The Ontario Great Gray Owl Irruption of 2004-2005: Mortality, Sex, Molt and Age

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Introduction

Large scale and irregular irruptions of Great Gray Owls (*Strix nebulosa*) have been reported many times in Ontario and throughout eastern North America (Nero 1980, James 1989a, Bull and Duncan 1993). These irruptions often occur during periods when northern small mammal populations are low, causing Great Gray Owls to leave their boreal forest breeding grounds in the autumn and wander south in search of food.

During the fall of 2004 and the first half of 2005, Great Gray Owls moved into southern environs in high numbers. It was undoubtedly one of the largest irruptions ever recorded. According to reports in *North American Birds* (Bannon et. al. 2005, Currie 2005, Granlund 2005, Koes and Taylor 2005), this massive influx moved into Minnesota, Wisconsin, Ontario and Quebec, with large numbers of owls being found at the edge of the boreal forest in Alberta, Saskatchewan and Manitoba also.

Within Ontario, Great Gray Owls were first documented in September in northern Ontario, and continued their southward movement, concentrating in several sites throughout southern Ontario by early 2005. The distribution and movement of the Ontario birds are detailed in the associated *Ontario Birds* article by Jones (2005). The irruption was reported on television and radio, and was written-up in several local and national newspapers. Daily reports were found on the ONTBIRDS listserv. Birders and non-birders alike were provided with the wonderful chance to observe birds in open rural sites, urban parks and even in backyards. Initial observations included attempts to sex and age the birds in the field, with many birders using the information provided by Pittaway and Iron on the Ontario Field Ornithologists' website (www.ofo.ca). An updated version is presented elsewhere in this issue (Pittaway and Iron 2005).

The irruption provided a unique opportunity to investigate the mortality, sex, molt and age of owls moving south also. Along with observations, there was considerable human contact. Owls were banded, rehabilitated, accidentally killed, mounted and prepared as specimens, resulting in valuable data being collected. This article summarizes the information collected from the following sources:

Ontario Ministry of Natural Resources (OMNR) Certificates of Reporting: Persons possessing a mount or specimen of a specially protected raptor species must obtain a Certificate of Reporting from an OMNR district office. Ministry staff kindly provided summaries of **444 Great Gray Owls** registered in the autumn of 2004 and the first half of 2005 (Table 1).

OMNR Peterborough: Lorraine Norris, Senior Fish and Wildlife Technical Specialist, obtained weight, wing chord and photographs of spread wings from **57 Great Gray Owls.** Primary coverts were also collected from most of the owls and were given to the Royal Ontario Museum (ROM) where they will be added to the permanent collections.

Taxidermists: After obtaining Certificates of Reporting, many owls were taken to taxidermists for mounting. Ken Morrison, Jim Vogel, Ron Armstrong, Jim Jackson and Rick Poulin saved carcasses or kept detailed notes on **30 Great Gray Owls** during the mounting of specimens. Unfortunately, 12 additional carcasses were destroyed during a freezer breakdown and were unavailable for analysis.

Bird banding: During the fall of 2004 and winter of 2005, Nigel Shaw (Innisfil area), Brian Ratcliff (Thunder Bay area), Myles Falconer (Perth area) and John Lemon (Sudbury area) banded **100 Great Gray Owls**. Age and sex information on the owls was generously made available to the authors.

Wild Bird Clinic, Ontario Veterinary College, University of Guelph: Dr. Katharine Welch provided data from **14 Great Gray Owl** autopsies performed at the clinic.

Wildlife Centres, Humane Societies and the Society for the Prevention of Cruelty to Animals (SPCA): Injured birds taken to animal care facilities were nursed back to health and released or, if euthanized, were returned to the nearest OMNR office. The ROM received **28 Great Gray Owls** from wildlife care facilities.

Royal Ontario Museum (ROM): With the assistance of OMNR staff and the ONTBIRDS listserv, the authors at the ROM requested any unwanted dead owls, hoping to add specimens to the ornithology permanent collections. The request was answered by numerous individuals, resulting in an additional **39 Great Gray Owls** being turned in to the OMNR or sent directly to the ROM (Figure 1). Birds were prepared as study skins, skeletons and spread wings. Tissue and feather samples were collected and have been added to the permanent collections also. Upon request, all specimens will be made available for morphometric, molecular and/or isotopic signature research.

Table 1: Area summaries of Great Gray Owls obtained from Certificates of Reporting, Ontario Ministry of Natural Resources (2005).

	2004			2005					
AREA	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**TOTAL**
Unknown location					1			1	**2**
Algoma District		5	13	5	3	3			**29**
Bruce County						1			**1**
Cochrane District	1	4	1		1			4	**11**
Durham Region				7	4	5			**16**
Frontenac County				1	3	1	1		**6**
Haliburton County					1			1	**2**
Hastings County				11	10	15	3	1	**40**
Kenora District	1	10	6	1	4	2		2	**26**
Lanark County				10	4	4			**18**
Leeds & Grenville County				2	2	3			**7**
Lennox & Addington County				2	1				**3**
Manitoulin District				1	3	1	1		**6**
Middlesex County		1							**1**
Muskoka District			1	1			2		**4**
Nipissing District				1					**1**
Northumberland County				2	2	3	1		**8**
Ottawa				9	6	1	1	1	**18**
Parry Sound District				1					**1**
Peterborough County				13	5	6	1	1	**26**
Prescott & Russell County				3		1			**4**
Rainy River District		9	13	5	1	1		2	**31**
Renfrew County			1		1	3	1		**6**
Simcoe County			1	9	13	13	4		**40**
Stormont, Dundas & Glengarry County					1				**1**
Sudbury District	1	6	6	3		4	3		**23**
Thunder Bay District	2	46	23	4	1	1	4	2	**83**
Timiskaming			1					1	**2**
Kawartha Lakes				3	4	5	2		**14**
York Region				5	5	3	1		**14**
TOTAL	**5**	**81**	**66**	**99**	**76**	**76**	**25**	**16**	**444**

MORTALITY

Certificates of Reporting

Most of the known Great Gray Owl casualties were first reported to district offices of the OMNR. Each office tracks all specially protected raptor species, determining cause of death, date of acquisition, location where the specimen was found and other associated data. Table 1 summarizes the date and area where each owl was found.

Many of the northern districts had their greatest mortality reported during November and December 2004. Birds continued to move south, with increasing mortality reported in southern counties and regions in January, February and March 2005. During the first few months of 2005, mortality in the northern districts quickly decreased, suggesting birds were leaving the north and moving south in a concentrated fashion.

In the north, mortality was greatest in Algoma, Rainy River and Thunder Bay, and may be a reflection of higher human interaction/populations in those areas. Southern Ontario mortality was highest in Hastings, Peterborough and Simcoe counties, all areas where owls had concentrated in large numbers (Jones 2005), suggesting that food resources were plentiful and starvation was not a major cause of mortality.

Figure 1: Glenn Murphy on 19 April 2005 with some of the Great Gray Owls donated to the Royal Ontario Museum by private individuals, animal welfare organizations and the OMNR. Photo by *Brian Boyle, ©ROM.*

Additional Specimens

Kay McKeever of The Owl Foundation in Vineland admitted 43 Great Gray Owls from November 2004 through June 2005. Six of the birds subsequently have been released in western Manitoba with the assistance of Jim Duncan, Biodiversity Conservation Section, Manitoba Conservation. Eight of the birds have died and 29 remain in the care of The Owl Foundation staff (Kay McKeever, pers. comm.). The Wildbird Care Centre in Ottawa admitted 23 birds, released four and had 19 succumb to their injuries. Sue Meech of the Sandy Pines Wildlife Centre in Napanee took in 16 birds. Two of the birds were sent on to The Owl Foundation, one was released and 13 died. An additional 30 owls were reported from the University of Guelph or were turned in directly to the ROM without Certificates of Reporting.

In total, there is documentation for 541 Great Gray Owls being injured (40) or killed (501) during the irruption. How many of these owls died and went unreported is impossible to determine. This is considerably more than the 51 dead birds noted during the 1983-1984 irruption (James 1989b).

In Minnesota, 750 owls were reported to have died in 2005 and an as yet undetermined number perished in Wisconsin (Granlund 2005). Jim Duncan (pers. comm.) reported lower than average numbers were killed in Manitoba in 2004-2005.

Cause of Death

There were 414 Great Gray Owls found dead along roadsides in Ontario. Many were observed in collisions with vehicles, and birds found dead on roadsides with no additional information were presumed to have met a similar fate. Six were found dead in traplines, nine died of starvation, five died in collisions with trains, two were window kills, one died from Aspergillosus, one expired from pulmonary congestion, and one was presumed electrocuted after it was found dead under a hydro line. In addition, one bird flew into a tractor, another died after it flew into a parked truck and a third owl was reported "just falling out of the sky"! Cause of death for 59 birds was undetermined.

There were no reports of owls being shot in Ontario, but the Associated Press reported four men in Minnesota had been charged with poaching over a dozen Great Gray Owls in that state.

SEX

Table 2 details the number of males and females sexed internally, using gonads, from ROM specimens and donated carcasses. Females outnumbered males almost two to one. This is consistent with findings elsewhere that suggest females tend to wander more widely while males remain more sedentary (Duncan 1987, James 1989b). Males may also have migrated later as is suggested by their higher March mortality

Table 2: Number of male and female Great Gray Owls sexed from ROM specimens and carcasses donated by taxidermists.

	2004			2005						
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Unknown	TOTAL
Females	0	2	3	17	17	10	2	0	14	65
Males	0	0	1	5	2	11	1	0	15	35

number. Results are consistent with earlier findings from Manitoba and northern Minnesota (Bull and Duncan 1993). We also found that many of the early female mortalities were second winter birds, suggesting that young females may move out of the north first.

During the preparation of specimens, individual owls were weighed and measured (Table 3). Owls were weighed with an electronic balance to the nearest gram. Six females weighing between 696 and 943 g were later determined to have died of starvation. Captive and emaciated birds were not used in the sample. Weights from all other owls were within the ranges reported by Bull and Duncan (1993), with the exception of one male that weighed 1435 g. This bird was considered an outlier, and removed from the sample. Minimum weights in both males and females of these Ontario owls were approximately 150 g higher than had been reported previously (Bull and Duncan 1993).

Unflattened wing chord, tarsus and foot pad lengths were also recorded. Wing chord measurements were similar to measurements taken in Manitoba (Duncan 1992). Foot pad length was measured from the base of the talon of the halux to the base of the talon on the middle toe. Tail length was not measured because of extensive feather wear or damage to many of the specimens (Figure 2). Measurements originally were taken to determine sex of unknown birds from banding results using a discriminant function analysis developed by Duncan (1996). However, lack of tail and foot pad

Table 3: Great Gray Owl minimum and maximum weight and measurement values obtained from birds turned in to the ROM.

	Weight (g)		Wing (mm)		Tarsus (mm)		Footpad (mm)	
	Female	Male	Female	Male	Female	Male	Female	Male
Number	47	18	37	14	37	13	30	15
Minimum	1051*	845*	400	390	46	44	59.15	58.5
Maximum	1664	1135**	455	425	57	55	72.25	63.8

* captive and emaciated birds were removed from the sample

** one male outlier weighing 1435 g was removed from the sample

measurements in owls of known and unknown sex prevented us from completing the study. Measurements were included in this article to allow for future comparisons.

Using weight and wing chord measurements from banding results and owls processed by OMNR (Lorraine Norris, pers. comm.), we estimated sex of birds using range values provided by Duncan (1992) and the minimum weight value obtained from ROM prepared specimens (Table 4). Overlapping range values between sexes does not allow for complete segregation in Great Gray Owls. Flattened wing chord measurements taken during OMNR processing were compared with values obtained by Johnsgard (1988). ROM birds were included in the table to show the amount of overlap in owls of known sex.

Measurements taken during OMNR processing and during banding programs also suggest a strong bias toward females in all areas of the province (Table 4). Very few known males weighed less than 900 g (reported minimum value of females) and we do not believe this weight accurately represents the males in our sample. Specimens prepared at the ROM showed no overlap between the sexes at weights less than 1051 g, with the exception of the emaciated females mentioned above. We believe birds weighing less than 1051 g may be designated males,

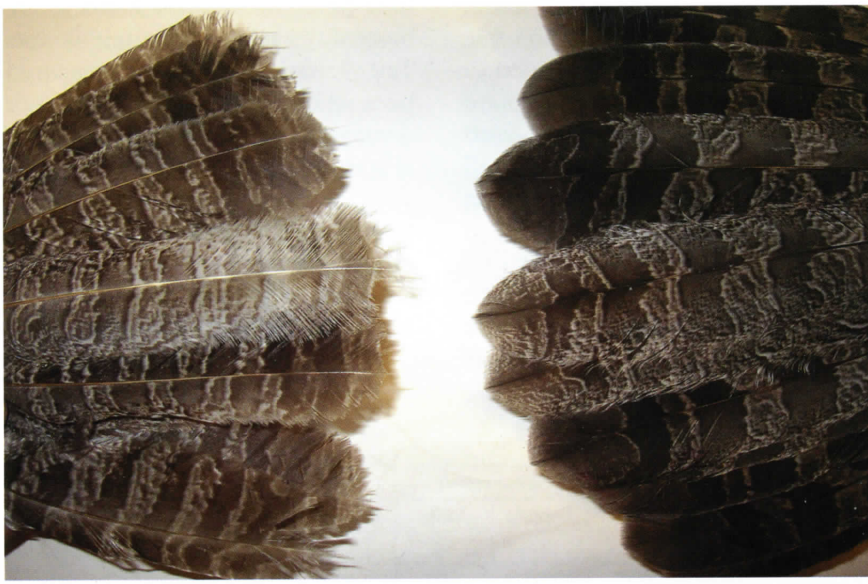

Figure 2: Great Gray Owl rectrices. The heavily worn, faded rectrices of a second winter (HY 2003) are presented on the left. The juvenile feathers have not been molted. The white tips normally seen on these feathers have been worn off. Recently grown adult rectrices are presented on the right. Photo by *Mark K. Peck, ©ROM.*

providing a more accurate representation of the male to female ratio found in Ontario.

Unflattened wing chord also appeared to underestimate male numbers. The flattened wing chords provided by Norris better represented the male to female ratios found elsewhere. Additional study is required to confirm these findings.

PREY ITEMS

Stomach contents from ROM specimens, carcasses from taxidermists and two pellets brought to the ROM were analyzed by the authors, with additional confirmation of skeletal material provided by Bill Kilburn, University of Toronto. All prey items were removed from the crop and gizzard, and cleaned of fur and tissue, both manually and using Dermestid beetles in the bug room of the ROM. Sixty-five stomachs were dissected, of which 31 were empty. Meadow Vole (*Microtus pennsylvanicus*) was the most common prey item found in 30 of the remaining 34 gizzards. Both pellets also contained Meadow Vole skulls. In addition to Meadow Voles, other prey items found in gizzards included: Star-nosed Mole (*Condylura cristata*) in four, Hairy-tailed Mole (*Parascalops breweri*) in one, Short-tailed Shrew (*Blarina brevicauda*) in five, Common Shrew (*Sorex cinereus*) in four and House Mouse (*Mus musculus*) in two. Evidence of larger prey items was not found in any of the stomachs. A search of Great Gray Owl reports in the 2004/2005 ONTBIRDS archives failed to reveal any other prey items being noted.

Granlund (2005) reported Great Gray Owls in Minnesota and Wisconsin pursuing doves, rabbits, squirrels, small dogs and cats and even a fur hat. In the Ontario irruption of 1983-1984, James (1989b) reported several larger prey items

Table 4: Weight and wing chord measurements from Great Gray Owls of known sex (ROM). Estimates of sex using banding results (Shaw, Ratcliff, Falconer and Lemon), and owls processed at OMNR (Norris). Sample size in brackets.

	Weight			Wing chord unflattened		Wing chord flattened	
	<900 g	<1051 g (ROM)	>1200 g	<391 mm	>429 mm	<430 mm	>447 mm
	male	male	female	male	female	male	female
ROM	3 (24)	17 (24)	39 (47)	1 (14)	25 (38)	NA	NA
Shaw	0 (47)	9 (47)	25 (47)	0 (47)	33 (47)	NA	NA
Ratcliff	1 (32)	11 (32)	10 (32)	0 (32)	22 (32)	NA	NA
Falconer	0 (13)	1 (13)	10 (13)	0 (13)	8 (13)	NA	NA
Lemon	0 (4)	0 (4)	3 (4)	0 (9)	7 (9)	NA	NA
Norris	1 (56)	13 (56)	33 (56)	NA	NA	7 (57)	28 (57)

also, including a possible Ermine (*Mustela erminea*), a Snowshoe Hare (*Lepus americanus*), an Eastern Cottontail (*Sylvilagus floridanus*), and a Beaver (*Castor canadensis*). Avian prey items included a domestic chicken and a Northern Goshawk (*Accipiter gentilis*).

SUBCUTANEOUS FAT

Many banded birds, carcasses and specimens were examined for subcutaneous fat. Most owls were determined to be healthy, with considerable fat deposits at the time of banding/death. Of the 55 female owls checked, three were described as having light fat, four had moderate fat and 42 were described as having heavy or extremely heavy fat. The remaining six birds had no fat, and all were reported to have died of starvation. Of the six females that died of starvation, two were from the Toronto area, two were found near Lake Simcoe and individual birds were picked up in Tobermory and Ottawa.

A similar pattern was found in male owls. Twenty-one birds were described as having heavy fat, one had moderate fat, three had light fat and one bird had no fat. Interestingly, the latter bird was found dead along the roadside, with three voles in its stomach.

ESTIMATING AGE

Internal

Museum specimens and taxidermy carcasses were aged internally by examining skull ossification, long bone ossification, and the presence or absence of the bursa of Fabricius, a small organ located near the cloaca. The bursa is grown during the nestling stage and regresses as the bird reaches maturity, usually disappearing by April following the first year in other owl species. It is commonly used for ageing museum specimens, and has been successfully used to age Great Horned Owls (*Bubo virginianus*; Weller 1965), Snowy Owls (*Bubo scandiaca*; Josephson 1980) and Ural Owls (*Strix uralensis*; Pietiainen and Kolunen 1986). Completeness of skull ossification and the ossification of long bones were checked by the authors, with a supplemental examination by Kevin Seymour, Department of Natural History, ROM. Using these criteria, no first winter birds were found in the ROM specimens. However, preparations of skeletons did allow for easy identification of starved birds. Starved owls had very little fat left in the bones, causing skeletal material to appear greaseless, pale and dry.

External

Great Gray Owls do not molt their primaries (P), secondaries (S), primary coverts (PC) or tail feathers (rectrices) during the first prebasic molt (Pyle 1997). Most juvenal feathers are easily distinguished from adult feathers by their light beige/white tips. Molt of flight feathers begins in early to late summer, follows a regular pattern, but is partial, and may take several years to complete. This incomplete molt

has been used in Europe as an effective technique for ageing Great Gray Owls (Pyle 1997). Nero and Copeland (1997) have suggested that Great Gray Owls may show an inhibited molt of flight feathers if inadequate nutrition during the summer months does not allow for the necessary energy requirements of feather replacement.

Using banding results, photographs and specimens brought in to the ROM, we examined flight feathers on Great Gray Owls to assess molt pattern and age structure. Rectrices in younger birds and roadside casualties often showed heavy wear or extensive damage (Figure 2) and were not used in our study. In field situations, heavy wear of rectrices may assist in ageing younger birds (Pittaway and Iron 2005).

First Winter (HY [Hatch Year] 2004): Juvenal flight feathers are grown in May and June and are retained during the first prebasic molt. All primaries (with the exception of P10), secondaries and rectrices are white-tipped and more heavily barred than adult feathers. The white tips on some of the feathers may be slightly worn but the feathers should still be dark and should not show much evidence of fading. Compared to adult feathers, the rectrices are narrower, more pointed and may be slightly frayed by spring of the following year. Juvenal feathers may be of slightly poorer quality and will show some wear and fading, but should still be darker than juvenal feathers grown in previous years (Jim Duncan, pers. comm.). Only one owl was confirmed as a first winter bird (Myles Falconer, pers. comm.). This owl was banded in the Perth area on 23 February 2005.

Second Winter (HY 2003): Second winter owls retained all or most of their white-tipped juvenal feathers, but the primaries, secondaries and rectrices were heavily worn. The feathers also showed heavy fading, appearing a lighter brown, when compared to adult feathers. In this age class, newly molted feathers, when found, were usually at the inner secondaries, S9 or S10 (Figure 3). Ageing of the innermost secondaries, S11-S13, often referred to as tertials in passerines, is difficult and often problematic. These feathers are different in appearance from the other secondaries, lacking the white tip, and often show less fading than other flight feathers. Darker coloration in adult feather rachis (central shaft) often provided a useful character that can be easily checked. After the innermost secondaries have been molted, the molt moves outward toward the tip of the wing. During the second winter, molted feathers do not appear to extend beyond S8.

Third Winter (HY 2002): In the third winter, supplementary molt centres are usually found at S5 and at P5 (Figure 4). Secondary molt continues to move distally from the innermost secondaries toward the

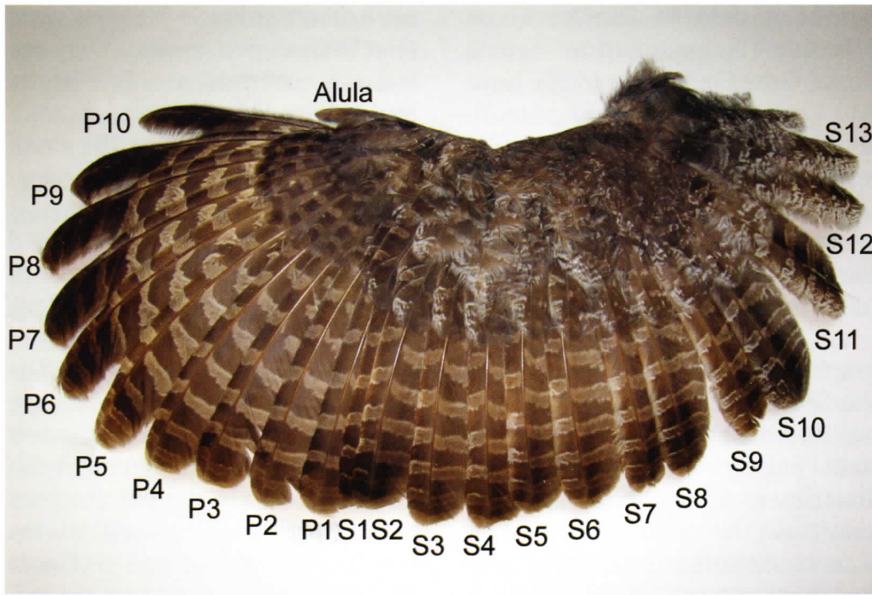

Figure 3: Spread wing of a second winter (HY 2003) Great Gray Owl showing the numbering of primaries and secondaries. P1-P10 and S1-S9 have retained their juvenal "white" tipped feathers and show considerable wear and colour fading. S10 is a newly molted feather. S11-S13 are juvenal feathers but are different in appearance, lacking the white tips, and are difficult to score accurately. Photo by *Mark K. Peck, ©ROM.*

primaries. A second secondary molt centre begins later at S5 and also moves distally toward the primaries. Primary molt is centrifugal, progressing in both directions, usually beginning at P5, but initiation at P4 and P6 was also recorded. By the end of this molt cycle, one to three primaries had been replaced. Primary coverts appear to molt prior to the primaries and are readily distinguished between adult (PC5-PC7) and juvenile plumages.

Fourth/Fifth Winter (HY 2000/2001): Many of the juvenal feathers have now been replaced with dark-tipped adult feathers (Figure 5). Pattern of molt corresponds with the details noted in third winter birds, with three to nine primaries having been replaced by autumn.

> Fourth Winter (HY earlier than 2001): All juvenal feathers have now been replaced with adult feathers (Figure 6). P5 and P6 may sometimes show fading at the tips due to wear and care must be taken to avoid confusion with juvenal feathers. The pattern of the wing molt is still evident due to the colour fading of older feathers. From the limited information we had on this age class, there is a suggestion that adult molt may not follow the same pattern

Figure 4: Spread wing of a third/fourth winter (HY 2001/2002) Great Gray Owl. New feathers are found at P5, P6, S5 and S9 – S13. Flight feather molt in young Great Gray Owls is not completed annually but does follow a regular pattern. Primary molt is centrifugal, progressing in both directions, usually beginning at P5. Secondary molt starts at the innermost secondaries and moves distally toward the primaries. A second secondary molt centre begins later at S5 and also moves distally toward the primaries. Primary coverts appear to molt prior to the primaries and are distinguishable between the adult (PC5-PC7) and juvenile plumage. Photo by *Mark K. Peck, ©ROM.*

observed in younger birds. It is possible that adults may replace specific flight feathers as they become worn rather than in a regular pattern as is seen in younger birds.

It is important to note that flight feather molt may vary considerably depending on the nutrient resources available during the molting period, confirming the findings of Nero and Copeland (1997). In years when northern small mammal numbers are low, molt may be minimal or even completely inhibited, thus increasing the difficulty of ageing birds accurately. Variation in individual fitness, sex, age and raising of young could all impact molt strategies for Great Gray Owls.

Although difficult, estimating age classes of Great Gray Owls provides valuable information on the population structure of this species and may also provide insight into northern breeding conditions. In 2004, several Ontario Breeding Bird Atlas field crews reported on the low numbers of small mammals in the north (Don Sutherland, pers. comm.; Glenn Coady, pers. comm.). According to Jim Duncan (pers.

Figure 5: Spread wing of a fourth/fifth winter (HY2000/2001) Great Gray Owl. Juvenal feathers have now been replaced at P1-P7, S5 and S7-13. Pattern of molt corresponds with the details noted in Figure 3. Photo by *Mark K. Peck, ©ROM*.

Figure 6: Spread wing of a > fourth winter Great Gray Owl. All juvenal feathers have now been replaced. The pattern of the wing molt is still evident due to the colour fading of older feathers. P8, P4-P6, P1, S1, S2, S4, and S8-S13 all appear to be recently molted, suggesting older birds may not follow the same molt pattern observed in younger birds. Photo by *Mark K. Peck, ©ROM*.

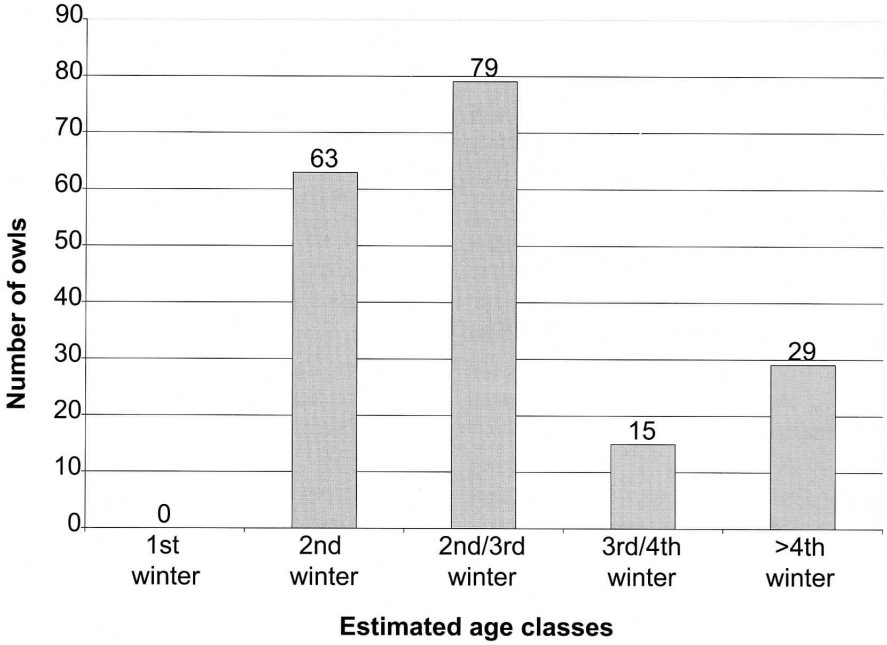

Figure 7: Great Gray Owl age class totals, estimated from wing molt.

comm.), Great Gray Owls in his Manitoba study area had little or no productivity in 2004 also. This would account for the lack of juveniles found in the 2004-2005 irruption (Figure 7) and may have been the trigger for the southward movement of the owls. Juvenile birds were not reported in Manitoba or Minnesota as far as we have been able to determine (Jim Duncan, pers. comm.; Nigel Shaw, pers. comm.).

Second and third winter birds made up the majority of the birds found in our sample. This suggests that productivity in the north was high in those two years, with many younger birds successfully surviving through to the autumn of 2004. It is unlikely that these numbers accurately reflect the age structure of all Great Gray Owls in the north of Ontario and Manitoba. Juvenile and younger age class birds wandering or moving out of suboptimal habitat is probably the usual situation during invasions and provides further evidence for food stress as the likely cause for the irruption (Duncan 1987). Older, more experienced birds, occupying optimal habitat, would be more likely to survive and stay in the north.

SUMMARY

During the Great Gray Owl irruption of 2004-2005, information on mortality, sex, molt and age was col-

lected from owls brought in to the Ontario Ministry of Natural Resources, taxidermists, bird banders, wildlife rehabilitators and the Royal Ontario Museum. There were 541 owls found dead (501) or injured (40) throughout Ontario. The majority of birds were found dead along roadsides. Other causes of death included starvation, traplines, trains, and windows. Most owls appeared healthy, with considerable subcutaneous fat deposits at the time of banding/death.

In a comparison of known sex owls, females outnumbered males, 65 to 35. Sexing of unknown owls using weight and wing chord values also pointed to a greater number of females moving south during the irruption.

Estimates of age classes were obtained using internal examinations and flight feather molt patterns. The only first winter Great Gray Owl found was banded in the Perth area, indicating poor productivity in the north in 2004. Molt patterns suggested most Great Gray Owls, 142 of 186, were second or third winter in age.

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