only 31 burrows remained — the rest having been lost when most of the bank collapsed due to undercutting from the river. In 2011, the colony was back up to 289 burrows.

Although three of the small colonies had no burrows in one or more years, two of them re-established when the bank returned to a usable condition. The "Dugout" colony, however, was destroyed by mammalian predator(s) in 2009 and has not been re-established since. The talus beneath the vertical bank has a fairly shallow slope, making it accessible to predators (Figure 6). The nests were mostly close to the bottom of the vertical bank where they could be reached by predators. In our Bank Swallow work in aggregate pits, we have found signs that Coyote (*Canis latrans*), Red Fox (*Vulpes*

When the young begin to emerge from their burrows they are quite vulnerable to raptors.
Photo: Zoé Lebrun-Southcott

vulpes), Striped Skunk (*Mephites mephitis*) and Raccoon (*Procyon lotor*) have depredated burrows by excavating them, but we do not know which species was responsible for the predation in Figure 6. A colony might re-establish at this location when the bank returns to a suitable condition.

The "Riverbank" colony provides a special case in relation to occupancy rate. Although a small number of burrows were counted each year, none of these burrows were seen to be occupied by Bank Swallows in 2011, 2012 or 2013, and many of the same burrows persisted for several years in a row — as viewed from photographs. This is perhaps because the soil has higher clay content than most of the other colonies, so the bank is much less susceptible to erosion and collapse, and burrows survive the winter. In other colonies along this stretch of the Saugeen River, which are mostly in banks of sand, almost all of the burrows disappeared between years due to erosion. For example, of the 2,060 burrows counted along the river on 25 June 2010, only 48 (2.3%) were still extant on 29 April 2011, and 19 of these were in the "Riverbank" colony. Although some burrows in this colony survived from one year to the next, they were not occupied because Bank Swallows generally avoid reusing old nests because of increased likelihood of infestation by fleas (*Ceratophyllus* spp., Haas *et al.* 1980). Northern Rough-winged Swallows were observed using some of the "Riverbank" colony burrows in 2011 and 2012.

In 2014, Canadian Wildlife Service and Ontario Ministry of Natural Resources will conduct a large scale survey for Bank Swallows on Ontario rivers. The results should help to elucidate the importance of rivers to Bank Swallows in Ontario relative to their numbers in pits (which were surveyed in 2013), and to the large population along Lake Erie (M. Falconer, unpubl. data) and Lake Ontario (Ontario Power Generation, unpubl. data) which have been surveyed since 2010 and 2007, respectively. If you have any information about Bank Swallow colonies on Ontario rivers, please contact the lead author.

Acknowledgements

The assistance of the following in surveying the colonies along the river is gratefully acknowledged: Jenn Bock, Meghan Douglas, Kyle Horner, Jessica Klawunn, Tina Knezevic, Lauren Rae, Antonio Salvadori, Kerry Schutten, Reinder Westerhoff and Bryan Wyatt. Meghan Douglas and Jessica Klawunn helped count burrows from photographs. Thanks to Jeff Costa for producing Figure 2. Thanks also to Virgil Martin for providing the photographs and location data for colonies along the Saugeen River and to David Featherstone for similar assistance along the Nottawasaga River. The advice and support of Ontario's Bank Swallow Working Group is much appreciated.

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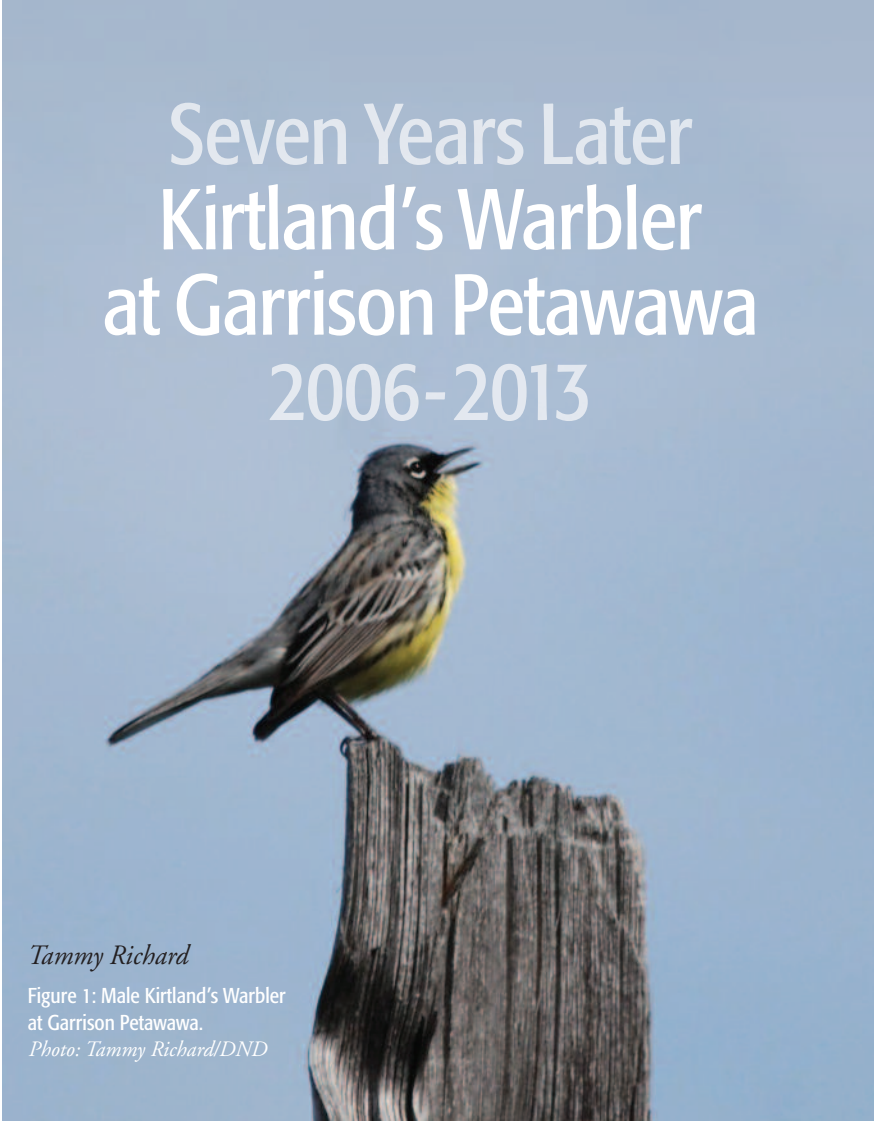
Mike Cadman
Canadian Wildlife Service
Environment Canada
867 Lakeshore Road
Burlington, ON L7R 4A6
E-mail: Mike.Cadman@ec.gc.ca

Zoé Lebrun-Southcott
307-114 Vaughan Road
Toronto, ON M6C 2M1

Seven Years Later
Kirtland's Warbler at Garrison Petawawa 2006-2013



Tammy Richard

Figure 1: Male Kirtland's Warbler at Garrison Petawawa.
Photo: Tammy Richard/DND

Introduction

The Kirtland's Warbler (*Setophaga kirtlandii*) is an endangered species that was re-discovered in Ontario in 2006 at Garrison Petawawa (formerly Canadian Forces Base Petawawa) (Richard 2008). Until 2006, the species was only known to breed in Michigan, USA (Walkinshaw 1983, Probst 1991, Mayfield 1992). However, in 2007, surveys led by the Department of National Defence (DND) on Garrison Petawawa detected the first nesting pair in Canada in 62 years (Richard 2008). That same year, Kirtland's Warblers were also discovered nesting in Wisconsin (Trick *et al.* 2008).

There are historical records of Kirtland's Warbler in suitable habitat in Ontario, dating back to 1916 in Petawawa (Table 1). Approximately 18 occurrences of Kirtland's

Table 1: Kirtland's Warbler sightings in potential breeding habitat in Canada from 1900 to 2005 (compiled from multiple sources)*

Location	Year	Date(s) detected	Details	Source
CFB Petawawa, ON	1916	4 June – 12 July	Multiple males singing on property	Harrington 1939
CFB Petawawa, ON	1939	5 June	Male	Harrington 1939
Barrie, ON**	1945	8-31 August	One male, one female and fledgling	Speirs 1984
CFB Petawawa, ON	1946	18 June	One singing male	Hibbard and Aird 1978
CFB Petawawa, ON	1946	27 July	One male	Hibbard and Aird 1978
Bruce Peninsula (Tobermory/McVicar, ON)**	1958	8-30 June	Singing male	Baillie 1958; Hibbard and Aird 1978; Aird and Pope 1987
Hamilton, ON	1960	17 June	Male	Hibbard and Aird 1978
Parry Sound, ON (Point au Baril)**	1961	17 June	Male	Curry 1991
Rice Lake, ON	1963	2 July	Male	Hibbard and Aird 1978
Barrie/Midhurst, ON	1964	16-20 May	Male	Hibbard and Aird 1978; COSEWIC 2008
CFB Petawawa, ON**	1977	9 June – 14 July	One singing male; banded on 1 July; had two territories	Aird 1977; Hibbard and Aird 1978; Aird 1989
CFB Petawawa, ON**	1978	27 May – 21 June	One singing male; banded in Petawawa in 1977	Hibbard and Aird 1978; Aird 1989
Kazabazua, PQ	1978	27 May – 21 June	Male; banded as nestling in Michigan	Hibbard and Aird 1978; Chamberlain and McKeating 1978
Makwa Lake, Sudbury District, ON**	1982	1 June	Male	COSEWIC 2008
Near Orillia, ON	1985	22 June – 9 July	One singing male	Aird and Pope 1987
Minaki, Kenora District, ON**	1988	14 August	One (sex not stated)	COSEWIC 2008
Thessalon area, ON	1997	4 July	Male	COSEWIC 2008
Forest, ON**	1999	9-10 June	Male	COSEWIC 2008

* Migration records in Canada, as listed in Petrucha *et al.* (2013), have been excluded from this table except for one record in May 1964 that was likely in suitable habitat based on supplemental information. Migration records were defined by Petrucha *et al.* (2013) as sightings between 1 March and 31 May and between 1 August and 30 November. Additional information, if available, was screened by the author to assess the migration record (i.e. behavior). In a few cases in Ontario, sightings in August were not listed as a migration sighting in Petrucha *et al* (2013), and are supported by evidence of suitable habitat and are therefore included in this table.

** Records of Kirtland's Warbler accepted by the Ontario Bird Records Committee (OBRC) (COSEWIC 2008).

Warbler in potential breeding habitat are documented in Canada between 1900 and 2005, however, there are 47 spring migration records of Kirtland's Warbler in Ontario between 1900 and 2005 and 7 fall migration records (Petrucha *et al.* 2013). Kirtland's Warblers leave the Bahamas for their breeding grounds in the United States and Canada at the end of April and fly through Florida, Georgia and South Carolina (Walkinshaw 1983). As they move northward, the migration route widens in a fan-like pattern across several U.S. states (Petrucha *et al.* 2013). Many spring migrants have been detected along the shorelines of the Great Lakes including in Toronto, Point Pelee, Rondeau Provincial Park and Prince Edward Point as they move towards their breeding grounds (Petrucha *et al.* 2013).

In Michigan, Kirtland's Warblers arrive on their breeding grounds at the beginning of May (Mayfield 1992), usually in the period between the 3rd and 12th of May (Mayfield 1960). However, some are documented to have arrived as late as 5 June in Michigan (Rockwell *et al.* 2012). The total duration of spring migration ranges between 13 and 23 days (Ewert *et al.* 2012). Once on the breeding grounds, males occupy a territory between 0.6 ha to more than 10 ha in size, the average being 8.4 ha (Walkinshaw 1983). There is strong site fidelity, and males usually return to the same territories in subsequent years (Walkinshaw 1983). Males defend their territory by singing persistently and chasing away other male Kirtland's Warblers along with other bird species (Walkinshaw 1983, Mayfield 1992). Individuals depart from their breeding grounds in late August or September and return to their wintering grounds in the Bahamas over 2000 km away (Sykes *et al.* 1989).

Historically, the Kirtland's Warbler was found in the Petawawa area in suitable breeding habitat. Harrington (1939) noted that they were "not uncommon" to the Jack Pine (*Pinus banksiana*) of Petawawa and suspected that they were breeding on the military base. Singing males were heard at Garrison Petawawa in 1916, 1939, 1946, 1977 and 1978, but nesting was not detected (Harrington 1939, Aird 1977, Hibbard and Aird 1978, Cadman *et al.* 1987). Since their re-discovery in 2006, Kirtland's Warblers have been surveyed and monitored annually at Garrison Petawawa. The purpose of this paper is to provide information on arrival dates, territory sizes and habitat use of Kirtland's Warbler at Garrison Petawawa.

Observations and Discussion

Since 2006, between May and August, surveying and monitoring of Kirtland's Warblers were conducted in suitable habitat by the author and supporting staff. Over this time period, a total of seven different males and between four and six different females was detected (Figure 1, Figure 2). Not all females could be distinguished due to the lack of leg-bands as identifiers, but assumptions were made based on mates and locations. Males were distinguished based on leg-bands, unique calls, territory locations and photographs. The number of singing males detected each year during the May to June survey period is illustrated in Figure 3.

Figure 2: Female Kirtland's Warbler at Garrison Petawawa. *Photo: Tammy Richard/DND*

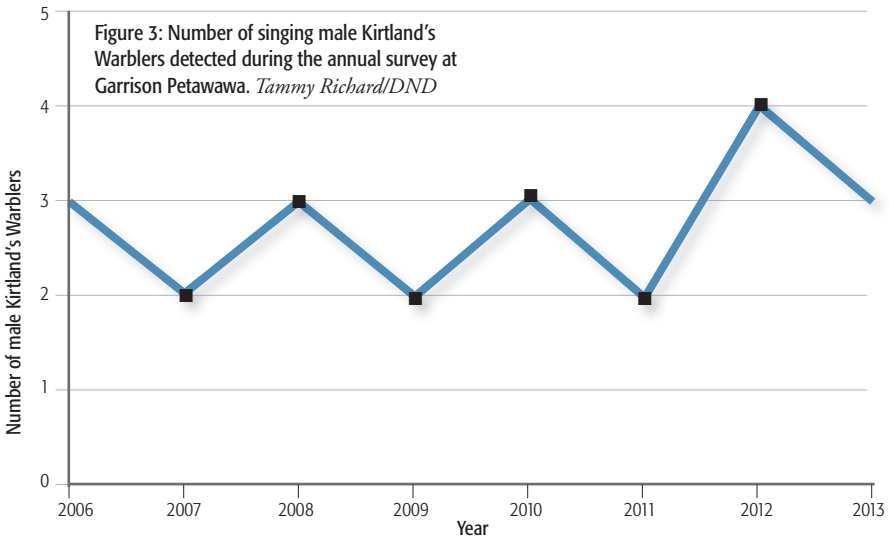


Figure 3: Number of singing male Kirtland's Warblers detected during the annual survey at Garrison Petawawa. *Tammy Richard/DND*

Table 2: Kirtland's Warbler survey and monitoring results, Garrison Petawawa, 2006-2013

Date detected	Bird	Observation dates	Banded (Y/N)	Banding location (date)	Nest detected (Y/N)	Comments
6 June 2006	Male 1	6-7 June	N		N	
7 June 2006	Male 2	7 June – 7 July	Y	CFB Petawawa	N	
13 June 2006	Male 3	13 June	N		N	
13 May 2007	Male 2	13 May – 17 July	Y	CFB Petawawa (2006)	N	
18 June 2007	Male 1	18 June – 10 July	Y	CFB Petawawa	Y	
28 June 2007	Female 1	28 June – 10 July	Y	CFB Petawawa	Y (w/Male 1)	Nest w/2 young and 2 eggs
15 May 2008	Male 2	15 May – 16 July	Y	CFB Petawawa (2006)	Y	
30 June 2008	Female 2	30 June – 14 August	N		Y (w/Male 2)	Nest w/4 young
22 May 2008	Male 4	22 May – 7 July	Y	Bahamas (2007)	N	
15 May 2008	Male 1	15 May – 27 June	Y	CFB Petawawa (2007)	N	
11 May 2009	Male 2	11 May – 30 June	Y	CFB Petawawa (2006)	Y	
25 May 2009	Female 2?	25 May – 24 June	N		Y (w/Male 2)	Nest w/4 eggs
15 May 2009	Male 4	15 May – 30 June	Y	Bahamas (2007)	Y	
21 May 2009	Female 3	21 May – 24 June	N		Y (w/Male 4)	Nest w/5 eggs
13 May 2010	Male 2	13 May – 15 July	Y	CFB Petawawa (2006)	N	Found w/female and 2 fledglings
26 May 2010	Male 4	26 May – 15 July	Y	Bahamas (2007)	Y	Nest w/5 eggs
11 June 2010	Female 3?	11-30 June	N		Y (w/Male 4)	
6 July 2010	Male 5	6-7 July	N		N	
12 May 2011	Male 2	12 May – 12 August	Y	CFB Petawawa (2006)	N	
24 May 2011	Male 5	24 May – 19 July	N		N	
25 May 2011	Female 4	25 May – 19 July	N		N	Found w/male 5
22 May 2012	Male 2	22 May – 31 July	Y	CFB Petawawa (2006)	N	
14 May 2012	Male 5	14 May – 15 August	N		Y	
11 June 2012	Female 4 or 5?	11 June – 27 July	N		Y (w/male 5)	Nest w/5 eggs
6 June 2012	Male 6	6-20 June	N		N	
6 June 2012	Male 7	6 June – 5 July	N		N	
9 May 2013	Male 6	9 May – 26 July	N		N	
31 May 2013	Female 6?	31 May – 20 June	N		N	Found w/male 6
14 May 2013	Male 5	14 May – 4 June	N		N	
30 May 2013	Male 7	30 May – 4 June	N		N	

Figure 4: Male Kirtland's Warbler detected at Garrison Petawawa in 2006, which returned every year up to and including 2012.
Photo: Tammy Richard/DND

At Garrison Petawawa, the earliest male arrival date is 9 May. Males occupied territories between 0.47 ha and 12.1 ha, which is consistent with the information provided by Walkinshaw (1983). Most males returned to Garrison Petawawa in at least one subsequent year, to a similar territory location, exhibiting strong site fidelity. A complete account of Kirtland's Warbler arrival dates, observations dates, banding and nest information is provided in Table 2.

One male, banded on the property as an After Second Year (ASY) in July 2006, returned for six consecutive years and was last sighted by the author on 31 July 2012 (Figure 4). He did not return in 2013. Based on his age in 2006, this male was likely 9 years old in 2012. The average lifespan of males is 4.0 ± 1.90 years, while females live 2.5 ± 1.8 years (Mayfield 1992). Interestingly, the oldest male on record is an 11 year old from the Lower Peninsula of Michigan (Ewert 2005, USFWS 2012).

Another male that was banded in the Bahamas in February 2007 arrived in Petawawa in May 2008 (Figure 5). He returned in 2009 and 2010 and bred successfully both years. As many as two pairs have been detected on the property in a given year. At least 27 fledglings have been produced thus far; numbers, however, are approximate because not all fledglings can be accounted for after leaving the nest. Furthermore, monitoring did not involve active nest searches due to restrictions in permit conditions by the regulatory agency.

Left: **Figure 5: Male Kirtland's Warbler banded in the Bahamas in February 2007 detected at Garrison Petawawa from 2008-2010.** *Photo: Tammy Richard/DND*

Above: **Figure 6: Typical Kirtland's Warbler habitat at Garrison Petawawa. Typical Kirtland's Warbler habitat on the property is composed of Jack Pine, mixed with Red Pine (*Pinus resinosa*) and White Pine (*Pinus strobus*), that is under 20 years old and is accompanied by ground cover such as Low-sweet Blueberry (*Vaccinium angustifolium*), Sweet Fern (*Comptonia peregrina*), lichens (*Cladonia* spp.) and mosses (Richard 2013)** *Photo: Tammy Richard/DND*

In July 2012, drought conditions resulted in a fire in a portion of the Kirtland's Warbler habitat, consuming 200 ha of forest (Figure 7). Fire officials at Garrison Petawawa confirmed that based on lightning data from the Ontario Ministry of Natural Resources, physical evidence and the behavior of the fire, the fire was due to a lightning strike (DND Fire Authority 2012). No Kirtland's Warblers were harmed during the fire. One pair remained on territory near the fire, while one lone male in the fire zone moved to an alternate location for the remainder of the season. It is very likely that future habitat will be available for Kirtland's Warblers as a result of the fire. Most Jack Pine trees were of seed-producing maturity and most exhibited open cones following the fire. However the quality and extent of the habitat cannot be predicted at this time, as several factors, including climatic conditions and moisture, affect Jack Pine growth following a fire.

Figure 7: Forest fire, caused by a lightning strike, burned a portion of Kirtland's Warbler habitat in July 2012. Photo was taken one week after the fire began. *Photo: Tammy Richard/DND*

The Kirtland's Warbler population at Garrison Petawawa appears to be stable. Birds have continually returned to the property indicating the quality of habitat available and the protection mechanisms in place. Kirtland's Warblers are protected on the property as per the federal *Species at Risk Act* (2002) and the Kirtland's Warbler population is at a record high, with 2024 singing males detected in North America in 2013 (USDA Forest Service 2013). Additional Kirtland's Warblers are likely to be found on military land, and further surveying in other areas of Ontario and Quebec may also reveal additional populations.

Acknowledgements

Financial support was provided by the Department of National Defence. The author wishes to thank the following people for their assistance in the Kirtland's Warbler project: C. Macfarlane, A. McCrum, M. Cybulski, B. Doering and M. Perry. Thanks to C. Risley, G. Coady and C. Weseloh for reviewing earlier versions of this article.

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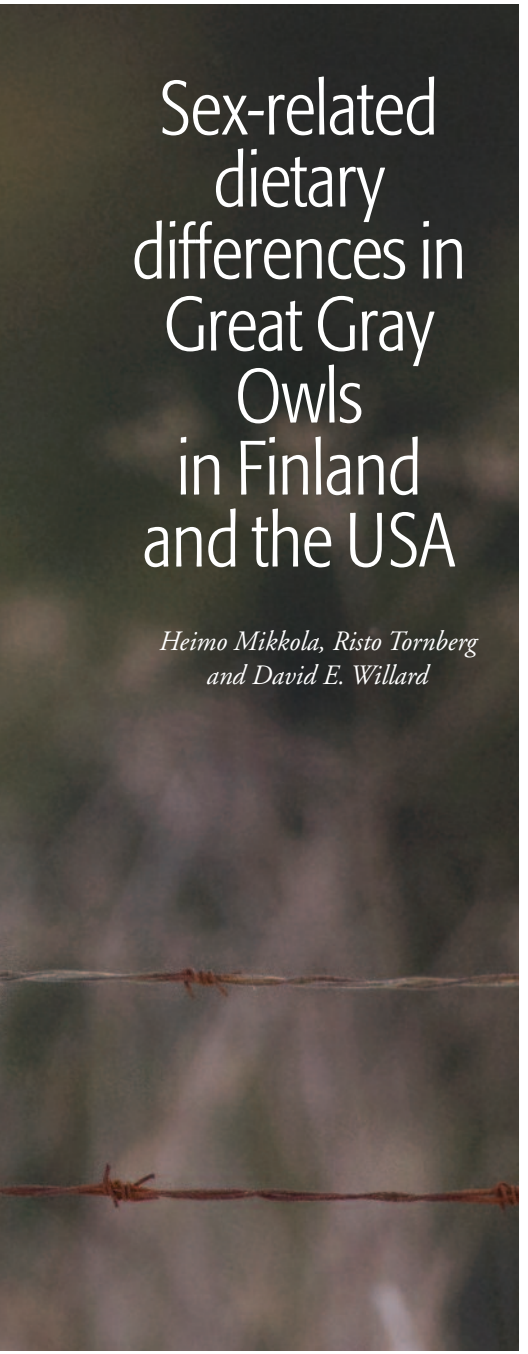
Tammy Richard
Wildlife/Species at Risk Biologist
Department of National Defence
Garrison Petawawa
P.O. Box 9999, Stn Main
Petawawa, ON K8H 2X3
E-mail: Tammy.Richard@forces.gc.ca

Great Gray Owl listening for prey from a barbed wire fence. *Photo: J. Spallin*



Sex-related dietary differences in Great Gray Owls in Finland and the USA

Heimo Mikkola, Risto Tornberg and David E. Willard

Introduction

The Great Gray Owl (*Strix nebulosa*) is a large nocturnal raptor of the boreal zone, ranging south through coniferous mountain regions. It is the only member of the genus with populations in both the Old and New Worlds (Bull and Duncan 1993), with nominate *nebulosa* found in North America and *lapponica*, differing in plumage characters (Mikkola 2012), in Eurasia. The species exhibits high reverse sexual size dimorphism (RSD) with females clearly larger than males. Based on specimens at the University of Oulu, Finland, female owls from Finland had an average weight of 1165 g (N=89), while male weights averaged 894 g (N=50). Values from North America were remarkably similar (based on specimens at the Field Museum of Natural History, Chicago). Mean female weight was 1168 g (N=356) and males averaged 902 g (N=272). On both continents, the largest females were nearly three times as heavy as the smallest males. The Reversed Size Dimorphism (RSD) index of the European Great Gray Owls is 11.8 (calculated as in Amadon (1943) and Earhart and Johnson (1970) by using the cube root of body mass to compare to indices of linear measurements). This is the highest value of all European owls (Mikkola 1983).

There are many studies of owl diets based on analysis of prey remains found in pellets (summarized in Marti *et al.* 1993). Pellets of Great Gray Owls at breeding sites have provided information on overall diet (Mikkola and Sulkava 1970, Bull and Henjum 1990, Duncan 1992, Sulkava and Huhtala 1997), but because it is difficult to be certain which sex produced the pellet, and because the male is almost exclusively responsible for prey deliveries to the nest, these studies cannot address the question of sexual differences in diet or prey selection. With the large amount of sexual size dimorphism in this species, it seems logical to hypothesize that females should take larger prey, minimizing intraspecific competition, as seen in studies of diurnal raptors (Temeles 1985, Krüger 2005).

Two large samples of Great Gray Owls allow us to test whether there are dietary differences between the sexes. HM and RT analyzed a sample from Finland found dead along roads or confiscated after illegal hunting over a 78 year span, 1927–2005 (specimens in collections of taxidermist Pentti Alaja, Vesanto and the University of Oulu); DW worked with birds from Minnesota and Wisconsin found dead during the huge irruption of the winter of 2004-2005 (Svingen and Lind 2005). The source of many of these irruptive owls in Minnesota and Wisconsin would have undoubtedly referred to breeding populations in the boreal forest regions of Ontario and Manitoba.

Materials and Methods

One hundred and fifty Great Gray Owls from Finland and 675 from Minnesota and Wisconsin were sexed internally and the contents of their stomachs identified. In Finland, 312 prey items were identified from 59 females and 46 males, while there were 1225 prey items from 203 female and 148 male stomachs in North America. The remainder of stomachs were either empty or contained no identifiable prey items. The samples from Finland were collected over several decades in years of variable prey abundance, whereas those from Minnesota and Wisconsin were all collected in a single winter, during an irruption when prey was abundant.

For the Finnish prey items, we used average weights given by Siivonen (1967) and Jensen (1994) for small mammals, and for birds, we used Von Haartman *et al.* (1963-1972). Average weights for Minnesota and Wisconsin prey items were taken from on-line data provided by the Smithsonian Institution.

We tested differences in the diet between sexes in both countries by Chi-square χ^2 tests. We arranged the data according to prey weight classes in order to have sufficient numbers of prey in each cell of the contingency table. These weight categories were: a) < 15g (mostly shrews); b) 16-30g (mostly smaller rodents); c) 31-50g (larger voles, frogs, thrushes); d) 51g and above (water voles, weasels, large birds, hare).

To calculate diet width, we used Levins' index (Levins 1968) $B=1/\sum Pi^2$, in which Pi is the proportion of the i^{th} prey or prey group.

Table 1. Sexual differences in the diet of Great Gray Owls in the USA based on 351 stomach contents (148 male and 203 females). The average weight of prey species calculated from minimum and maximum weights given by Smithsonian Institute and/or Wisconsin University on the internet.

Prey species of *Strix nebulosa nebulosa*	Average Prey item Weight (g)	Female Prey Number %	Female Prey Weight %	Male Prey Number %	Male Prey Weight %	Total Prey Number %	Total Prey Weight %
Arthropod	2	0.13	0.01	0.20	0.01	0.16	0.01
Sorex cinereus/hoyi Masked / Pygmy Shrews	5	4.88	0.55	8.62	1.09	6.37	0.76
Sorex arcticus Arctic Shrew	8	3.79	0.69	6.36	1.29	4.82	0.91
Aves sp. small Birds	12	0.41	0.14	-	-	0.25	0.08
Peromyscus sp. Deer Mice	16	0.41	0.15	2.26	0.92	1.14	0.43
Blarina brevicauda Short-tailed Shrew	24	3.52	1.92	3.08	1.87	3.35	1.90
Clethrionomys gapperi Southern Red-backed Vole	28	1.49	0.95	4.11	2.92	2.53	1.68
Synaptomys cooperi Southern Bog Lemming	36	0.68	0.55	0.82	0.75	0.74	0.63
Microtus pennsylvanicus Meadow Vole	48	82.38	89.86	71.87	87.51	78.20	88.99
Rana sp. Frogs	50	0.54	0.61	0.21	0.26	0.41	0.48
Unidentified prey	50	0.81	0.92	1.85	2.34	1.22	1.45
Condylura cristata Star-nosed Mole	59	0.54	0.73	0.41	0.62	0.49	0.69
Scalopus aquaticus Eastern Mole	80	-	-	0.21	0.42	0.08	0.17
Tamiasciurus hudsonicus Red Squirrel	227	0.14	0.70	-	-	0.08	0.44
Mustela frenata Long-tailed Weasel	250	0.14	0.77	-	-	0.08	0.48
Mustela erminea Ermine	467	0.14	1.44	-	-	0.08	0.90
Total		100	100	100	100	100	100
Prey Item Numbers/ Total Weights (g)		738	32476	487	19198	1225	51674
Average Prey Size (g)			44.0		39.4		42.2
Diet Niche Breadth			1.462		1.899		1.681

Results

In the sample from Minnesota and Wisconsin (Table 1), the most common prey for both male and female owls was the Meadow Vole (*Microtus pennsylvanicus*). Shrews of several species were also commonly eaten (12% of female, 18% of male prey items), but by weight, their contribution was considerably less important. Only females were documented taking prey over 80 g: Red Squirrel (*Tamiasciurus hudsonicus*), Long-tailed Weasel (*Mustela frenata*) and Ermine (*Mustela erminea*). Previous studies have also documented Ermine in Great Gray Owl diet (Brunton and Reynolds 1984).

In the USA, the average weight of the 738 prey items taken by females was 44.0 g, while the average weight of male prey based on 487 items was 39.4 g. These differences are statistically significant (χ^2=20.702, p<0.001, Figure 1).

The sample for Finland comprises 312 prey items, with 180 of those taken by females and 132 by males (Table 2). Short-tailed and Root Voles (*Microtus agrestis* and *M. oeconomus*) were the most common prey (40% of total prey, 52% by weight), but shrews were taken nearly as often (39% of total, but only 11 % by weight). The average prey weight for both sexes in the Finnish sample is 33 g which

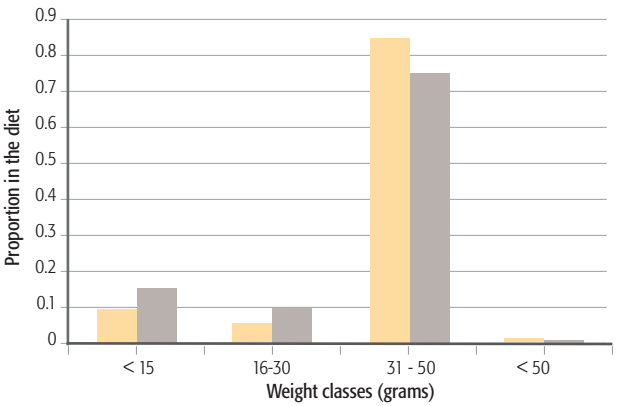


Figure 1. Proportion of prey specimens found in stomachs of male and female Great Gray Owls collected in Minnesota and Wisconsin, USA in winter 2004-05. Prey specimens are categorized into weight classes.

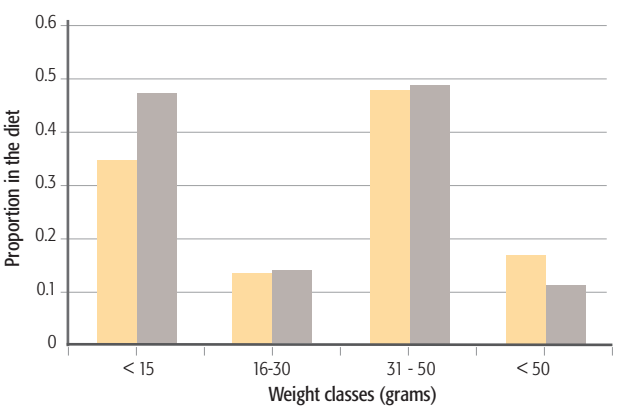


Figure 2. Proportions of prey specimens found in stomachs of male and female Great Gray Owls collected in Finland during 1929-2005. Prey specimens are categorized into weight classes.

Table 2. Sexual differences in the diet of Great Gray Owls in Finland based on 105 stomach contents (46 males and 59 females). Average weights calculated from Siivonen (1967) and Jensen (1994) for small mammals, and from Von Haartman *et al.* (1963-1972) for birds.

Prey species of *Strix nebulosa lapponica*	Average Prey item Weight (g)	Female Prey Number %	Female Prey Weight %	Male Prey Number %	Male Prey Weight %	Total Prey Number %	Total Prey Weight %
Sorex minutissimus Least Shrew	3	0.55	0.04	3.02	0.36	1.60	0.15
Sorex minutus Pygmy Shrew	5	0.55	0.07	3.78	0.75	1.92	0.29
Sorex caecutiens Laxmann's Shrew	7	0.55	0.10	-	-	0.32	0.07
Sorex sp.	9	5.56	1.29	9.85	3.51	7.37	2.01
Sorex araneus Common Shrew	10	26.67	6.89	25.76	10.19	26.28	7.96
Sorex isodon Taiga Shrew	11	0.55	0.16	-	-	0.32	0.11
Neomys fodiens Eurasian Water Shrew	15	0.55	0.21	0.76	0.45	0.64	0.29
Aves sp. (small)	20	0.56	0.28	-	-	0.32	0.19
Mus musculus House Mouse	20	0.56	0.28	-	-	0.32	0.19
Clethrionomys glareolus Bank Vole	24	12.22	7.58	10.61	10.07	11.54	8.38
Myopus schisticolor Wood Lemming	29	0.56	0.42	2.27	2.61	1.28	1.13
Clethrionomys rufocanus Grey Red-backed Vole	35	2.22	2.01	-	-	1.28	1.36
Cricetidae sp.	35	1.67	1.51	4.55	6.29	2.89	3.06
Microtus agrestis Short-tailed Vole	40	26.67	27.55	28.79	45.56	27.57	33.38
Microtus oeconomus Root Vole	48	15.00	18.60	9.85	18.71	12.82	18.63
Turdus pilaris (juv.) Fieldfare	50	1.11	1.43	-	-	0.64	0.97
Rana temporaria Common Frog	50	1.11	1.43	0.76	1.50	0.96	1.46
Arvicola terrestris European Water Vole	150	2.22	8.62	-	-	1.28	5.82
Lagopus lagopus Willow Ptarmigan	600	0.56	8.62	-	-	0.32	5.82
Lepus timidus (carrion) Mountain Hare	900	0.56	12.91	-	-	0.32	8.73
Total		100	100	100	100	100	100
Prey Item Numbers/ Total Weights (g)		180	6969	132	3336	312	10305
Average Prey Size (g)			38.7		25.3		33.0
Diet Niche Breadth			5.417		5.407		5.412

is identical to that found in a large (N=5177) sample of prey material from pellets studied in Fenno-Scandia (Mikkola 1981). Mean weight of prey for females in this study was 38.7 g and for males 25.3 g, and although they were more dramatically different in an absolute sense than the American sample, owing to smaller sample size, they did not differ significantly (χ^2=3.938, n.s., Figure 2).

Many owl stomachs (40% in Minnesota and Wisconsin and 30% in Finland) were empty or contained only hair or a few unidentified bones, but some individuals had remarkable numbers of prey items in their stomachs. A stomach from a Finnish female contained 13 prey items: 7 Common Shrew (*Sorex araneus*), 1 Pygmy Shrew (*S. minutus*), 1 Least Shrew (*S. minutissimus*) and 2 Bank Voles (*Clethrionomys glareolus*). Total weight of these prey animals was 126 g. Another female had 7 Root Voles in the stomach. Total estimated weight of these voles was 336 g, helping to explain why this female owl was the heaviest ever weighed in Finland (1900 g). The highest number of prey in one stomach from Finland came from a male which had 17 items: 13 Common Shrew, 1 Pygmy Shrew, 1 Common Frog (*Rana temporaria*), 1 Bank Vole and 1 Short-tailed Vole. Total weight of this stomach content was about 250 g. There were similar individuals in the Minnesota and Wisconsin sample. One female had 13 items (8 Meadow Voles, 2 Southern Red-backed Voles (*Myodes gapperi*), 2 Cinereous Shrews (*Sorex cinereus*), 1 Short-tailed Shrew (*Blarina brevicauda*) and 1 Star-nosed Mole (*Condylura cristata*); another female stomach contained remains of 12 Meadow Voles, for which the total weight was estimated to be even 576 g. The most prey items recorded in a single stomach in the North American sample came from a male with 18 items (10 Arctic Shrews (*Sorex arcticus*), 3 Cinereous Shrews, 3 North American Pygmy Shrews (*S. hoyi*), 1 Southern Red-backed Vole and 1 Star-nosed Mole). Several male stomachs contained more than 10 Meadow Voles.

When comparing Finnish material with that collected in Minnesota and Wisconsin, size class 30-50 g, *i.e.* the size of large voles, was found more frequently in the USA material, while smaller size classes were relatively better represented in Finnish material (Figure 3). The difference is statistically highly significant (χ^2 = 262,333, df = 3, $p < 0.001$).

Levin's index of dietary niche breadth in Finland was almost the same between males and females (Table 2); in Minnesota and Wisconsin, that measure was slightly lower for females than males (Table 1). The niche breadth of the Finnish sample was considerably higher than that for Minnesota and Wisconsin.

Discussion

Reversed sexual dimorphism may have evolved to allow members of a pair to capture different prey types and/or sizes and thus more efficiently exploit the local food resources and reduce competition between the sexes (Snyder and Wiley 1976, Hakkarainen and Korpimäki 1991, Tornberg *et al.* 1999). Studies of temperate owls have generally failed to show this (Mikkola 1981, Lundberg 1986). The two data sets presented here give some indication of niche partitioning of this sort, with female owls on both continents

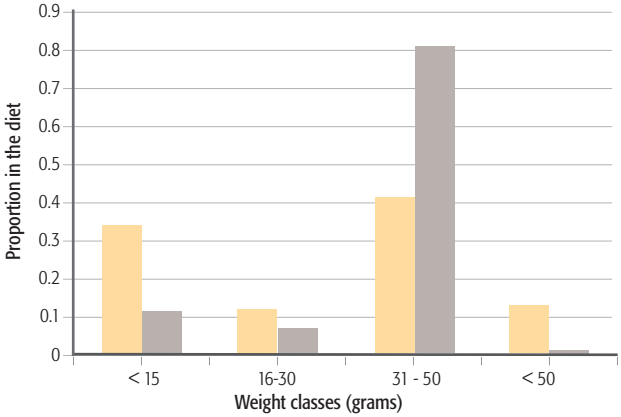


Figure 3. Proportion of prey specimens found in stomachs of Great Gray Owls collected in Finland and Minnesota and Wisconsin, USA during 1929-2005. Prey specimens are categorized into weight classes.

taking slightly larger prey and a broader variety of prey species although the differences were only statistically significant in the Minnesota and Wisconsin sample (owing to the larger sample size). Greater differences may be masked by the nature of the samples. Since we are dealing with partially digested stomach contents, we have to rely on average weights of the prey items for this analysis. For most of the prey identified there was a range of weights (*e.g.* Meadow Voles range in weight from 33 to 65 g), so there is still the possibility that males and females specialize at either end of the range.

There is some indication of a pattern like this in the shrews in both the European and North American samples. In Minnesota and Wisconsin, shrews 8 grams and less make up 15 % of the male prey items, but only 8.7% of the female diet, while the larger Short-tailed Shrew (24 g) is about equally represented in the diets of both sexes. In the Finnish sample, nearly 7% of the male prey items were shrew species weighing less than 5 grams, with only 1.1% of this size in female stomachs, but females were taking equal numbers of the larger Common Shrew. Whether smaller males can better justify the energy expended on capturing small prey, whether they may be pushed to microhabitats with reduced availability of larger prey or some other explanation needs further observation and testing.

The fact that the average weight of prey in the Minnesota and Wisconsin sample is somewhat larger than that in Finland (42 *vs.* 33 g) may simply reflect the available prey base. In studies from the western USA, average prey size was greater than in either the Minnesota and Wisconsin or Finnish samples. In Oregon, pocket gophers (*Thomomys* spp.) comprised one third of the prey items and 69% of the biomass taken by Great Gray Owls, making the average prey weight 54.4 g (Bull *et al.* 1989). Pocket gophers were an even greater component of the diet in California and Idaho, where average prey size was over 80 g (Winter 1986, Franklin 1987). These western pocket gopher specialists recently have been described as a third subspecies, *Strix nebulosa yosemitensis* (Hull *et al.* 2010).

Great Gray Owl
Ken Newcombe

The much greater niche breadth in Finland may reflect the longer duration of that study, representing samples collected over decades and including birds from years when voles were scarce and shrews were plentiful. The samples from Minnesota and Wisconsin represent a one-time irruption; all collected over one winter when Meadow Voles were abundant.

Owl diets in general are fairly well known, owing to the ease of finding regurgitated pellets from known species and analyzing prey remains in those, but usually there is no way of determining which sex produced them, so they cannot be used to address the question of sexual differences.

Snowy Owls (*Bubo scandiacus*) are one of the few owl species that can be sexed with some accuracy by plumage, making them a candidate for a field study of prey partitioning. Boxall and Lein (1982) showed that wintering female Snowy Owls in southern Alberta consumed a greater diversity of prey than males which preyed almost exclusively (85 per cent in numbers) upon North American Deer Mouse (*Peromyscus maniculatus*) and Meadow Vole (61% and 24%, respectively). By numbers, mice were also the most common prey of females (45%) and voles next (34%), but in addition they preyed upon eleven Gray Partridges (*Perdix perdix*), and four weasels (*Mustela* spp.). Three pellets from females contained remains of White-tailed Jackrabbits (*Lepus townsendii*), the largest prey taken by Snowy Owls in that study. None of the pellets from males included remains of any of these larger prey items.

The Boreal Owl (*Aegolius funereus*) is another species with high RSD, but there is very little evidence for dietary separation between sexes (Korpimäki and Hakkarainen 2012). However, in Idaho, USA, wintering female Boreal Owls captured Northern Flying Squirrels (*Glaucomys sabrinus*) more than males did (Hayward *et al.* 1993). Of twelve flying squirrels (body mass 140 g) found in prey remains, only one was captured by a male. Flying squirrels represented 45 per cent of the female prey weight. While the sample is too small to be statistically significant, it represents another example among owls where the largest prey is taken by females.

The Great Gray Owl specimens used in the current study represent a somewhat serendipitous sample, but salvaged birds such as these may provide the best avenue to address sexual dietary differences in species where internal examination is the only sure way to determine gender. Salvaged specimens can provide information for a variety of studies; the same USA sample served as the basis for a study on nutritional stress and body conditions (Graves *et al.* 2012).

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Heimo Mikkola, University of Eastern Finland, P.O.B. 1625, FIN-70211 Kuopio, Finland.
E-mail: heimomikkola@yahoo.co.uk

Risto Tornberg, University of Oulu, P.O.B. 3000, FIN-90014, Oulu, Finland.
E-mail: risto.tornberg@oulu.fi

David E. Willard, Field Museum of Natural History, 1400 S Lake Shore Drive, Chicago, Illinois 60605, United States.
E-mail: dwillard@fieldmuseum.org

Distinguished Ornithologist
Jon McCracken

Erica Dunn

Jon McCracken receiving the Distinguished Ornithologist Award at the OFO 2013 Annual Convention at Leamington on 28 September. Robert Maciver on left and Erica (Ricky) Dunn on right. *Photo: Jean Iron.*

Jon McCracken is a modest, low-key kind of person, who surely does not think of himself as a "Distinguished Ornithologist." Yet, there is scarcely a person more immersed in learning about Ontario and Canada's birds, or more deeply involved in working for their welfare. People who don't know Jon personally are nonetheless very likely to know about the programs he has helped organize and the conservation issues he has brought to the forefront of the birding and ornithological world.

After graduating from the University of Western Ontario (UWO) in 1977, Jon took on what may be a record number of biology contract positions. Over a period of 12 years, he worked on encephalitis incidence in birds, ran the banding program at Long Point Bird Observatory,

monitored paper mill effluent, studied lead-shot poisoning of waterfowl, evaluated wetland quality, examined the impact of logging on heronries and undertook a slew of floral, faunal and habitat surveys. Jon's employers included non-governmental organizations (Norfolk Field Naturalists, Long Point Bird Observatory), business and academic institutions (Eurocan Pulp and Paper, LGL Ltd., Western University [WU]) and government (Canadian Wildlife Service, Transport Canada, Ontario Ministry of Natural Resources, Ontario Ministry of Health, Grand River Conservation Authority).

While many biologists do contract work while looking for a "real" job, they often bail out of biology altogether, or go back to school if one of those doesn't come along. Jon did consider returning to university for a graduate degree, but he was a good biologist and other opportunities kept arising, and he loved what he was doing. Although he admits to having some regrets about not pursuing another degree, it's not for the reason you might think — that it might have led him on a different career path. Rather, like a true scientist, he regrets the lost learning opportunities.

Indeed, life-long learning is one of Jon's main satisfactions, and certainly one of his greatest assets. When he told me about his mentors, who included David Hussell and Michael Bradstreet at Long Point, Dave Ankney and Dave Scott at WU, and later on, Don Sutherland and Mary Gartshore, Jon noted that he learned "a ton" from these people and from many others along the way.

When many of us think of mentors, we generally consider the ones that influence us as adults, but those people and incidents that fan the early spark are equally, if not more, important. Jon spent his early years in the Prairies, where he was fascinated by flight, both of birds and airplanes. There was a cage in his backyard where, as in many Prairie homes of the era, wild birds were sometimes kept. Jon remembers that cage at various times holding a Black-billed Magpie (*Pica hudsonia*), a Northern Harrier (*Circus cyaneus*) and a Short-eared Owl (*Asio flammeus*). An older brother who liked to draw birds introduced Jon to more formal ornithology. After the family moved to Ottawa, this brother took Jon, then in Grade 3, to look at bird skins at the Museum of Nature. Jon was awed at meeting real professionals—Earl Godfrey and Stu MacDonald — and was greatly impressed. (Indeed, he suspects he was also impressed by his brother surreptitiously whacking him to curb his enthusiasm.) Another seminal experience was receiving a gift of Fred Bodworth's classic book *The Last of the Curlews*. Later, Jon was thrilled to meet and get to know the author. Many of us in the Ontario Field Ornithologists have opportunities to provide such experiences to a young person who is showing interest, and we sometimes need to remind ourselves how important a little encouragement can be.

Jon advanced steadily during his long period of contract work. Starting as an assistant, he rose to the person in charge of study design, training, project management and preparation of reports —

all skills he has used daily in the full-time positions he has held at Bird Studies Canada since 1989: first as Manager for the Migration Monitoring Program, then Ontario Programs Manager, and now National Programs Manager.

Jon's career at Bird Studies Canada, as with his earlier contract work, has been incredibly varied. He has been responsible for special surveys of loons, marsh birds, Red-shouldered Hawks (*Buteo lineatus*), nocturnal owls, certain woodpeckers, and programs such as migration monitoring, the Ontario Breeding Bird Atlas, Great Backyard Bird Count, training of Latin American biologists, and a variety of species-at-risk assessment and recovery programs. While the job at Bird Studies Canada (BSC) is more than full time, it is far from everything that Jon does. He is also a valuable member of innumerable committees, boards and panels. His curriculum vitae lists 28 committees, including many species-at-risk recovery teams, the North American Banding Council and the North American Ornithological Atlas Committee. Jon is also a subject editor for the journal *Avian Conservation and Ecology*.

Not even included in this list of 28 is perhaps the most influential group with which Jon serves, the Bird Species Specialist Subcommittee of COSEWIC (the Committee on the Status of Endangered Wildlife in Canada). As co-chair of this subcommittee, Jon shares the lead in identifying candidate species for assessment, tendering contracts for status reports of those candidates, evaluating subsequent reports and making appropriate recommendations for official COSEWIC status. The work involves many time-consuming administrative duties, and Jon gets the job done — but I suspect his most important contribution is clear-headed thinking about the kinds and quality of evidence needed to confidently assign an appropriate conservation status.

On top of his job at BSC and his committee service to the ornithological community, Jon is also a prolific writer. While he has relatively few research papers published in peer-reviewed scientific journals, his bibliography of about 160 articles is replete with technical reports, species status assessments, recovery plans, training manuals and data-rich articles that raise awareness of the informed public about bird study and avian conservation issues (including several in *Ontario Birds*). His publications not only reflect the great variety of programs and projects in which he has been involved (see sample below), but also demonstrate a most enviable facility for clear communication.

One might think that Jon's administrative responsibilities, committee work and writing would be sufficient to keep him busy, but he refuses to be cut off from doing field work. Jon is out nearly every morning during the field season, keeping in touch with the birds that his work is really about.

To summarize Jon's contributions to ornithology in Ontario and Canada, then, I would say that he is a well-rounded birder and field man, a talented administrator and designer of field programs, an excellent writer and a hands-on conservation biologist — altogether a combination that makes him more than worthy of the title of "Distinguished Ornithologist."

Jon's publications since 2010 illustrate the breadth of his writing:

McCracken, J.D. 2013. The mysterious decline of aerial insectivores. pp. 6-9 *in* M. Bull (ed.), Connecticut State of the Birds: 2013. The Seventh Habitat and the Decline of our Aerial Insectivores. Connecticut Audubon Society, Fairfield, CT. 34 pp.

McCracken, J.D., **R.A. Reid**, **R.B. Renfrew**, **B. Frei**, **J.V. Jalava**, **A. Cowie** and **A.R. Couturier**. 2013. Recovery Strategy for the Bobolink (*Dolichonyx oryzivorus*) and Eastern Meadowlark (*Sturnella magna*) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. viii + 88 pp.

Environment Canada. 2011. Recovery Strategy for the Prothonotary Warbler (*Protonotaria citrea*) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. v + 26 pp.

McCracken, J.D. 2010. Long Point Bird Observatory and Bird Studies Canada 50th Anniversary Report: Celebrating half a century of research, conservation, and education. Bird Studies Canada, Port Rowan, ON. 82 pp.

McCracken, J.D. 2010. The plight of the Prothonotary. Ontario Field Ornithologists (OFO) News 28(2):1-3.

Calvert, A.M., **J. Woodcock** and **J.D. McCracken**. 2010. Contrasting seasonal survivorship of two migratory songbirds wintering in threatened mangrove forests. Avian Conservation and Ecology 5(1): 2. [online] URL: http://www.ace-eco.org/vol5/iss1/art2/

Moore, D.J., D.V. Weseloh, **J. McCracken** and **C.A. Friis**. 2010. Forster's Terns breeding in Ontario: historical trends and recent surveys of eastern Lake St. Clair and Long Point, Lake Erie. Ontario Birds 28:2-18.

Nebel, S., **A. Mills**, **J.D. McCracken** and **P.D. Taylor**. 2010. Declines of aerial insectivores follow a geographic gradient. Avian Conservation and Ecology 5(2):1. [online] URL: http://www.aceeco.org/vol5/iss2/art1/

Ontario Barn Owl Recovery Team. 2010. Recovery strategy for the Barn Owl (*Tyto alba*) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. vi + 31 pp.

Erica Dunn
Environment Canada
National Wildlife Research Centre
Carleton University
Ottawa, Ontario K1A 0H3
Email: EricaHDunn@gmail.com

Ontario Field Ornithologists

President: Robert Maciver,
91 Alderson Dr. Cambridge, Ontario N3C 0E4
E-mail: robert.maciver@gmail.com

Ontario Field Ornithologists is an organization dedicated to the study of birdlife in Ontario. It formed in 1982 to unify the ever-growing numbers of field ornithologists (birders/birdwatchers) across the province, and to provide a forum for the exchange of ideas and information among its members. The Ontario Field Ornithologists officially oversees the activities of the Ontario Bird Records Committee (OBRC); publishes a newsletter (*OFO News*) and a journal (*Ontario Birds*); operates a bird sightings listserv (ONTBIRDS), coordinated by Mark Cranford; hosts field trips throughout Ontario; and holds an Annual Convention and Banquet in the autumn. Current information on all of its activities is on the OFO website (www.ofo.ca), coordinated by Doug Woods. Comments or questions can be directed to OFO by e-mail (ofo@ofo.ca).

All persons interested in bird study, regardless of their level of expertise, are invited to become members of the Ontario Field Ornithologists. Membership rates can be obtained from the address below. All members receive *Ontario Birds* and *OFO News*.

Please send membership enquiries to:
Ontario Field Ornithologists, PO Box 116, Station F, Toronto, Ontario M4Y 2L4.

Printing: DTP Inc., Richmond Hill, Ontario

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www.fsc.org Cert no. SW-COC-003090
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