Toronto Spring Warbler Survey

Annual Report 2007
35th Anniversary

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1 History

1.1 Short History

The Warbler Survey was established in 1970 by George Fairfield and has been carried on continuously since then with the exception of the years 1985 and 1986. In 1974, the three non-warbler species were added to the list of target birds.

Since 1970, 52 study plots have been covered at various times by 72 observers. (The high number of plots reflects in part the earlier practice of having sub-plots within what we now consider one area. What is now considered the single study plot for High Park has in the past been split into four separate study plots.) The number of plots per year has varied from 4 to 15 with an average number per year between 8 and 9. The 2000s have seen a relatively stable list of plots covered by a relatively stable group of observers. Since 2000, we have averaged between 7 and 8 study plots per year.

1.2 Accuracy Factors

Since the inception of the Survey, co-ordinators have been aware of problems that could affect the accuracy of the data collected.

1. **Protocol Variations**. The amount of observing time is not fixed. The protocol has specified for years “30 minutes to one hour” of observing time. A "visit" is therefore not well defined. Different numbers of observers will affect the number of birds seen per visit unless "visit" means one person's count for a walk through the plot. Start time is not constant from day to day nor from plot to plot. The designated path through the plot may change over time. The physical nature of the plot area changes over time as vegetation matures.
2. **Observer Bias**. Different observers have different abilities. Therefore, Identification at some sites may be more reliable than at others. An observer's physical ability to detect birds degrades over time. An observer's technical ability to detect birds improves over time.
3. **Resident Birds**. Observations cannot correct for birds remaining in an area over time during the migration.
4. **Data gaps**. Some years were not covered at all. Weather is not recorded.

Regarding Protocol Variations, we could tighten up the protocol to make it more exact and controlled. But the nature of the survey is not formal and the observers often have other concerns pressing on their time.

Observer bias is real but cannot be corrected for in a study such as ours.

Multiple counting of Resident Birds is a problem that we cannot correct for but which is minimized in many of our plots since there are few resident birds during the time the survey is in progress.

Data Gaps cannot be repaired unless someone else was collecting data during the gap periods. We will be able to get historical weather information from Pearson Airport and from Rochester that we can use to check correlations between migrating bird numbers and weather measurements.

My belief is that no field collection method is 100% sure: there will always be imperfections in the data. My hope is that the percentage error for our survey is low and that errors will be smoothed out over time.

1.3 What Are We Measuring?

Last year I gave a table summary of population trends for the birds in our sample that show rising or falling trends.

It is important to be clear that what we are measuring in the Warbler Survey is a **population sample of migrating birds passing through Toronto**. If a particular bird shows a down-sloping graph and statistical tests show that this downward slope is significant, then we are entitled to conclude that our sample is declining over time. This does not necessarily mean that we can extrapolate to the population as a whole and conclude that it is declining too.

The trend summary in last year's report suggested that many warblers are declining in numbers. Since we are dealing with a Toronto sample, we might just as easily conclude that Toronto as a whole is declining in quality as a migration stopover. However, despite undeniable changes in Toronto over time, it has never been an ideal migration stopover site. Because of this **it is my belief that changes in the Toronto populations reflect real changes, not just changes in Toronto suitability.**

What we should do is compare our sample trends with trends calculated in other areas of the province. If we get several confirmations of a trend then we may be able to conclude that the population as a whole is changing. This is topic for further research in subsequent reports.

2 This Year

2.1 Data Computerized

The summary data for 1982, which was missing, has been recovered and the data is entered into the computer.

The Access database currently has 39,519 records: 864 records for each year comprising a record for each of the 24 birds (21 Warblers and 3 additional species) for each of the 36 days for each of 36 years. This is summary data combining information from all Toronto sites for the year.

2.2 Season Summary

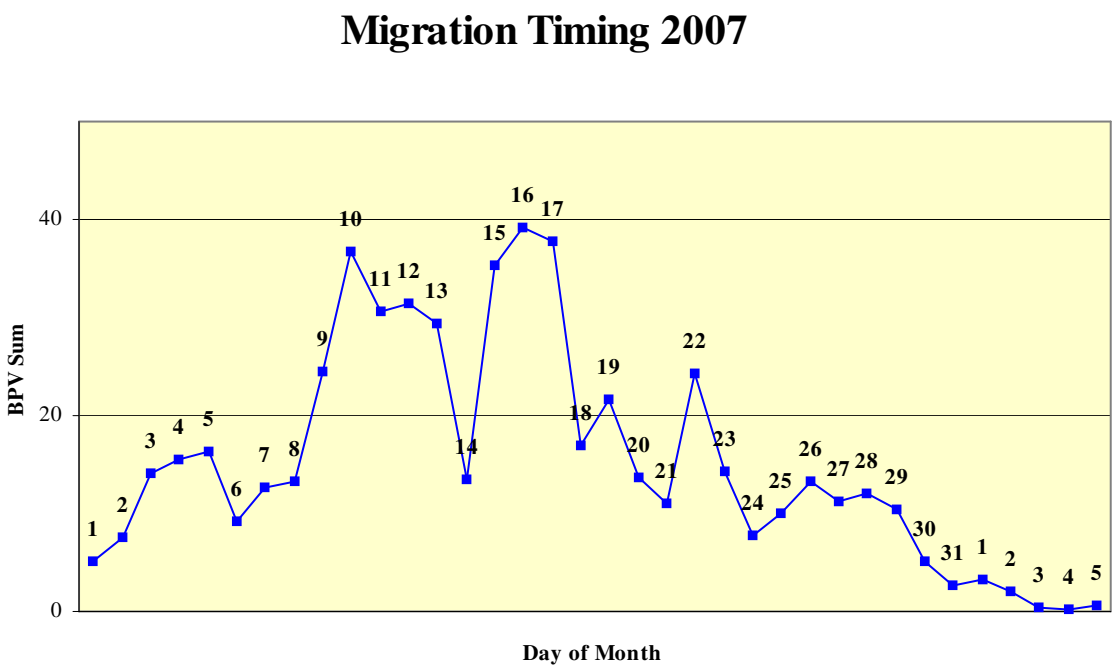
Site and visit information for 2007 is summarized in the following table. Sites and observers are listed alphabetically by first name.

Site	Visits	Observers
Brookbank Ravine	32	Jean Iron, Naish McHugh, Bruce Park, Ron Pittaway
Cedarvale Ravine	30	Mike Solomon
High Park	36	Don Barnett, Steven Favier
Mount Pleasant Cemetery	26	Attila Fust
Unwin Avenue	36	Bob Kortright, Tom Flinn, Don Peuramaki
Wychwood Park	35	Hugh Currie, Herb Elliott, Jess MacKenzie

Many thanks to the observers who collected data for us for the 2007 season. Each visit means that one or more observers (typically one only) spent an hour in the morning traversing a set study plot counting the birds seen and heard. Visits are made from May 1 through June 5.

2.2.1 Migration Timing

Migration Timing is a plot of the sum of the Birds Per Visit (BPV) values[1] from all sites for the year for each day of the survey period.



The number above each point shows the day of the month. The scale on the left shows the value of the BPV sum [2]. The peak day was May 16 when all Toronto sites combined had a value slightly under 40. This year there were 2 noticeable peak periods during the migration.

[1] BPV is Birds Per Visit averaged over all Toronto sites. If 3 sites reported a total of 18 Yellow Warblers on a day the BPV for Yellow Warblers for that day is 6.0.

[2] BPV Sum is all BPV values for all birds for the day added together.

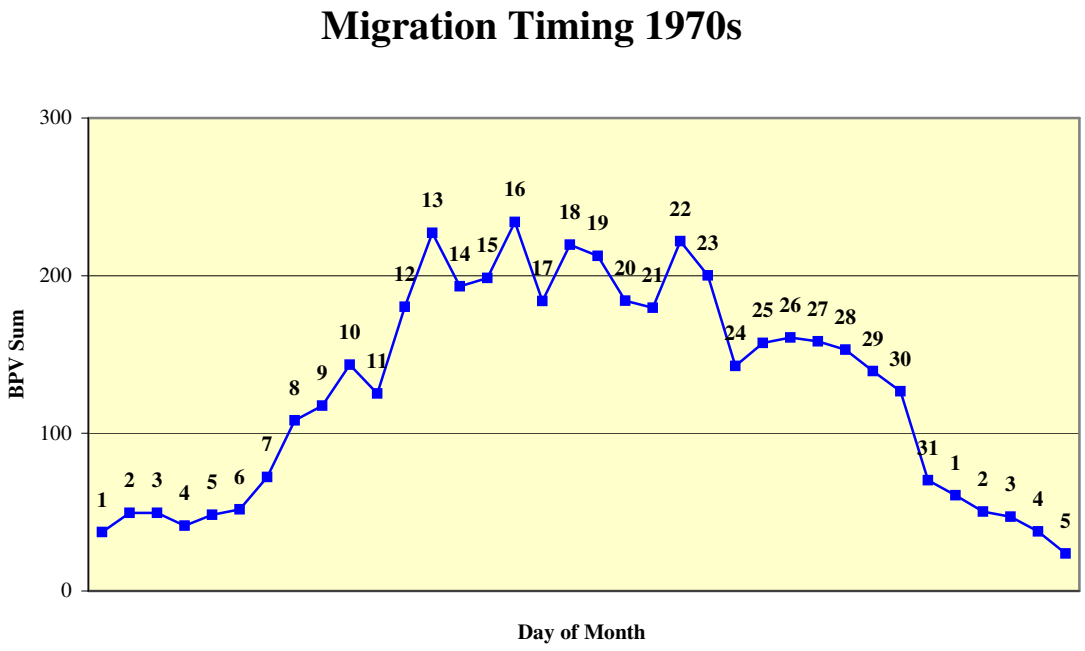
3 Trends

Because this is an anniversary report, I am including information about the various measures over the lifetime of the project.

3.1 Migration Timing

3.1.1 Decade of the 1970s

For the decade of the 1970s migration timing looked like this.

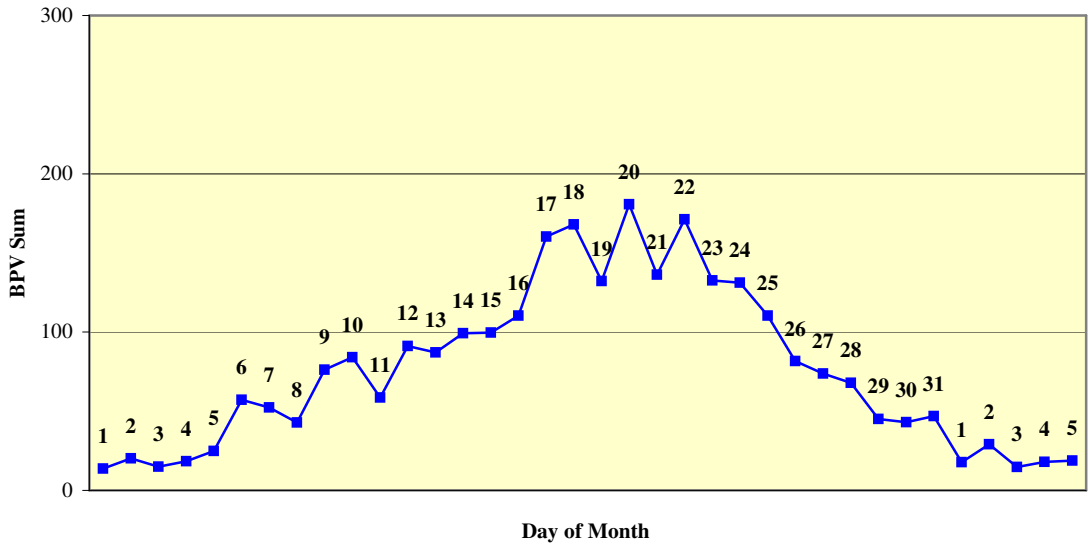


This timing pattern is perhaps the one we most expect to see, with the migration ramping up in the first week of May and tailing off in June, with the bulk of the birds passing through in the middle of May.

3.1.2 Decade of the 1980s

For the decade of the 1980s this was the timing pattern.

Migration Timing 1980 - 1989

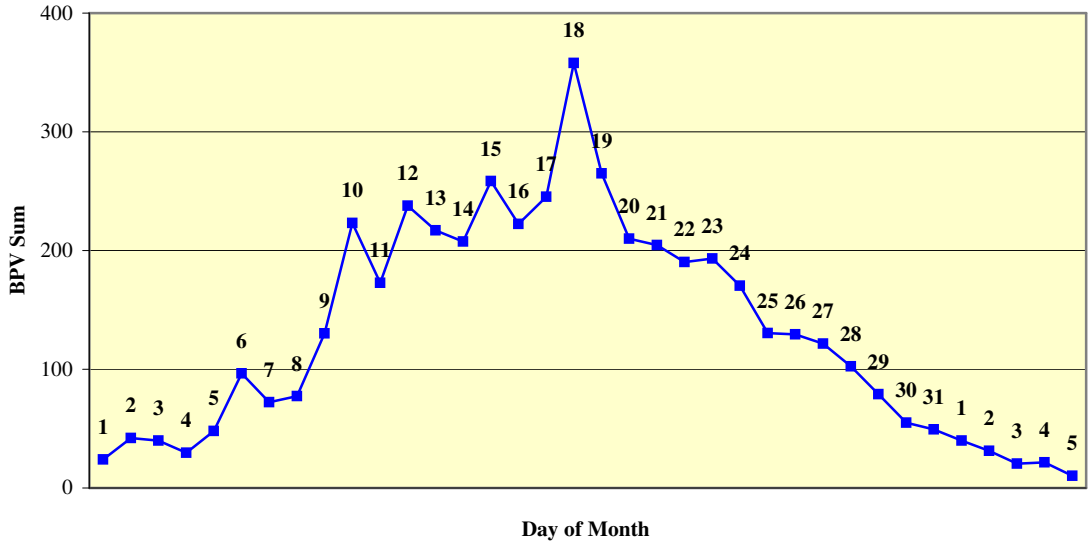


This pattern is similar to the decade before but with noticeably fewer birds and a peak period shifted toward the third week of May. The reduced number of birds may be entirely due to the missing data for 1985 and 1986.

3.1.3 Decade of the 1990s

The decade of the 1990s saw this timing pattern.

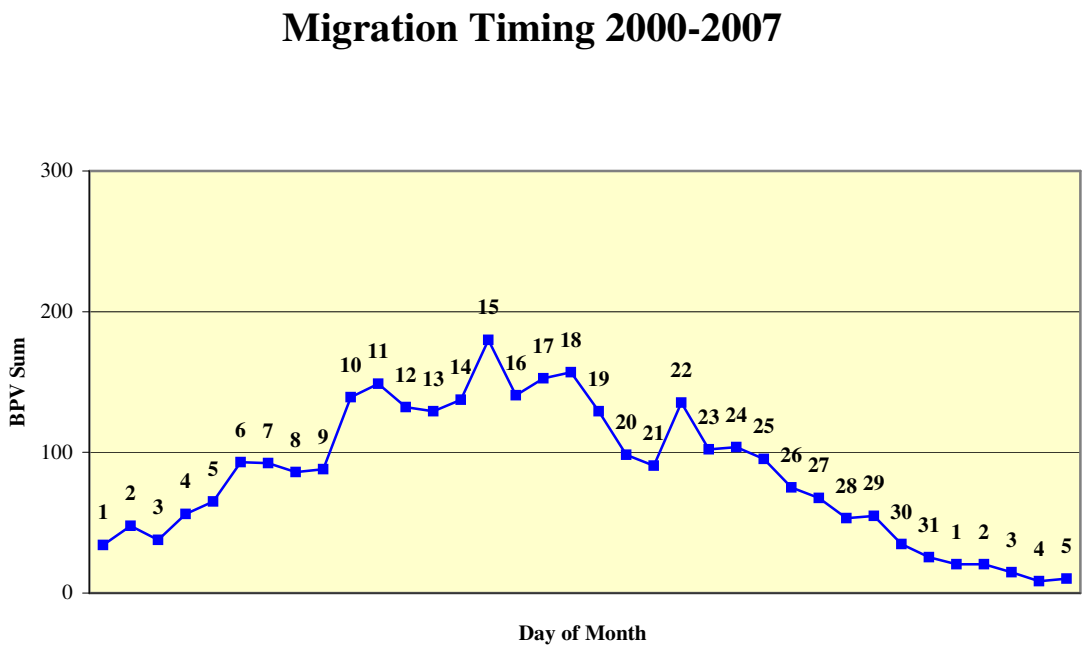
Migration Timing 1990 - 1999



This decade saw the largest number of birds passing through the study area and its peak in the third week of May still dominates the overall picture.

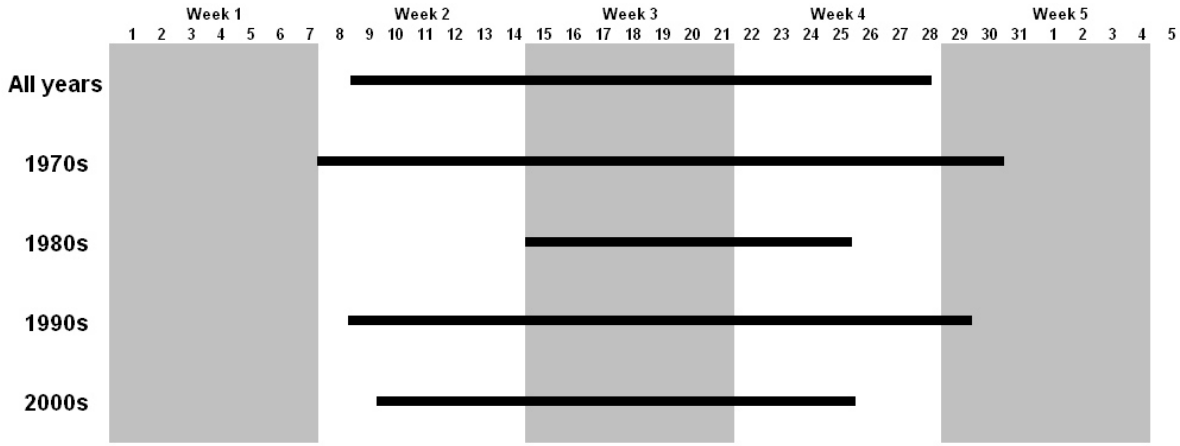
3.1.4 Decade of the 2000s

Since the beginning of the 2000s the pattern now looks like this.



As in the 1980s, the 2000s show a reduced number of birds with the expected peak in mid-May. The reduced number of birds is almost certainly due to the missing three years.

3.1.5 Decade Comparison



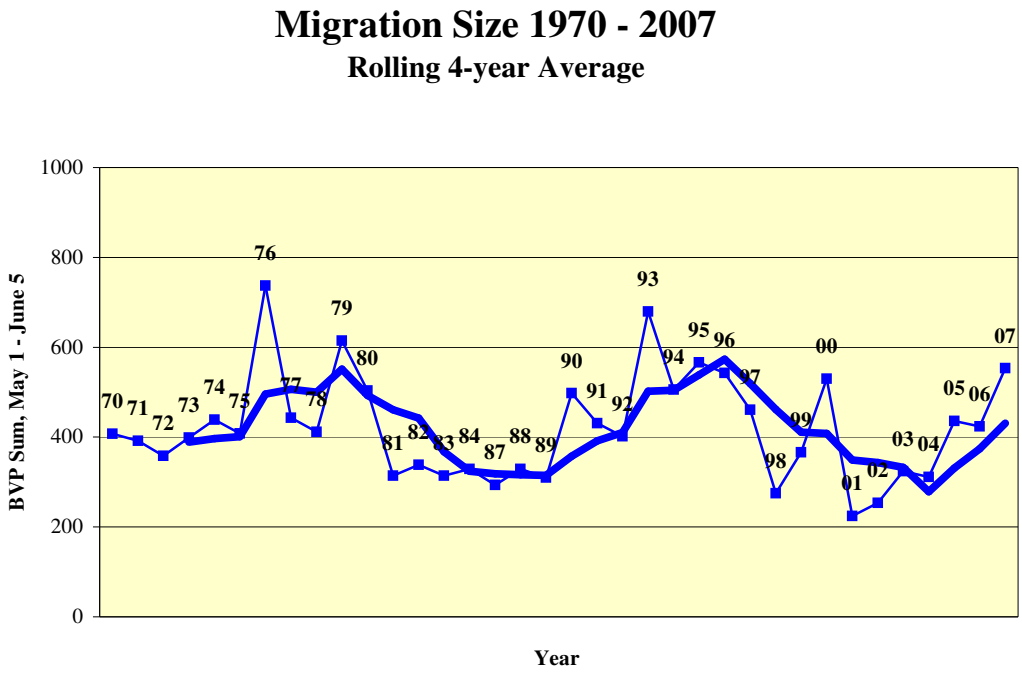
(The dark lines mark days in which the total BPV exceeded 100 birds.) This graph immediately shows that **migration timing is not being pushed earlier due to a factor such as global warming.**

3.2 Migration Size

Migration size is the sum of all the BPV values for all birds for every day[3]. It is a single number standing for "how many birds were observed this year".

3.2.1 Migration Size

For 2007, the **migration size is 553, an increase** over last year.



The migration size for 2007 continues the pattern we noted in last year's report.

(The rolling average takes the average of the first four years 70,71,72,73 as its first value (shown as the value for 73), then it drops 70 and adds 74 so that its next value is the average of the four years 71,72,73,74 (shown as the value for 74) and so on.)

The dark line is the rolling 4-year average line. As we noted last year the distance from the first high point (79) to the next high point (96) is 17 years; the distance from the first low point (87) to the next low point (04) is 17 years. The addition of a data point for 1982 makes the low point in the late 80's hard to fix. So we are

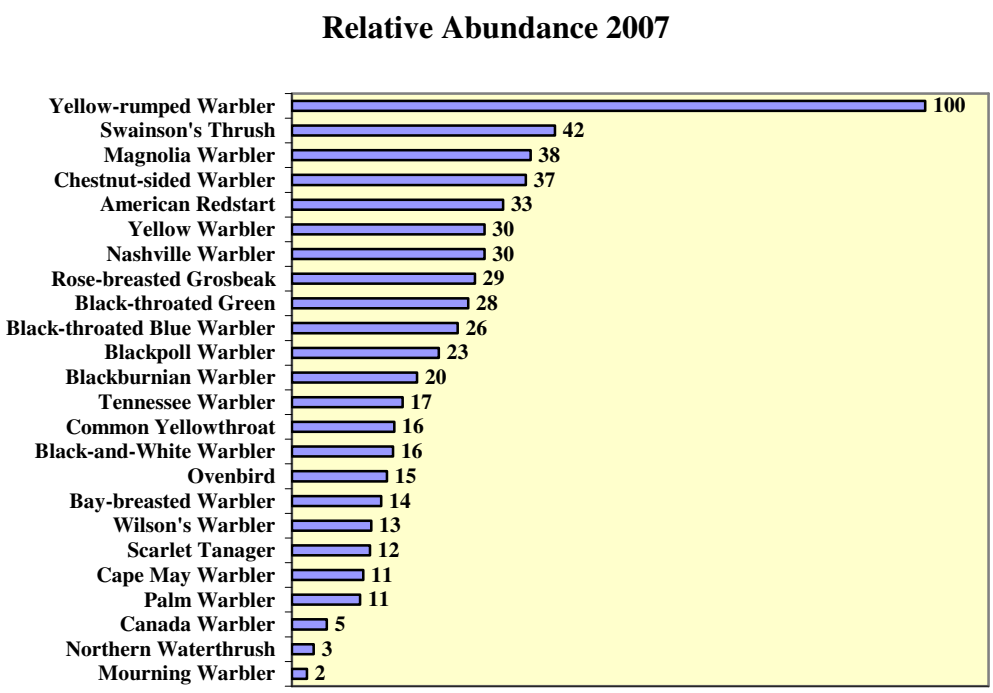
[3] Details of the calculation are available on request.

forced, of course, to merely pose the question again, **is there a 17-year cycle in the migration size?**

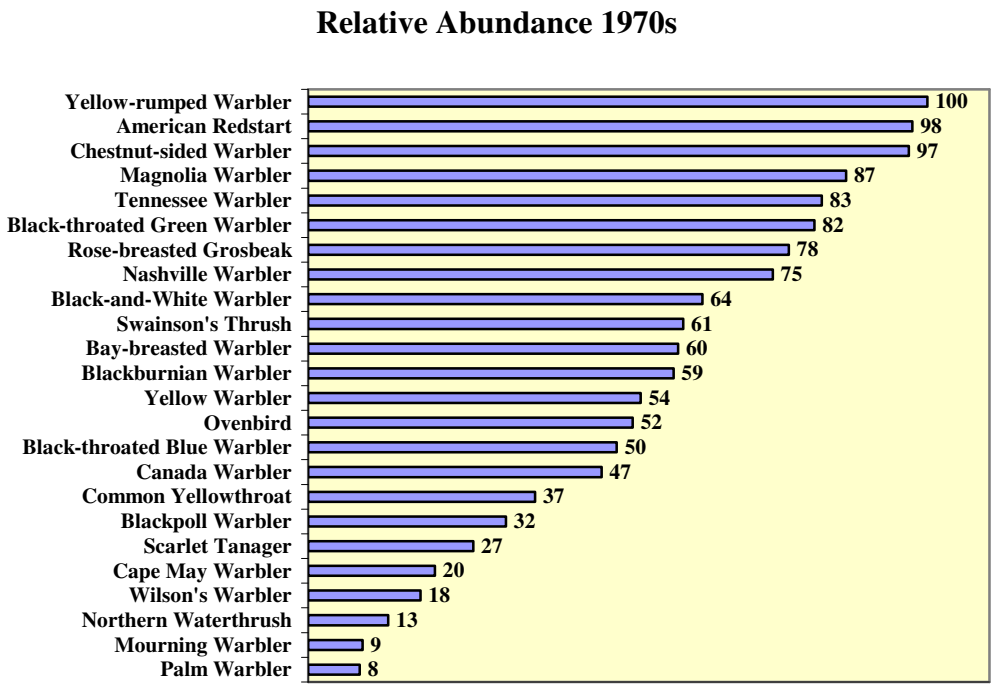
3.3 Relative Abundance

Relative Abundance is the ranking of birds in order from highest to lowest BPV sum where the highest-ranking bird is assigned the arbitrary value 100 and all other birds assigned values proportionally.

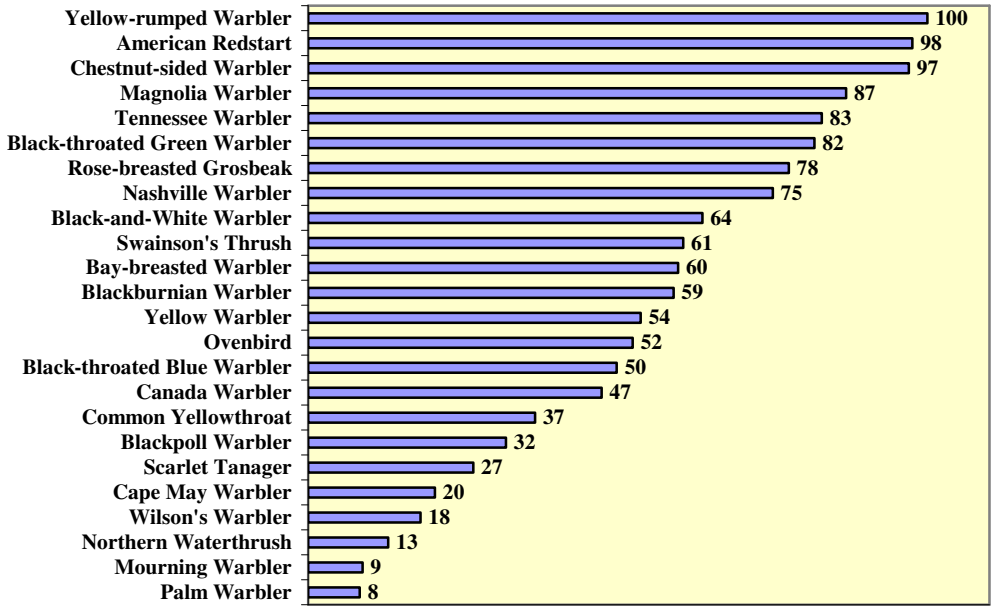
3.3.1 Current Year



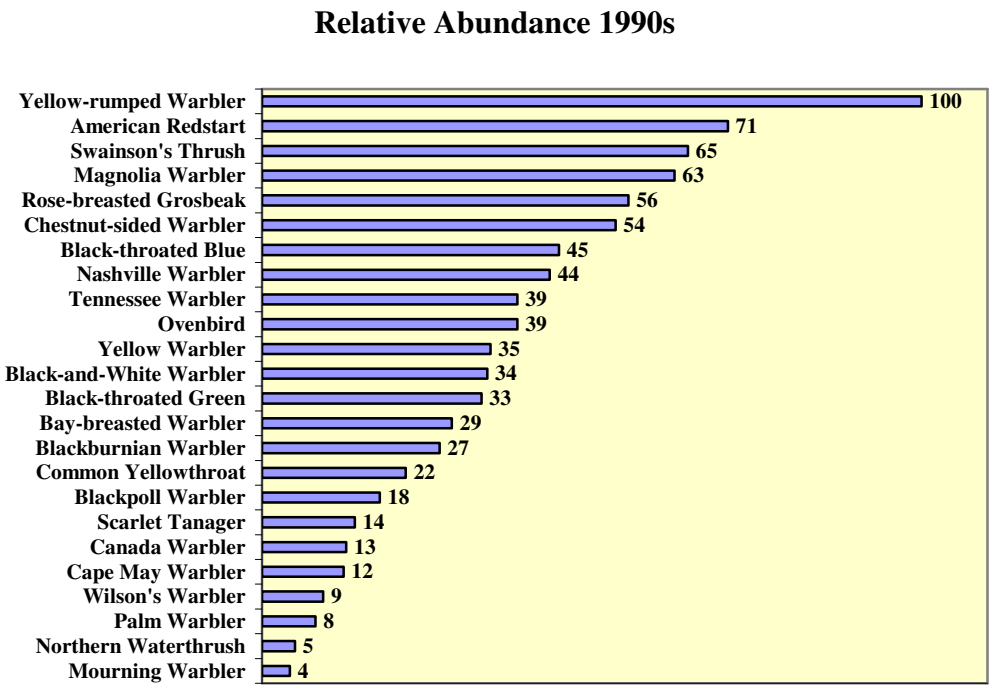
3.3.2 Decade of the 1970s



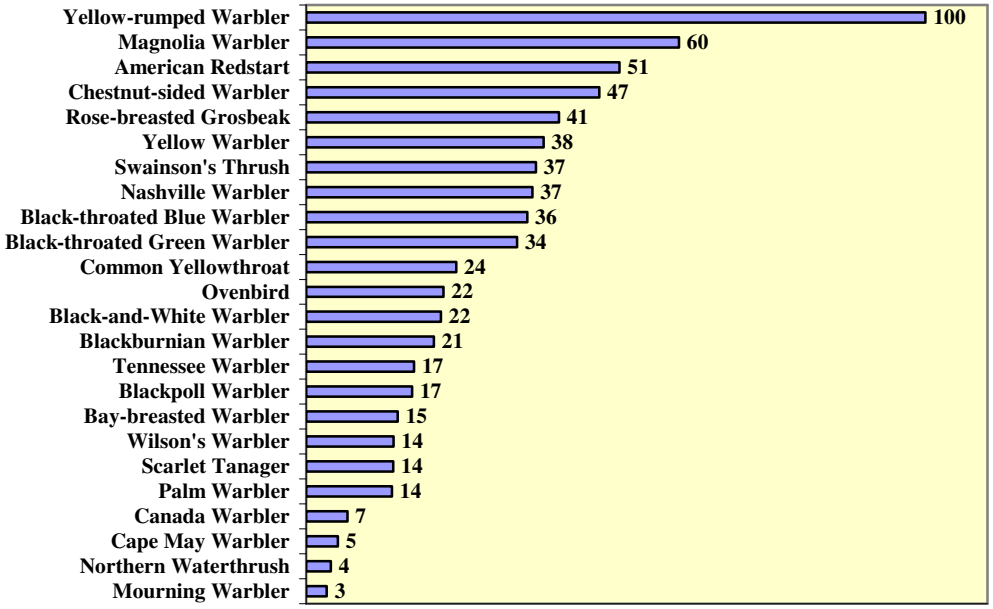
3.3.3 Decade of the 1980s



3.3.4 Decade of the 1990s



3.3.5 Decade of the 2000s



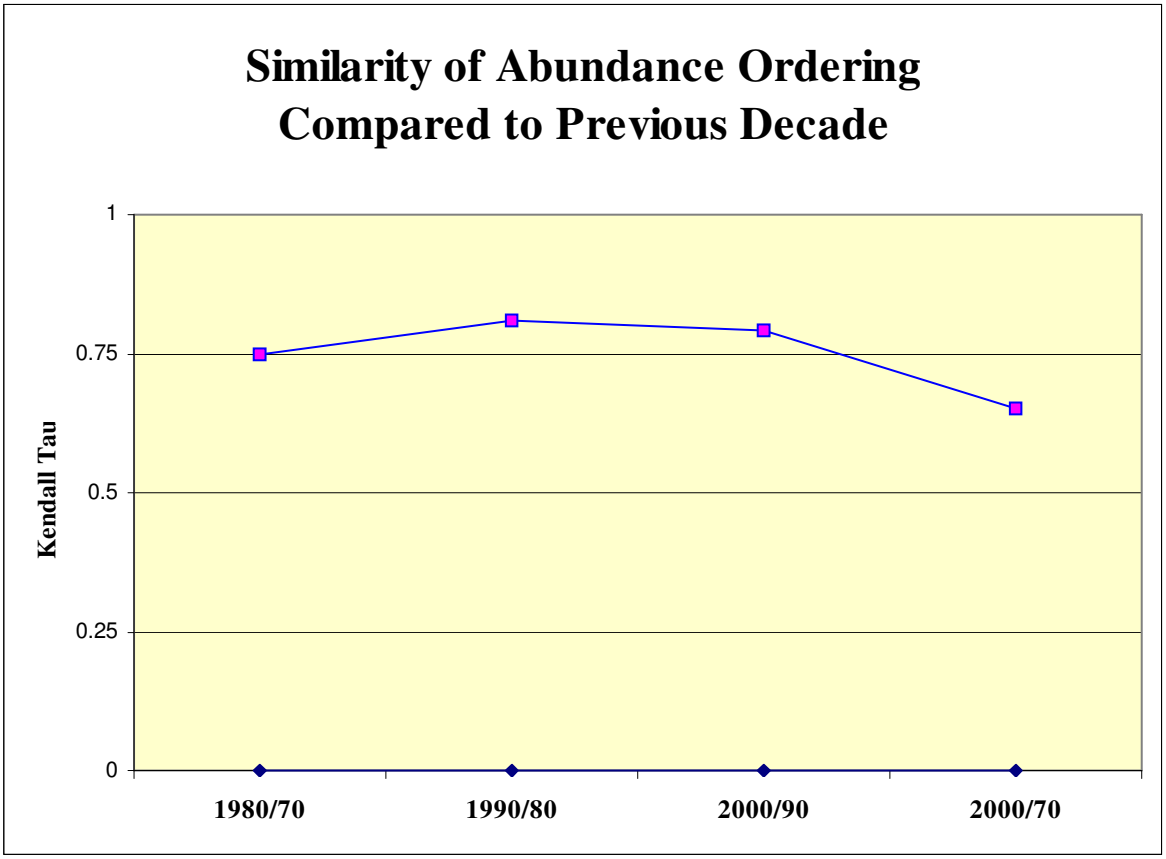
As we noted last year, the relative population of birds is changing over time. That is, **Relative Abundance has changed dramatically over the decades starting in the 1990s.**

3.4 Abundance Ordering

A new measure I am calling Abundance Ordering means simply the listing order of the birds in terms of how common they are. For the duration of the survey, the Yellow-rumped Warbler has been the most common warbler seen. The Mourning Warbler, Palm Warbler and Northern Waterthrush have exchanged places over the years as the least common bird.

Has the abundance ordering of birds changed significantly over the years? To answer this question I am using a statistic called Kendall's Rank Correlation. This gives a number (called Tau) between –1 and 1. If two lists are in exactly the same order from top to bottom, then Kendall Tau is 1; if one list is exactly the reverse order of the other, then Kendall Tau is –1.

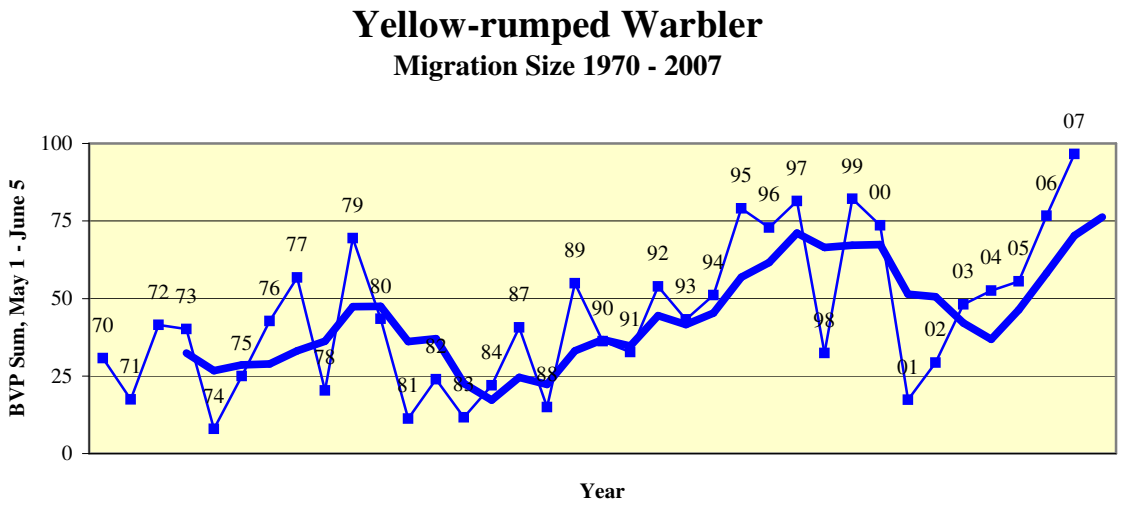
Using the Relative Abundance graphs above for each of the 4 decades, I compared the ordering of the birds between consecutive decades and then between the 1970s and the 2000s. The results are graphed below.



In the graph above, "1980/70" means the 1980 list order compared to the 1970 list order. All of the Tau values are high, meaning that **the ordering of the birds has not changed significantly since the 1970s.**

3.4.1 Individual 17-year Cycles

A question posed last year was “do individual birds show a 17-year cycle in numbers?” Taking our most populous bird and applying the same 4-year Rolling Average Trend line produces the following graph.



While the distance between the highs (80 to 97) is 17 years, the distance between the lows (84-04) is 20 years. **This is an inconclusive result**.

3.5 Further Plans

Here are some ideas and questions that I am considering for next year.

Migration Timing

- Correlate migration timing to temperature, wind speed and direction and precipitation.
- Does migration timing for individual birds change over time?
- Create a timing graph for all birds.

Migration Size

- Do other Ontario sites show a cycle over time?
- Is migration size related to weather?

Relative Bird Abundance

- How do our graphs compare with Ontario sites?

Population Trends

- Does comparison of our results with other Ontario sites allow determination of whether the downward trends are population changes or changes in Toronto suitability?
- Do rolling 4-year averages show cycles for individual birds other than the Yellow-rumped warbler?

General

- Update information on the TOC web site showing graphs and statistics.
- Do patterns emerge if we group the birds into breeding eco-zones?
- Describe all statistical tests for inclusion as an appendix to reports.

Finally, I would like to thank again all the observers who participated in gathering this year's Warbler Survey data. Without your tireless efforts we would have no data to work with. Special thanks to Barry Kent MacKay for the Title Page Canada Warbler illustration and to Glenn Coady for suggesting improvements to an earlier draft.

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