



**Migration Monitoring at the Rocky Point Bird Observatory:
Fall 2006**

**Jessica Murray
Rocky Point Bird Observatory
February 2007**

ABSTRACT

2006 marked the 13th monitoring season at Rocky Point Bird Observatory located on southern Vancouver Island, British Columbia. The fall migration monitoring period was conducted from July 21 to October 18, 2006. Within that period, 3068 birds of 60 species were banded. Out of the 90 day banding season 12 days were lost due to military activity or heavy rains. The five most frequently banded species were Ruby-crowned Kinglet (398), Pacific-slope Flycatcher (214), Golden-crowned Kinglet (201), Lincoln's Sparrow (174) and Wilson's Warbler (166).

1.0 INTRODUCTION

Rocky Point Bird Observatory (RPBO) is one of 23 member stations that composes the Canadian Migration Monitoring Network (CMMN) and is the only bird observatory situated on the Canadian Pacific coast. The observatory is uniquely situated on Department of National Defence land, located at the southern-most tip of Vancouver Island, British Columbia and encompasses 9km² of mixed coniferous and deciduous forests, freshwater ponds and marshes, marine tidal flats, and one of the few remaining areas of Garry oak meadow habitat in Canada. Typically, between 3000 and 4000 birds of approximately 60 species are banded at Rocky Point each year during fall migration (more than 34,000 birds of 94 species have been banded since 1994). The most commonly banded species during fall migration include Ruby-crowned Kinglet, Pacific-slope Flycatcher, Wilson's Warbler, Orange-crowned Warbler, and Lincoln's Sparrow. Over the past 13 years of monitoring, RPBO has collected data regarding the migratory habits of many passerine species, including information on arrival and departure dates, morphological features, and migration trends. This data is shared with Bird Studies Canada and the Canadian Wildlife Service in an effort towards conservation and long-term monitoring of avian species.

Since many studies have shown that neotropical migrant songbird populations have been declining over the past two decades (Robbins et al, 1989, Donovan et al. 2002, Ballard et al. 2003), the objective of banding at RPBO is to collect data on neotropical migrant songbirds utilizing southern Vancouver Island as a migration corridor and/or stopover site. This data provides a useful indicator of local bird movements at Rocky Point, and when the data is pooled with other banding stations within the CMMN, the

status of neotropical migrating songbirds and their long-term population trends can potentially be monitored at a national scale.

2.0 METHODS

2.1 BANDING PROTOCOL

In 2006, the fall banding season was conducted from July 21 to October 18. During this period, 13 mist-nets were opened 30 minutes before official sunrise each day and stayed open for a total of 6 hours. Mist-nets were located within a 500m radius of the banding shack, with five nets located in an open grass meadow with some Garry oak, while the remaining eight nets were placed throughout the Douglas fir/red alder forest (as outlined in RPBO protocol 2005). Mist-nets were nylon, 70 denier/2-ply, 2.6 x 12 meters, with 30 mm mesh, and were not opened in high winds or heavy rains, which pose a safety risk to birds caught in the nets. Nets were monitored on a regular basis, and were checked for captured birds approximately every 20 minutes. Captured birds were extracted, placed in a cloth bag, and brought to the banding shack for processing by the Bander-in-Charge (BIC), a qualified individual hired for the banding season. The BIC would first identify the bird to species, then place a federal aluminium band on one leg (stamped with a nine digit unique identification number), sex and age the bird (as per Pyle 1997), measure the wing chord, check fat storage, weigh the bird, and then release it. In general, this process took no more than 2-3 minutes per bird. If a bird captured in a mist-net was already banded (a 'recapture'), the bird was placed in a cloth bag, brought to the banding shack, and physical measurements and weight were taken. The band number of the re-captured bird was recorded and queried to bring up the capture history of the bird (date/age when first captured) and was added to the database.

2.2 ESTIMATED TOTALS (ET) AND DAILY SPECIES TOTALS (DST)

In addition to banding, a daily census and standardized count observations were conducted in order to provide a daily 'best estimate' of the number of birds of each species passing through Rocky Point. The daily census was conducted along a standardized route by a single, competent observer (outlined in RPBO protocol 2005) beginning one hour after sunrise and lasting for 90 minutes. This "window" for census is

significant as suitable light levels and high bird activity generally occurs at this time. All birds seen or heard were counted along the census route, and the observer was only permitted to use binoculars (no spotting scopes). During the census, careful observations of bird locations and movements were noted in order to not double-count any birds. The daily census targets migrant passerines and even though the census route followed the ocean shoreline closely, counting water birds were given less priority.

In addition to the standardized census, all field personnel were encouraged to record bird observations during the standard seven hour count period (six hours of banding, plus one hour field observation). Specifically, areas within the study area that were not covered by the census were checked at least once a day and a visible migration watch, mostly hawk-watch and sea-watch, of variable lengths were conducted.

The totals from banding, census, and additional observations within the standard count period were combined to form the daily Estimated Total (ET). The daily ETs attempted to estimate the number of individuals of each species that were observed that day, while taking possible overlap into account when arriving at a final estimate. Any observations made in the non-standard count period (after the seven hour standard count), were factored into the Daily Species Total (DST), which is the final tally of all species occurrence within both the standard count period and the non-standard count period for the day. For example, non-standard mist-netting, sea-watch, raptor counts, and afternoon general observations are factored into the DST, while considering possible double counts for an overall summation of the day.

3.0 RESULTS

3.0.1 FALL 2006 BANDING TOTALS

In total, 3068 individuals of 60 species¹ were banded at RPBO in fall of 2006 (Table 1).

Table 1. 2006 Fall Banding Totals for Rocky Point Bird Observatory (in order of capture abundance).

¹ Including two subspecies of Yellow-rumped Warbler (Audubon's and Myrtle), two subspecies of White-crowned Sparrow (Puget Sound and Gambel's), and one unidentified subspecies of Dark-eyed Junco.

Species	# banded	Species	# banded
Ruby-crowned Kinglet	398	Rufous Hummingbird	10
Pacific-slope Flycatcher	214	Warbling Vireo	10
Golden-crowned Kinglet	201*	Hammond's Flycatcher	8
Lincoln's Sparrow	174	Marsh Wren	8
Wilson's Warbler	166	Cedar Waxwing	7
Song Sparrow	164	Hutton's Vireo	6
Winter Wren	161	Sharp-shinned Hawk	5
Fox Sparrow	157	Downy Woodpecker	5*
Puget Sound White-crowned Sparrow	125*	Brown Creeper	4
American Goldfinch	125	Varied Thrush	4
Yellow Warbler	124	Audubon's Warbler	4
Golden-crowned Sparrow	111	Pine Siskin	4
Spotted Towhee	105	Northern Waterthrush	3
Orange-crowned Warbler	90	White-throated Sparrow	3
Willow Flycatcher	76	Gambell's White-crowned Sparrow	3
Common Yellowthroat	69	Red-shafted Flicker	2
Hermit Thrush	68	Red-breasted Nuthatch	2
Oregon Junco	67	Unidentified Yellow-rumped Warbler	2
Chestnut-backed Chickadee	53	Black-headed Grosbeak	2
Swainson's Thrush	47	Northern Pygmy Owl	1
MacGillivray's Warbler	46	Northern Saw-whet Owl	1
Savannah Sparrow	37	Hairy Woodpecker	1
Steller's Jay	28	Cassin's Vireo	1
Bewick's Wren	27	Violet-green Swallow	1
Brown-headed Cowbird	26*	N. Rough-winged Swallow	1
House Wren	19	Tennessee Warbler	1
Myrtle Warbler	19	Black-throated Gray Warbler	1
American Robin	17	Townsend's Warbler	1
Bushtit	14	Western Tanager	1
Red-winged Blackbird	12	Swamp Sparrow	1
Purple Finch	12	Unidentified Dark Eyed Junco	1
Chipping Sparrow	11	House Finch	1

* indicates new season banding high

Banding totals were lower in 2006 compared to the previous four years (Table 2). However, the number of individuals and species banded were still within expected ranges. Four days resulted in more than 100 birds being banded: 14 September (131), 19 September (102), 6 October (109), and 7 October (116). The remaining days varied

between 6 and 98 individuals captured, with a mean of 45.9 birds/day and median of 37.5 birds/day.

Table 2. Total number of birds banded and species totals from 2000-2006

	2006	2005	2004	2003	2002	2001	2000
Total banded	3068	4619	4001	3716	3153	2576	2723
Total species	60	58	57	61	56	54	57

A new highest banding record was set by four species in 2006: Golden-crowned Kinglet (201), Puget Sound White-crowned Sparrow (125), Brown-headed Cowbird (26), and Downy Woodpecker (5). A Tennessee Warbler was captured and banded on September 4th – this represents the first banding record for this species at RPBO. Several species had lower capture rates in 2006 when compared to previous years, especially when compared to 2005 (Table 3).

Table 3. The top 20 species banded at Rocky Point Bird Observatory in 2006, compared to previous years captures (years before 2000 were not compared – only 10 nets in operation)².

Species	2006	2005	2004	2003	2002	2001	2000
Ruby-crowned Kinglet	398	839	467	441	466	186	295
Pacific-sloped Flycatcher	214	319	303	317	271	188	229
Golden-crowned Kinglet	201	150	94	165	117	94	82
Lincoln's Sparrow	174	216	197	194	148	102	170
Wilson's Warbler	166	316	180	228	231	230	177
Song Sparrow	164	128	136	141	168	108	120

²

2006	3 GWCS, 1 UDEJ;	2005	6 WCSP, 1 GWCS
2004	5 WCSP, 3 GWCS, 4 UDEJ	2003	5 WCSP, 1 GWCS, 9 UDEJ
2002	5 WCSP	2001	51 WCSP
2000	43 WCSP, 3 GWCS, 1 TRFL		

Winter Wren	161	295	168	281	177	208	260
Fox Sparrow	157	191	256	231	95	70	79
Puget Sound white-crowned sparrow	125	132	108	99	91	24	10
American Goldfinch	125	111	38	56	159	147	45
Yellow Warbler	124	315	265	147	114	112	139
Golden-crowned sparrow	111	113	278	83	66	28	23
Spotted Towhee	105	121	190	124	88	69	100
Orange-crowned Warbler	90	262	271	160	150	218	130
Willow Flycatcher	76	89	56	56	47	24	23
Common Yellowthroat	69	118	96	101	74	93	58
Hermit Thrush	68	143	139	131	53	43	52
Oregon Junco	67	96	59	64	63	39	88
Chestnut-backed Chickadee	53	159	79	59	93	53	69
Swainson's Thrush	47	90	150	91	62	57	47

3.0.2 *RECAPTURES*

In total 516 birds were recaptured, many of which were banded in 2006 and were re-captured in the nets within a few days. However, some birds were banded in previous years and were captured at RPBO during their subsequent fall migration. A Swainson's Thrush originally banded as a hatch-year on July 27 2002, was captured again on August 15, 2006. A Pacific-slope Flycatcher originally banded as a hatch-year on July 24, 2001, was captured on August 1, 2006. A Chestnut-backed Chickadee originally banded as a hatch year on September 1, 2000, was captured on October 14, 2006. This chickadee has been recaptured every year between 2000 and 2006, with the exception of 2003.

3.0.3 COVERAGE

Out of the 90 day banding season, 12 days were lost due to military activity or heavy rains. August 10, September 17, 20 and October 8, 15, and 18 were lost to rain, and September 8-13 was lost to military activity. This represents the highest number of days RPBO has ever lost in a season. The lower banding totals of 2006 are probably a reflection of these lost days (especially the days in September which were not a result of weather interference).

3.1 ESTIMATED TOTALS (ET) OBSERVATIONS

A total of 183 species were observed over the fall 2006 season (Appendix 2). The following ET highlights for July and August were taken largely in part from the Bander-in Charge's weekly summaries (Gabriel David).

July 21 – 27, 2006

The 2006 fall banding season at the Rocky Point Bird Observatory was initiated with a relatively high total of 81 birds banded on July 21st; normally around fifty birds are banded during the first few days of this period. Among the most noticeable of post-breeding dispersing species was a large flock of juvenile Brown-headed Cowbirds observed near the front nets. As a result, a banding season-high (26) for cowbirds had already been attained by July 27th. A fledgling Savannah Sparrow was mist-netted on July 21st – an early record for this species. During the first week of monitoring, a substantial presence of Wilson's Warblers was observed and 51 were banded. The majority of after hatch-year Wilson's were observed in heavy moult, halfway completed the replacement of their primaries. Since young of this species begin an early pre-formative moult close to fledging, nearly all of the hatch-year warblers had appropriately changed into their fall plumage. Other banding highlights included a Hutton's Vireo, Townsend's Warbler, Black-throated Gray Warbler, and Black-headed Grosbeak.

A handful of interesting non-passerines accompanied the week's highest Daily Species Total. Most notable was a **Brown Pelican** sighted briefly in the Juan de Fuca Strait, accompanied by a feeding flock of Red-necked Phalaropes.

July 28 - August 3, 2006

A high total of American Goldfinches (125) banded during these first two weeks surpasses the previous high in 2005. The majority of goldfinches banded were hatch-years, indicating that the local population has experienced a successful breeding season. Other passerines were represented in lesser abundance; Wilson's Warbler and MacGillivray's Warbler occurred in moderate numbers. However, a significant influx of Pacific-slope Flycatchers was noted on July 30, August 1, and August 3. Many species which were previously conspicuous, such as Black-headed Grosbeak and Olive-side Flycatcher, have now dissipated with only a few stragglers remaining.

Highlights of the week included the banding of a second-year male **Western Tanager** (6th banding record for RPBO), and the first Willow Flycatcher capture for the season. A juvenile Western Wood-Pewee was observed, and is an indication that this species may have bred nearby. Woodpeckers have been seemingly more abundant this year: Downy Woodpeckers have already tied last year's banding high (5), and both a Hairy Woodpecker and a Red-shafted Flicker were banded this week.

A handful of interesting non-passerines accompanied the week's highest Daily Species Total. Most notable were two **Marbled Godwits** (the 4th record for RPBO), in addition to Peregrine Falcon, Caspian Tern and Common Nighthawk.

August 4 - 10, 2006

Raptors have begun a modest movement, with an assortment of seven species observed earlier in the week, accompanied by a maximum count of six Turkey Vultures. The first American Kestrel of the fall, a very worn and faded second-year female, perched briefly near the Artisan trailer midweek. This is the earliest record for kestrel at RPBO in at least seven years – they typically they arrive at the end of August or early September.

Weekly highs occurred for Warbling Vireo, Orange-crowned, Black-throated Gray, and Townsend's Warbler. Yellow Warblers also appeared in our nets for the first time this fall. Wilson's and MacGillivray's Warblers continue to maintain stable numbers as they pass through, although American Goldfinches sparingly surpassed Wilson's Warblers on the 7th, momentarily becoming our most commonly captured bird. **Dusky**

Flycatcher received the honours as the first rare passerine encountered this fall, as it vocalized near the banding shack early in the week. It is the 14th record for this species at RPBO. The highlight banding for the period was an unexpected juvenile Varied Thrush near the end of the week. Flycatcher diversity was also relatively high on this day: weekly highs were recorded for Western Wood-Pewee, Hammond's, and Pacific-slope Flycatcher. A recently predated **Barn Owl** was found on site on August 5th, which represents only the 7th site record for this species.

August 11 – 24, 2006

A single Steller's Jay was first recorded for the season. The first sightings of a Ruby-crowned Kinglet, as well as the first bandings of Golden-crowned Kinglet, Lincoln's Sparrow, and Fox Sparrow occurred near the end of the week. The first Cassin's Vireo of the season was captured in the nets. Raptors made a relatively strong appearance during first week, as did shorebirds, such as a Solitary Sandpiper. The early portion of the second week was also productive along the shoreline and out to sea, with **Ruddy Turnstone**, Semi-palmated Sandpiper, and a large flock of congregating Rhinoceros Auklets being observed. Gulls comprised mostly of juvenile California continued to gather off of Bentinck Island and Race Rocks, peaking near the end of the week.

Highlight bandings included a **Northern Waterthrush** and a **Northern Pygmy-Owl** (6th banding record for RPBO). In addition, a **Northern Parula** was observed which represents only the second record for this species at Rocky Point.

August 25 – 31, 2006

A gradual increase over the period was noticed for Steller's Jays (highest ET since at least 2000); as was a movement of Lincoln's Sparrows and non-resident Song Sparrows. Savannah Sparrows frequented the front nets adjacent to the grassy field, and Oregon Juncos appeared in mist-nets on the 31st. A recently fledged Chipping Sparrow was banded; this is the latest banding record for this species at RPBO since September 15, 2003.

The most commonly banded bird of the week was the Pacific-slope Flycatcher (also the most abundant species of the season, to date). Season-highs were subsequently recorded for Surf-bird, Western Sandpiper, and Least Sandpiper. The first Short-billed Dowitchers of the season were encountered on the 30th. Swifts and swallows appeared in fluxes of abundance on a few days; the most noteworthy sightings included that of the first Black Swift for the fall and a scattering of Vaux's Swifts.

September 1 – 15, 2006

Species diversity remained high; however capture rates in the nets were lower than expected during the early part of the period. Accipiters, specifically Sharp-shinned Hawks are increasing in numbers, and a flock of 450 Vaux's Swifts flew over the banding area on September 3rd. The season's third **Northern Waterthrush** was banded tying the previous banding high from 1994. A **Tennessee Warbler** was banded on September 4 – this represents the first banding record of this species for RPBO. Yellow Warblers and Song Sparrows were observed in good numbers, and the first observations of Yellow-rumped Warbler occurred during this period. Six days (Sept 8-13) were lost, as personnel were not allowed on the property due to military activity. Returning to band on the 14th resulted in the highest number of birds banded for the season (131), including the banding of the season's first Hermit Thrush. Ruby-crowned Kinglets are starting to move through in higher numbers.

Raptor migration began to intensify, with 350 Turkey Vultures observed on the 14th, plus Sharp-shinned Hawks, Cooper's Hawks, and Red-tailed Hawks.

September 16 – 30, 2006

The numbers of Hermit Thrush, Winter Wrens, and Golden-crowned Kinglets continue to increase. American Robins were beginning to move through in small flocks. Varied Thrush (25) was observed on the 19th, and Yellow Warblers were peaking with 32 banded, and an ET of 42 individuals. Hermit Thrushes are also moving through in higher numbers. Only one hour of banding occurred on September 17th due to rain, and September 20th was completely lost also due to rain. On the 22nd, the season's first **White-throated Sparrow** was banded. Yellow-rumped Warblers are increasing and an ET of 300 was observed on the 24th. Hermit and Swainson's Thrushes appeared to be

decreasing by the end of the period. The season's first **Swamp Sparrow** was banded on the 29th.

Raptor migration is increasing still, with Turkey Vultures seen in high numbers (458 observed on the 22nd), joined by two Broad-winged Hawks. An immature male Anna's Hummingbird was observed during this period, which marks the 7th site record for this species. During this period, a **Long-billed Curlew** was observed on 24th which was a new bird for the RPBO checklist (Allinson 2003). Of interest, this species was also observed earlier in the year on May 31st and June 4th.

October 1 – 18, 2006

Offshore, seabird diversity is beginning to shift. The season's first Pacific Loon and Ancient Murrelet were observed. Other alcids occurred in large numbers, with hundreds of Common Murres being observed on several days. Bonaparte's Gulls have arrived in increasing numbers, and the first Northern Shoveler was observed.

Golden-crowned Sparrows continue to increase in movement, and high numbers of Ruby-crowned Kinglets are being captured with 66 banded on the 6th. That same day a high ET of 173 Golden-crowned Kinglets were observed. October 8, 15 and 18 were lost to banding due to rain. Other notable observations include a **Lapland Longspur** that flew over the banding area, and very high observations of Pine Siskins (272 on the 11th). On the 12th, a **Western Palm Warbler** was observed on census. A MacGillivray's warbler banded on October 7th represents the latest record ever for this species at Rocky Point.

4.0 CONCLUSION

It is challenging to adequately monitor bird populations; however RPBO has collected some valuable morphometric and migratory information over the past 13 seasons. Migration monitoring does have its advantages in that it allows the monitoring of migration indices over time and can be used as an indicator of population status over a large geographical area (through statistical analysis - see **Appendix 1**). The coverage RPBO has attained through standardized banding and daily counts can contribute to the nation wide effort in providing baseline data on population trends of migratory birds.

5.0 ACKNOWLEDGEMENTS

Rocky Point Bird Observatory wishes to thank the Department of National Defence and the Environmental Science Advisory Committee for providing access to the study site and permitting us to conduct the monitoring program. RPBO would also like to thank Gabriel David (Bander-in-Charge) and Nick Bartok (Assistant-Bander-in-Charge) for their hard work through the season, and also thanks go to the many volunteers who graciously donate their time and support to the organization.

More than 110 hours: David Allinson and Ann Nightingale

70-100 hours: Suzanne Maidment and Rick Schortinghuis

50-70 hours: Megan Lyden, Mary Robichaud, Chris Saunders, and Margie Shepherd

20-50 hours: Dannie Carsen, Pierre Geoffray, Robert Hadley, Des Kawai, David Kelly, Adrian Koolman, Marilyn Lambert, Agnes Lynn, Cheryl Mackie, Barb and Mike McGrenere, Ed Pellizon, Donna Ross, Aurora Skala, Mark Travers

20 hours and under: Brent Beach, Maj Birch, Barb and Doug Collister, Nancy Fedoruk, Rob Gowan, Denise Gubersky, Chris Harris, Susan Karens, Joanne MacDonald, Christian McCarty, Erin Prescott, Robin Robinson, Jessica Sabel, Andy Stewart

6.0 LITERATURE CITED

Allinson, D. 2003. Rocky Point Bird Observatory: A Checklist of Birds. Rocky Point Bird Observatory Society, Metchosin, BC.

Ballard, G., G.R. Geupel, N. Nur and T. Gardalli. 2003. Long-term declines and decadal patterns in populations of songbirds in western North America, 1979-1999. *Condor* 105: 737-755.

Christie, K. 2004. Trends in abundance of migratory songbirds at Rocky Point Bird Observatory, Southern Vancouver Island, British Columbia. Available at: http://www.islandnet.com/~rpbo/rptrends_kc.pdf

Derbyshire, D. 2005. Field Protocol for Migration Monitoring at Rocky Point Bird Observatory. Version 1.42. Rocky Point Bird Observatory Society. Metchosin, BC. Available at <http://www.islandnet.com/~rpbo/protocol/protocol.html>

Donovan, T.M., C.J. Beardmore, D.N. Boner, J.D. Brawn, R.J. Cooper, J.A. Fitzgerald, R. Ford, S.A. Gauthreaux, T.L. George, W.C. Hunter, T.E. Martin, J. Price, K.V.>

Rosenberg, P.D. Vickery, and T.B. Wigley. 2002. Priority research needs for the conservation of neotropical migrant landbirds. *Journal of Field Ornithology* 73: 329-338.

Dunn, E. and D. Hessel. 2003. Steps for basic analysis of daily migration counts, using multiple regression. Version 6 (unpublished). Available from the Canadian Wildlife Service.

Hussell, D.J.T. and C.J. Ralph. 2005. Recommended methods for monitoring change in landbird populations by counting and capturing migrants. *North American Bird Bander* 30 (1):6-20.

Pyle, P. 1997. *Identification Guide to North American Birds. Part 1. Columbidae through Ploceidae.* Slate Creek Press. Bolinas, California.

Robbins, C.S., J.R. Sauer, R.S. Greenberg, and S. Droege. 1989. Population declines in North American birds that migrate to the neotropics. *Proceedings of the National Academy of Sciences* 86: 7658-7662.

APPENDIX 1

STATISTICAL ANALYSIS – Migration Indices

Analyses presented here are similar to those prepared by Bird Studies Canada for monitoring songbird population trends for ten migration stations across Canada (<http://www.bsc-eoc.org/national/migmain.jsp>). Rocky Point Bird Observatory could independently analyze much of their collected data and estimate the annual population indices for many species of birds over the long term, based upon a multiple regression model. Guidelines for estimating population trends/migration indices using simple statistical analysis are outlined in a step-by-step instruction guide by Dunn and Hessel (unpublished), which can be obtained through the Canadian Wildlife Service (RPBO has obtained a copy). All that is required is a spread sheet program and access to a statistical program that can perform multiple regression or ANOVA (SPSS, SAS, etc). Annual migration indices can then be used as an indicator to estimate population trends through standardized banding and estimated totals that RPBO has observed over the past 13 seasons.

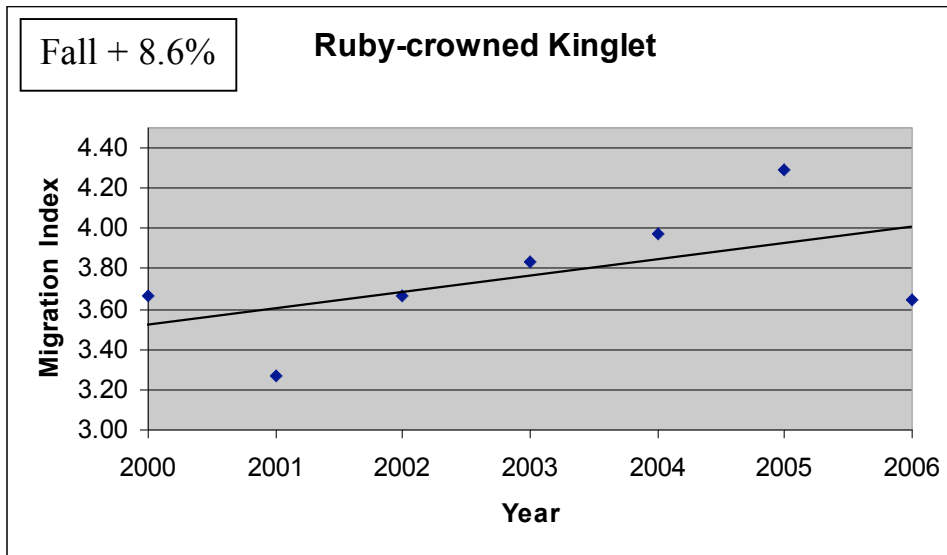
The main problem with daily migration counts and banding is that their distributions are skewed (many small counts and some very large counts). This skew in distribution is mainly due to weather and timing of migration (dates throughout the season), however the below method of multiple regression takes these variations into account and provides an estimate of annual change without being skewed by days with high (or very low) counts or captures.

Here I present an example of multiple regression analysis on data from 2000-2006 for the two most frequently banded species in 2006 at RPBO: Ruby-crowned Kinglet and Pacific-slope Flycatcher. Data before 2000 was not used in the regressions as there were fluctuations in number of nets, net hours, and standardized count periods. It should be noted that these analyses are only a rough approximation. Other factors that can contribute to fluctuations in migration indices, but were not included in this analysis are: weather (temperature, precipitation, prevailing winds, cloud cover), and migratory status (temperate versus neotropical migrants) and habitat requisites. This is simply an example of how RPBO has the resources and capabilities to do simple analyses in-house. It is recommended that if this method of statistical analysis is pursued, that RPBO should obtain site-specific weather data and incorporate that into the analysis. Other references in addition to Dunn and Hussell 2003 that can be consulted are Hussell and Ralph 1998 (migrants versus residents) and an RPBO specific analysis paper by Christie 2004.

1. Ruby-crowned Kinglet

Multiple regression on data from the past seven monitoring seasons (2000-2006) indicated that the Ruby-crowned Kinglet fall migration abundance has increased approximately 8.6% at the Rocky Point Bird Observatory.

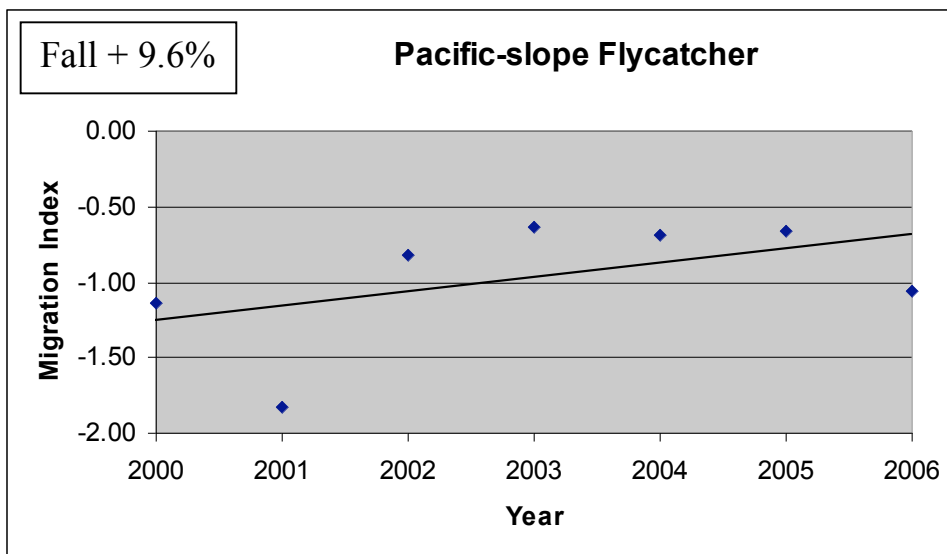
Figure 1. Index of fall migration (log captures/100 net hours) from 2000-2006 for the Ruby-crowned Kinglet at Rocky Point Bird Observatory.



2. Pacific-slope Flycatcher

Multiple regression on data from the past seven monitoring seasons (2000-2006) indicated that the Pacific-slope Flycatcher fall migration abundance has increased approximately 9.6% at the Rocky Point Bird Observatory.

Figure 1. Index of fall migration (log captures/100 net hours) from 2000-2006 for the Pacific-slope Flycatcher at Rocky Point Bird Observatory.



APPENDIX 2

Rocky Point Bird Observatory Check-list (July 2006 edition)

2006 Fall Site List (marked with an X)

DUCKS, GEESE, and SWANS

- Greater White-fronted Goose
 Emperor Goose
 Snow Goose
 Cackling Goose
 Canada Goose
 Brant
 Mute Swan
 Trumpeter Swan
 Tundra Swan
 Wood Duck
 Gadwall
 Eurasian Wigeon [sr]
 American Wigeon
 Mallard
 Blue-winged Teal
 Cinnamon Teal
 Northern Shoveler
 Northern Pintail
 Green-winged Teal
 Canvasback
 Ring-necked Duck
 Greater Scaup
 Lesser Scaup
 Harlequin Duck
 Surf Scoter
 White-winged Scoter
 Black Scoter
 Long-tailed Duck
 Bufflehead
 Common Goldeneye
 Barrow's Goldeneye
 Hooded Merganser
 Common Merganser
 Red-breasted Merganser

PHEASANT, GROUSE

- Ring-necked Pheasant
 Ruffed Grouse +
 Sooty Grouse

NEW WORLD QUAIL

- California Quail +

LOONS

- Red-throated Loon
 Pacific Loon
 Common Loon
 Yellow-billed Loon

GREBES

- Pied-billed Grebe
 Horned Grebe
 Red-necked Grebe
 Eared Grebe
 Western Grebe

ALBATROSS

- Black-footed Albatross
 Short-tailed Albatross

SHEARWATERS

- Northern Fulmar
 Pink-footed Shearwater
 Buller's Shearwater
 Sooty Shearwater
 Short-tailed Shearwater

- Manx Shearwater
 Black-vented Shearwater

STORM-PETRELS

- Fork-tailed Storm-Petrel
 Leach's Storm-Petrel

PELICANS

- Brown Pelican

CORMORANTS

- Brandt's Cormorant
 Double-crested Cormorant
 Red-faced Cormorant [sr]
 Pelagic Cormorant

BITTERN, HERONS and**ALLIES**

- Great Blue Heron
 Great Egret [sr]
 Cattle Egret [sr]
 Green Heron

NEW WORLD VULTURES

- Turkey Vulture

HAWKS AND EAGLES

- Osprey
 White-tailed Kite
 Bald Eagle
 Northern Harrier +
 Sharp-shinned Hawk +
 Cooper's Hawk +
 Northern Goshawk
 Broad-winged Hawk
 Swainson's Hawk
 Red-tailed Hawk
 Rough-legged Hawk
 Golden Eagle

FALCONS

- American Kestrel
 Merlin
 Gyrfalcon
 Peregrine Falcon
 Prairie Falcon [sr]

RAILS AND COOTS

- Virginia Rail +
 Sora +
 American Coot

CRANES

- Sandhill Crane

PLOVERS

- Black-bellied Plover
 American Golden-Plover
 Pacific Golden-Plover
 Semipalmated Plover
 Killdeer

OYSTERCATCHERS

- Black Oystercatcher

SANDPIPERS, PHALAROPES and ALLIES

- Spotted Sandpiper
 Solitary Sandpiper
 Wandering Tattler
 Greater Yellowlegs
 Lesser Yellowlegs
 Upland Sandpiper
 Whimbrel

- Long-billed Curlew

- Bar-tailed Godwit

- Marbled Godwit

- Ruddy Turnstone

- Black Turnstone

- Surfbird

- Red Knot

- Sanderling

- Semipalmated Sandpiper +

- Western Sandpiper +

- Little Stint [sr]

- Least Sandpiper

- Baird's Sandpiper

- Pectoral Sandpiper

- Rock Sandpiper

- Dunlin

- Stilt Sandpiper

- Buff-breasted Sandpiper [sr]

- Short-billed Dowitcher

- Long-billed Dowitcher

- Wilson's Snipe

- Wilson's Phalarope

- Red-necked Phalarope

- Red Phalarope

SKUAS, GULLS, TERNS

- South Polar Skua

- Pomarine Jaeger

- Parasitic Jaeger

- Long-tailed Jaeger

- Franklin's Gull

- Little Gull

- Black-headed Gull [sr]

- Bonaparte's Gull

- Heermann's Gull

- Mew Gull

- Ring-billed Gull

- California Gull

- Herring Gull

- Thayer's Gull

- Iceland Gull

- Western Gull

- Glaucous-winged Gull +

- Glaucous Gull [sr]

- Sabine's Gull

- Black-legged Kittiwake

- Caspian Tern

- Common Tern

- Arctic Tern

- Forster's Tern [sr]

ALCIDS

- Common Murre

- Pigeon Guillemot

- Marbled Murrelet

- Ancient Murrelet

- Cassin's Auklet

- Crested Auklet

- Rhinoceros Auklet

- Tufted Puffin

PIGEONS AND DOVES

- Rock Pigeon

- Band-tailed Pigeon

- White-winged Dove

- Mourning Dove

BARN OWLS

- Barn Owl

TYPICAL OWLS

- Western Screech-Owl

- Great Horned Owl

- Snowy Owl

- Northern Pygmy-Owl +

- Burrowing Owl

- Barred Owl +

- Long-eared Owl

- Short-eared Owl

- Northern Saw-whet Owl +

NIGHTJARS

- Common Nighthawk +

SWIFTS

- Black Swift

- Vaux's Swift

HUMMINGBIRDS

- Anna's Hummingbird +

- Calliope Hummingbird +

- Rufous Hummingbird +

KINGFISHERS

- Belted Kingfisher +

WOODPECKERS and ALLIES

- Lewis's Woodpecker [X]

- Red-naped Sapsucker

- Red-breasted Sapsucker +

- Downy Woodpecker +

- Hairy Woodpecker +

- Northern Flicker +

- Pileated Woodpecker +

TYRANT FLYCATCHERS

- Olive-sided Flycatcher +

- Western Wood-Pewee +

- Willow Flycatcher +

- Least Flycatcher

- Hammond's Flycatcher +

- Dusky Flycatcher +

- Pacific-slope Flycatcher +

- Eastern Phoebe [sr]

- Say's Phoebe

- Ash-throated Flycatcher

- Tropical Kingbird

- Western Kingbird +

- Eastern Kingbird

SHRIKES

- Northern Shrike +

VIREOS

- Cassin's Vireo +

- Hutton's Vireo +

- Warbling Vireo +

- Red-eyed Vireo

JAYS AND CROWS

- Steller's Jay +

- Blue Jay +

- Clark's Nutcracker

- Northwestern Crow

- Common Raven

LARKS

- Sky Lark [X]
 Horned Lark

SWALLOWS

- Purple Martin
 Tree Swallow
 Violet-green Swallow +
 Northern Rough-winged Swallow +
 Bank Swallow
 Cliff Swallow +
 Barn Swallow +

CHICKADEES

- Chestnut-backed Chickadee +

LONG-TAILED TITS

- Bushy-tit +

NUTHATCHES

- Red-breasted Nuthatch +

CREEPERS

- Brown Creeper +

WRENS

- Rock Wren
 Bewick's Wren +
 House Wren +
 Winter Wren +
 Marsh Wren +

KINGLETS

- Golden-crowned Kinglet +
 Ruby-crowned Kinglet +

GNATCATCHERS

- Blue-gray Gnatcatcher +

THRUSHES

- Western Bluebird [X]
 Mountain Bluebird
 Townsend's Solitaire
 Swainson's Thrush +
 Hermit Thrush +
 American Robin +
 Varied Thrush +

MIMIDAE

- Gray Catbird +
 Northern Mockingbird [sr]

STARLINGS

- European Starling +

WAGTAILS and PIPITS

- "yellow" wagtail sp. [sr]
 Red-throated Pipit
 American Pipit

WAXWINGS

- Cedar Waxwing +

WOOD-WARBLERS

- Tennessee Warbler [sr]
 Orange-crowned Warbler +
 Nashville Warbler +
 Northern Parula +
 Yellow Warbler +
 Yellow-rumped Warbler +
 Black-throated Gray Warbler +
 Townsend's Warbler +
 Pine Warbler [sr]

- Palm Warbler +
 Blackpoll Warbler [sr]
 Black-and-white Warbler [sr]

- American Redstart +
 Northern Waterthrush +
 Mourning Warbler +
 MacGillivray's Warbler +
 Common Yellowthroat +
 Wilson's Warbler +

TANAGERS

- Western Tanager +

EMBERIZIDS

- Spotted Towhee +
 Chipping Sparrow +
 Clay-colored Sparrow
 Vesper Sparrow [sr]
 Savannah Sparrow +
 Fox Sparrow +
 Song Sparrow +
 Lincoln's Sparrow +
 Swamp Sparrow +
 White-throated Sparrow +
 White-crowned Sparrow +
 Golden-crowned Sparrow +
 Dark-eyed Junco +
 Lapland Longspur +
 Snow Bunting

CARDINALIDS

- Rose-breasted Grosbeak +
 Black-headed Grosbeak +
 Lazuli Bunting +
 Dickcissel [sr]

BLACKBIRDS, ORIOLES

- Bobolink +
 Red-winged Blackbird +
 Western Meadowlark
 Yellow-headed Blackbird
 Rusty Blackbird
 Brewer's Blackbird
 Brown-headed Cowbird +
 Bullock's Oriole

FINCHES, CROSSBILLS

- Purple Finch +
 House Finch +
 Red Crossbill +
 White-winged Crossbill
 Common Redpoll [sr]
 Pine Siskin +
 American Goldfinch +
 Evening Grosbeak
OLD WORLD SPARROWS
 House Sparrow +

299 Species

KEY:

Highlighted species indicate a new species for the RPBO checklist in 2006

Highlighted species indicate confirmed or suspected breeding on site (or now 'X' extirpated, e.g. Sky Lark, Western Bluebird, Lewis's Woodpecker, but note vagrancy still possible).

Breeding species total - 87.

A '+' symbol indicates species banded or mist-netted (97).

Italicized indicates accidental status, with less than 10 records.

A '[sr]' symbol indicates a single observer, well-documented sight record that requires verification by photo or second observer.

Taxonomy follows the American Ornithologists' Union "Check-list of North American Birds", 7th edition, 47th supplement (July 2006).

The checklist area is defined as: the grounds of the Department of National Defence Rocky Point Ammunition Depot and the waters offshore to the international boundary, and includes Race Rocks.

I would like to acknowledge the help of many individuals in the preparation of this list. Michael Shepard, Rick Toochin, Alan MacLeod, and Daniel Derbyshire have been especially helpful with format suggestions, additions, corrections, and sighting information.

A detailed bar-graph version of this check-list is now available for \$3. Contact David Allinson at passerine@shaw.ca for more information.

Checklist Compiled by David Allinson, Rocky Point Bird Observatory, 2006.