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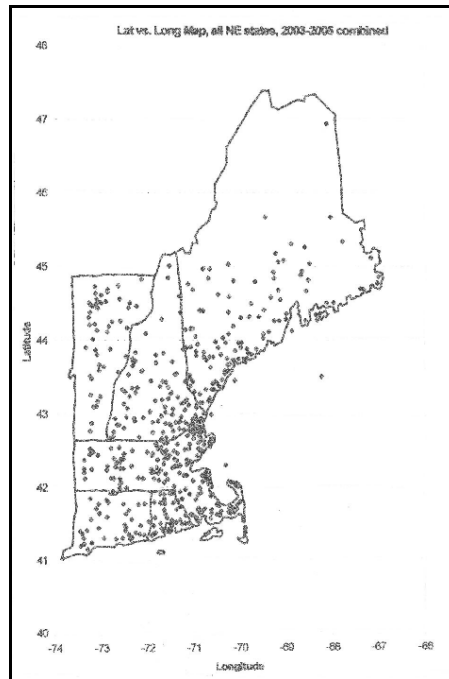
ARRIVAL OF RUBY-THROATED HUMMINGBIRDS IN NEW ENGLAND, 2003-2005

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This report presents some results from New England Hummers' study of Ruby-throat spring arrivals in our region during 2003-2005. (For a fuller description of this citizen science project, see the website www.nehummers.com.) The report presents a method of identifying an "average arrival date" for this species, which is important for comparison with such phenomena as floral phenology and weather variables, and also demonstrates daily variations in number of arrivals. It utilizes scatterplots to give a picture of the migration movement across latitudes. These analyses are presented for the New England region as a whole, but are planned for particular states as well.

Arrival in New England

For many purposes it is important to know an "average arrival date" for a species. The charts in this article show the modal, or most frequently reported, arrival date for each year for this sample. Charts 1A, 1B and 1C below present reports of "First Sightings" of Ruby-throats in New England states by date, for 2003, 2004 and 2005. These and all charts presented here were prepared with the advice and technical assistance of Lynette Leka, using Excel and Systat software. For the most part, the data consist of sightings at observers' yards and feeders, although the first reports from some popular and well-monitored field sites, such as Parker River National Wildlife Refuge in Massachusetts, are included. The approximate locations from which the sightings come can be seen in Map 1, which establishes that geographical coverage of the whole of New England is good. The scarcity of reports from extreme northern New England is probably due to there being fewer people, rather than fewer birds, in those areas. In general, among the states, Maine is underrepresented in these data in comparison to its geographical size, and Massachusetts is overrepresented.



Map 1

The charts build up a picture of the arrival from a series of “first bird reports.” The data may not be a fully representative sample of all of the arrivals, because after reading a few early reports, some people might decide not to report their own first sighting. The reports from New England Hummers site monitors do not have this disadvantage; they report their first yard sighting regardless of whether there have been other reports from the area. In the charts these site monitor reports are combined with an approximately equal number of first sighting reports from state-wide birding listserves, birding journals, and websites. Thus the charts give a good representation of the arrival dates of the very earliest migrants--- the “leading edge” of the migration--- but probably underestimate the numbers of later arrivals.

From a study like this it is difficult to show when the migration “ends.” Older bird reports sometimes mention an approximate “general arrival date,” or date by which arrival can be said to be “general” throughout an area. However, like other birds hummingbirds may move around quite a bit in a breeding area after they stop traveling northward, and a site observer can not really know if a new bird has arrived from points south or just from next door. It is generally thought that the hummingbird migration is complete by the end of May, and our “first bird” reports end about then, although there are a few reports, usually of “first females,” into June.

The four sources for the data are (1) reports to New England Hummers; (2) all first and some early sightings reported on the five state-wide birding listserves: RIBirds, MassBird, NH.birds, VTBird, and Maine-Birds; (3) reports mapped by Lanny Chambers on his www.hummingbirds.net website; and (4) early reports from *Field Notes of Rhode Island Birds* [FNRIB], *Bird Observer* [BO], and *New Hampshire Bird Records* [NHBR].

There were no major changes in the data collection methods or publicity for the study between the three years, except that 2003 was the start-up year of the study and more interest may have been generated at that time. Every effort was made to record only “first” sightings at a particular spot; sightings were eliminated if they were “early” but not “the first” from that location. The total number of reports each year fluctuated: in 2003 there were 393 reports with 449 birds; 2004 had 237 reports with 265 birds; and 2005 had 282 reports with 298 birds. This is a large enough sample size to attempt some meaningful statistical correlations with other variables.

Do the totals also indicate some bird population fluctuation, with 2003 being an especially good year, and 2004 being a low year? Probably not. “First bird” reports would not be a very precise measure of the whole arriving population, because the wide area covered means that a bird first counted making landfall in Connecticut might also be counted later as a first bird in New Hampshire. In addition, the number and location of the reporters in this sample varied from year to year.

The charts show that the modal or peak arrival date fluctuated from year to year, and was notably late in 2005. In 2003 the peak day came on Friday, May 2, with 48 birds reported; in 2004 it came on Saturday, May 1, with 26 birds reported; and in 2005 it did not happen until Wednesday, May 11, with 33 birds reported. Modal arrival dates for Massachusetts alone were May 2, May 1, and May 10 for 2003, 2004, and 2005 respectively. Separate charts (not shown here) for female Ruby-throats demonstrate their pattern of later arrival. In 2003 the peak arrival date for females came on May 13, eleven days later than the peak for the group as a whole. In 2004, the female peak was again 10-11 days later, on May 11 and 12, but in 2005 it was only a day later than the peak for the group, on May 12, probably because in that year earlier-arriving males had been held up by poor weather.

Chart 1A

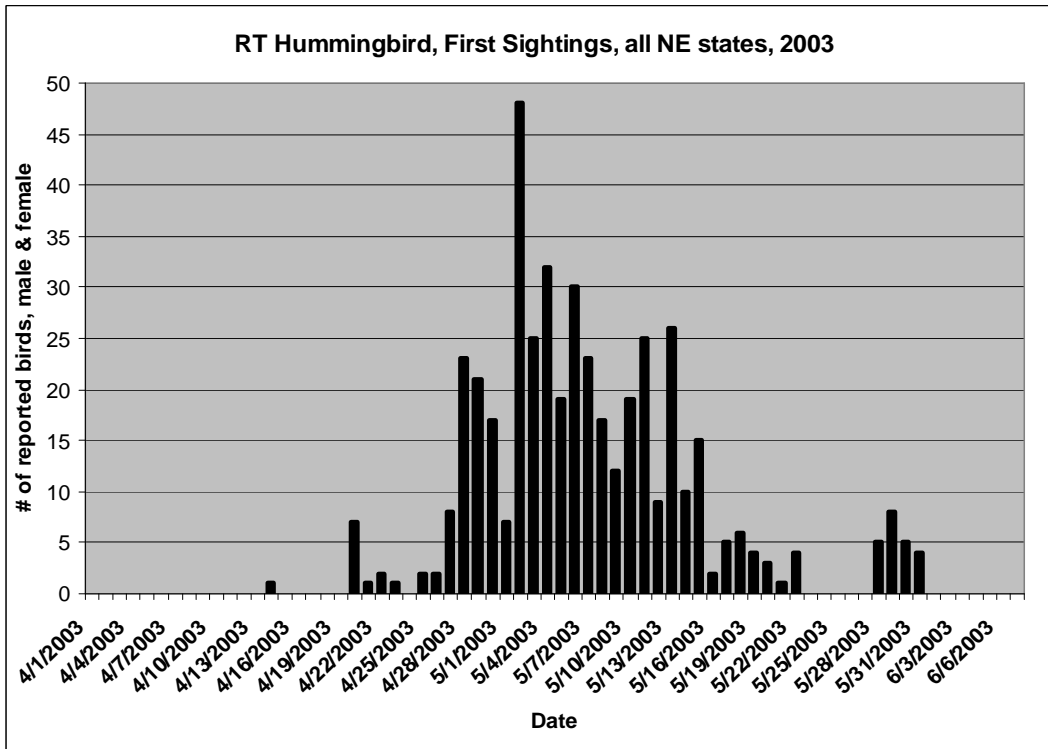


Chart 1B

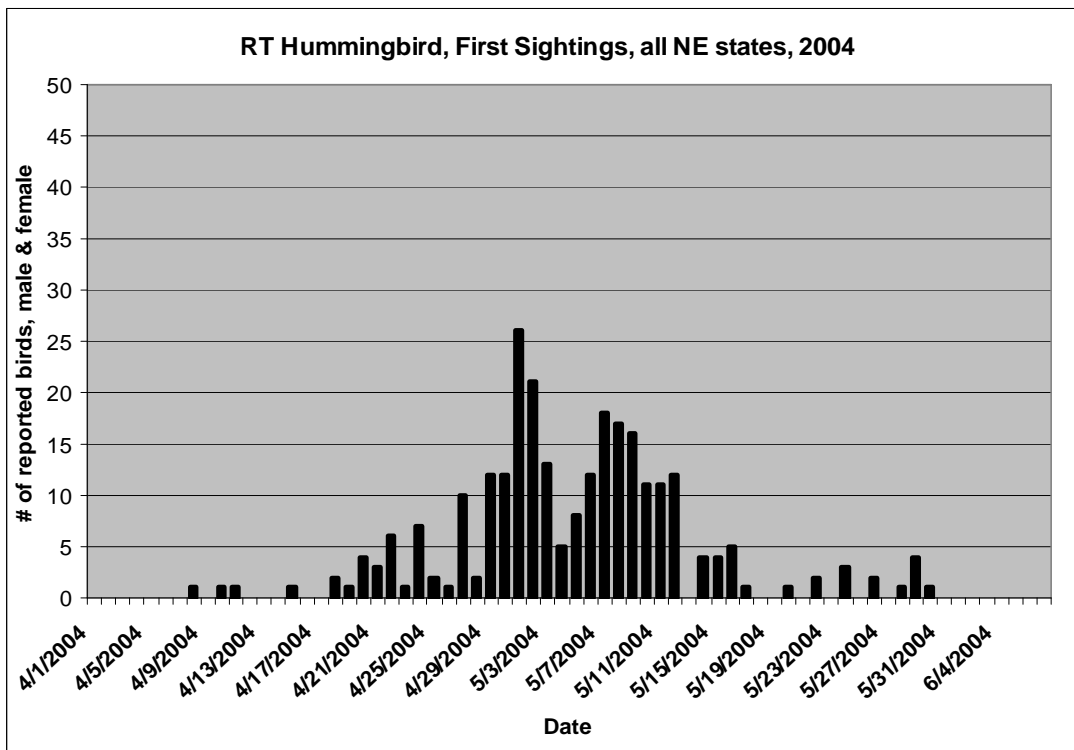
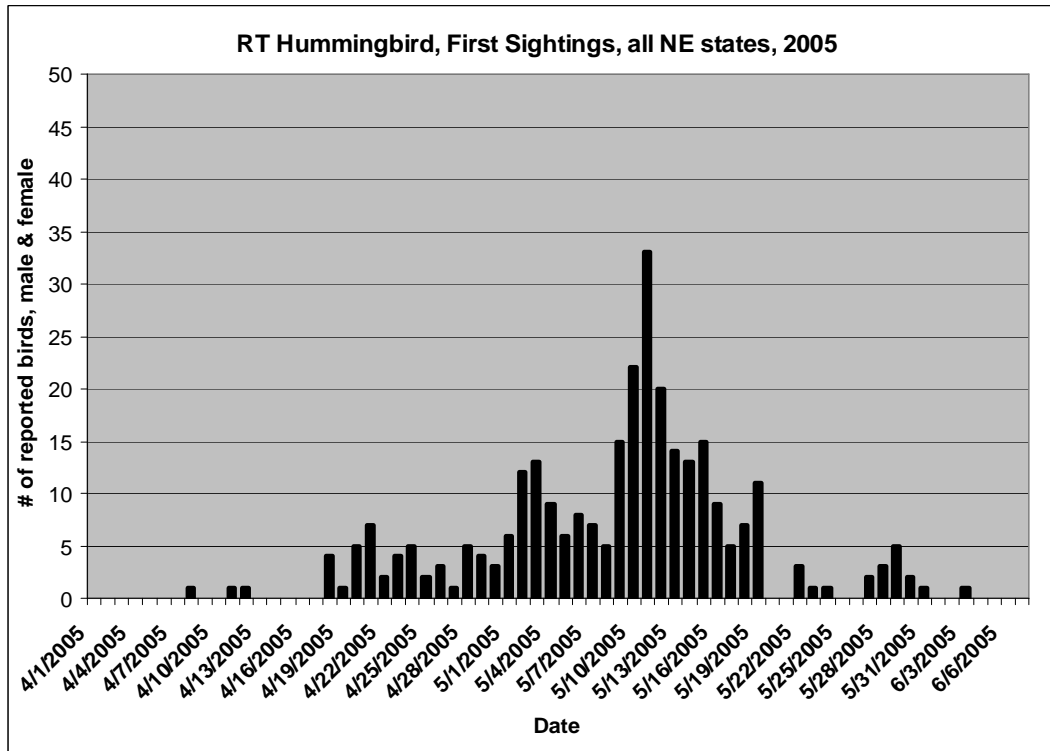


Chart 1C



Charts 1A - 1C also show the temporal compression of the migration, and the number of ebbs and flows, or peaks and valleys, in the arrivals. All the days with reports of 10 or more birds occurred within a 16-18 day period in early May. In 2003, 84% of the migrants arrived between 4/28 and 5/15, an 18-day period. In 2004, 78% arrived between 4/27 and 5/12, a 16-day period. And in 2005, 75% of the migrants arrived between 5/2 and 5/19, again a period of 18 days. Our unpublished charts for female arrivals also show a short temporal span, although the small number of reports for females suggests caution in generalizations. The bulk of female Ruby-throats seem to have arrived within a period of 15-20 days, between May 2 and May 17, 19 or 22 in all three years. For both sexes, this short arrival period mirrors the short time span of the fall migration southward, and may have to do with biologically built-in breeding needs, as a long-term evolutionary adaptation to northern climate.

Despite the central “bunching” of arrivals, charts for all three years show a late group of arrivals during the last week in May. This last wave of arrivals consists mainly of females, and can be seen in our charts for female hummingbirds. A daily ebb and flow of arrivals is also apparent, particularly in the 2003 data; the other two years both imply at least two “surges” of arrivals. The pattern in all the charts is consistent with the imagery of successive “waves” of arrivals from the south, the timing of the waves probably being dependent on local, as well as southern weather. The waves may reflect Ruby-throats’ staggered departure dates from the Yucatan peninsula, which Sargent suggests may be an adaptation to prevent major weather events from wiping out an entire population (Sargent

1999: 27), or staggered departures from southeastern stopover points, which may occur for the same reason.

Annual weather variations in New England

In general, with respect to weather over this time period, spring averaged colder than normal in 2003, a bit warmer than normal in 2004, and unusually variable in 2005. The peak arrival dates reported for hummingbirds, however, were the same in 2003 and 2004, and later in 2005. On a smaller temporal and geographic scale, however, some relationships with weather variables can be informally suggested.

April 2003 was unusually cold and cloudy, with frequent precipitation. The average temperature in Boston was 44.5° F., 3.8 degrees below Boston's average for that month. May's average temperature in Boston was 55.1° F., or 3.4° below normal. The situation in Rhode Island and New Hampshire was similar, with temperatures below average in both months. In southern New England southwest winds, those most favorable for bird migration, came only on April 14 -15, and on April 28; on both those days there were big "fallouts" of migrating warblers and other birds at stopovers such as Plum Island, Massachusetts. The April 28 fallout included five Ruby-throats, compared to one at this spot in the preceding year. (R. Stymeist, *BO* 31, Nos. 4 and 5; *FNRIB*, Nos. 409-410; and P. Hunt, *NHBR* 22, No. 1). April 28 is also the date of the first big spike in "first bird" reports (see Chart 1A), with 23 birds reported. However, there were hummingbird arrivals in New England before April 28, evidenced by the number of first bird reports before that date: 24 reports and birds total, 5% of total birds reported that year. The early reports came from all New England states: 6 from Connecticut, 10 from Massachusetts, and 2 from each of the other four states. Larry Dion, of Casco, Maine, near Sebago Lake, reported a male at his feeder on 4/22/03, his "earliest date ever", his previous earliest date having been May 1 (Maine-Birds). Nevertheless, the modal regional and Massachusetts arrival date of May 2 for that year seemed "normal" to most observers. The relatively sudden appearance of so many birds on that date may have been associated with a storm front which traveled up the east coast on May 1-2.

In 2004 both April and May had near-normal temperatures. In April, the average temperature in Boston was 49.6° F., 1.3 degrees above the monthly norm, and May averaged a normal 58.9° F. in Boston. In Rhode Island, temperatures in April and May were about 1° above normal, and in New Hampshire they averaged about 2° above normal. Southerly winds on the Massachusetts coast began about April 13, with the first major fallout here of neo-tropical migrants coming on April 18 at Plum Island and continuing through the month and into May (R. Stymeist, *BO* 32, Nos. 4 and 5). New early Massachusetts records were set for several migrant species, although not for Ruby-throated Hummingbirds. The peak arrival date for hummingbirds in New England, and for Massachusetts, May 1, was only one day earlier than the previous year (see Chart 1B).

In spite of the generally cold first two weeks of April, and generally northeast winds, what is notable about 2004 is the increase in very early sightings compared to 2003. The

number of reports prior to, and not including, April 20, rose from one in 2003 to seven in 2004 (and eight in 2005). In Maine, William Townsend reported a male hummingbird coming to a red-flowered window curtain on the exceptionally early date of April 8, 2004 (Maine-birds), and in New Hampshire there were sightings on 4/10/04 in Concord and 4/11/04 in Unity, which *New Hampshire Bird Records* noted were earlier than previous NH records by two weeks (P. Hunt, *NHBR* 23, No. 1: 21). *Field Notes of Rhode Island Birds* also noted many early reports of Ruby-throats (Nos. 421-422, April-May 2004). In Massachusetts, a 4/15/2004 sighting in Chilmark was in the ballpark for new early records. (It did not set a state record, because sightings reported to the www.hummingbirds.net website include a 4/10/2000 in Dighton, Massachusetts, a 4/14/1999 in Easthampton, and two on 4/14/2002 in Brewster and on Martha's Vineyard. In addition, *Bird Observer* has recorded 4/12/2000 and 4/14/2001 sightings from Tisbury, on Martha's Vineyard. For a list of historical earliest sightings in Massachusetts, see Table 1 below.) The 4/18/2004 reports from Northampton and Rochdale, Massachusetts, indicated that the early phenomenon was not confined to the coast. The four 4/20/2004 reports came from North Falmouth (Ian Nisbet), Attleboro, Marshfield, and Ipswich, Massachusetts. Tom Gagnon in Florence, Massachusetts, commented that the arrival of a male on 4/30 at his feeder was his "earliest date ever", and Steve Sauter in Ashfield, Massachusetts said his 5/1 arrival of a male at his feeder was the "earliest in six years."

The spring of 2005 was unusual in that April was relatively mild, with an average temperature of 49.7° F. in Boston, while May was the coldest since 1967, with an average temperature in Boston of 52.2° F., 6.3° below normal. Good southwest winds were noted on many days in April, and on May 2 and 11 and 28. In April, observers reported earlier-than-normal migrants. However, Robert Stymeist described the May bird migration in Massachusetts as "really quite bizarre" in that there were days when many birds would arrive on favorable winds, and then be blocked from continuing north by a stalled low pressure system (*BO* 33, Nos. 4,5). The data collected by New England Hummers supports this picture of a stalled migration for Ruby-throats as well; the regional peak of hummingbird arrivals came eleven days later than previous years, on May 11, and the Massachusetts peak came ten days later than before, on May 10, just before a push of other migrant birds on May 14-15.

Cold weather apparently affected hummingbirds by reducing what would normally have been the peak number of arrivals on May 2 and 3, holding back the peak arrival date until May 11 (see Chart 1C). On May 8 New England Hummers commented on the website that while many reports were coming in from eastern Massachusetts, Rhode Island and Connecticut, reports of two per yard from southeastern Massachusetts were suggesting a temporary buildup there. Cold, rainy weather was apparently obstructing the advance into other areas, and progress into New Hampshire, Vermont, Maine and western Massachusetts seemed slow. But by May 17, good numbers of reports were finally coming from these areas, with many observers commenting that their arrival was about a week later than in previous years.

Mark Simmons, a hummingbird enthusiast in New Boston, New Hampshire, wrote that his first male arrived on 5/9/2005, which was late compared to the four previous years

(5/1/04, 5/2/03, 5/3/02), and that his first female arrived on 5/13/2005, again later than in the previous years (5/7/04, 5/11/03, and 5/11/02). Other comments from northern New England reporters were "...a full week late in arriving" (Shannon Le Roy, Kokadjo Wilderness Camp, Maine, 5/15), "about a week later than usual" (Bruce Flewelling, Rochester, Vermont, 5/13); "Late this year compared to last" (K. Thalin, Saxton's River, Vermont, 5/09), "really late this year" (Bill and Gayle Baird, Loudon, New Hampshire, 5/11), and "Finally!- last year, May 5!" (Lisa and Frank, Errol, New Hampshire, 5/11).

In western Massachusetts, Rob Ranney at Deerfield in the Connecticut River valley reported that his first male arrived on 5/11/2005, whereas in 2004 the date had been 5/1, and in 2003 5/2. And his first female did not arrive until the late date of 6/3/2005, whereas in 2004 the date had been 5/30 and in 2003 5/15. Steve Sauter, at a higher elevation in nearby Ashfield, had his first bird on 5/9/05, "later than the usual pattern," previous dates being 5/1/2004, 5/3/2003, 5/4/2002, 5/5/2001, 5/6/2000, and 5/10/1999. The "late" picture did not hold everywhere; in the Berkshires at Tyringham, on Goose Pond, Dottie Naventi's first male managed to arrive on 5/3/2005, although in 2004 the date had been 4/29. Nor did the "late" picture hold for central Massachusetts, with three 4/20 sightings from Worcester area, or further south in "the valley" in Massachusetts, where there were sightings on 5/5/2005 in Granby (B. Benner; L. Rogers), and 5/7/2005 in South Hadley (A. Hill).

In general, reporters from southern New England did not comment that arrivals were late in 2005. A very carefully monitored hummingbird yard in Little Compton, Rhode Island, quite near the coast, has the following series of 'first observed' dates, which do not vary greatly over the past nine years: 1997 - 5/1; 1998 - 4/29; 1999 - 4/29; 2000 - 4/29; 2001 - 4/24; 2002 - 4/28; 2003 - 4/28; 2004 - 4/29; and 2005 - 4/26. The 2005 arrival was actually three days early.

Despite the delay in the overall migration, 2005 repeated the increase in very early sightings noted for 2004, with eight reports before April 20. A new record was set for Massachusetts with the sighting on a warm April 8 by Dorothy Wonson, in Newburyport, MA, of a male hummingbird buzzing around her garden patio, where she had a cherry red Icelandic poppy awaiting planting in her window box. Perhaps it arrived on the southwest winds recorded for April 7. The other pre-April 20 sightings in 2005 were from Fairhaven and Norwell, Massachusetts, Plymouth, Connecticut, Milton and Hampstead, New Hampshire, and Perryville and Narragansett, Rhode Island.

Hummingbirds by Latitude

One way to look at how Ruby-throats move across New England is to ask what latitude they have reached by what date. Lanny Chambers maintains a very popular website which tracks first sightings up the east coast by latitude and longitude, providing a fascinating picture of where the birds are on any given day (Chambers 1997-2006). His focus is necessarily very broad, and his map uses only a portion of the thousands of reports he receives. Nevertheless, his effort has stimulated many people to report who otherwise might not have done so, and has generated some of the earliest sightings ever in our area (Stichter, 2006b).

New England Hummers has attempted to provide a more detailed regional picture of the movement by latitude. Charts 2A – 2C plot the first sighting date against the latitude of the sighting. The plots show that on any particular date during mid-migration there are “first birds” being seen at many different latitudes, ranging from just above 41° N (Southport, Connecticut = 41.15°N), to almost 46° N (Bancroft, Maine=45.67° N). (The dots on the charts do not represent the total number of reported birds for any given point if this is greater than one, although these are taken into account in the trend line calculations.) Conversely, at any particular latitude, there is a degree of variability in the dates of “first bird” sightings.

Chart 2A

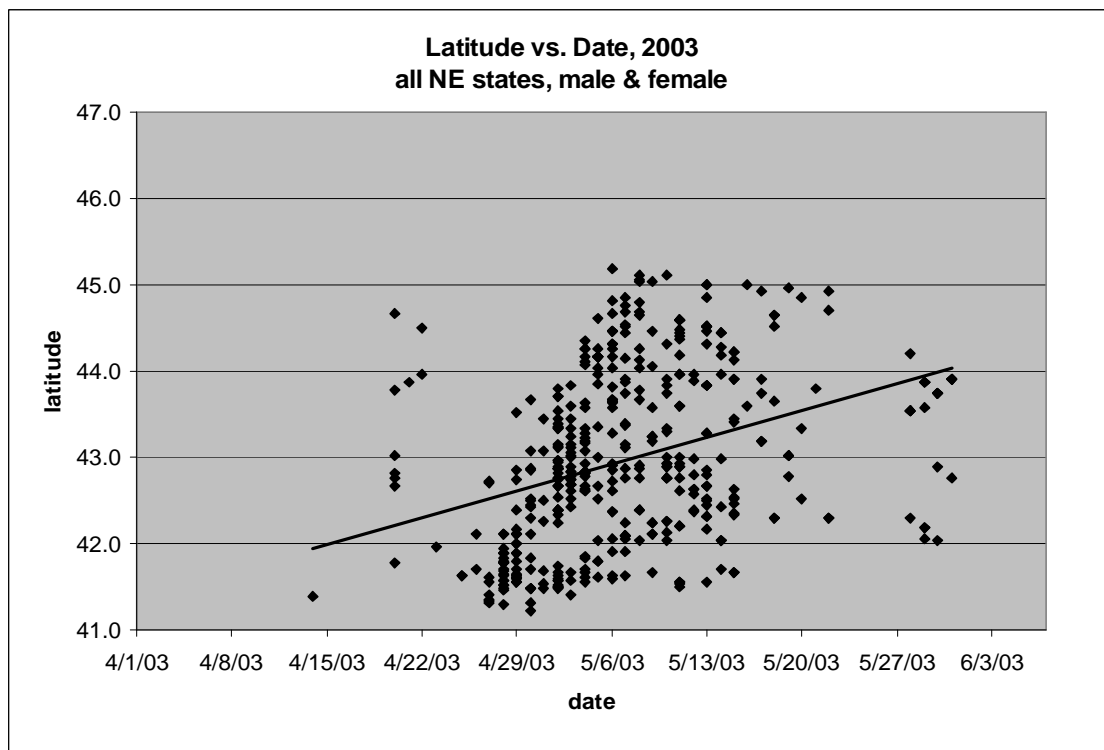
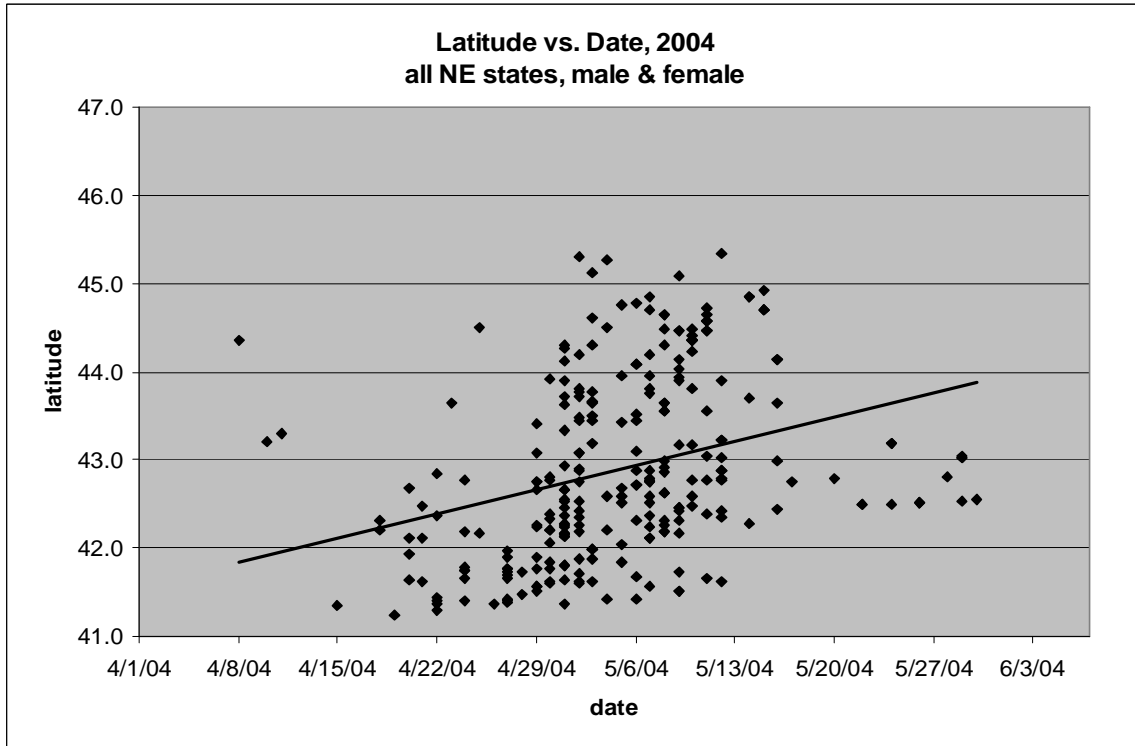


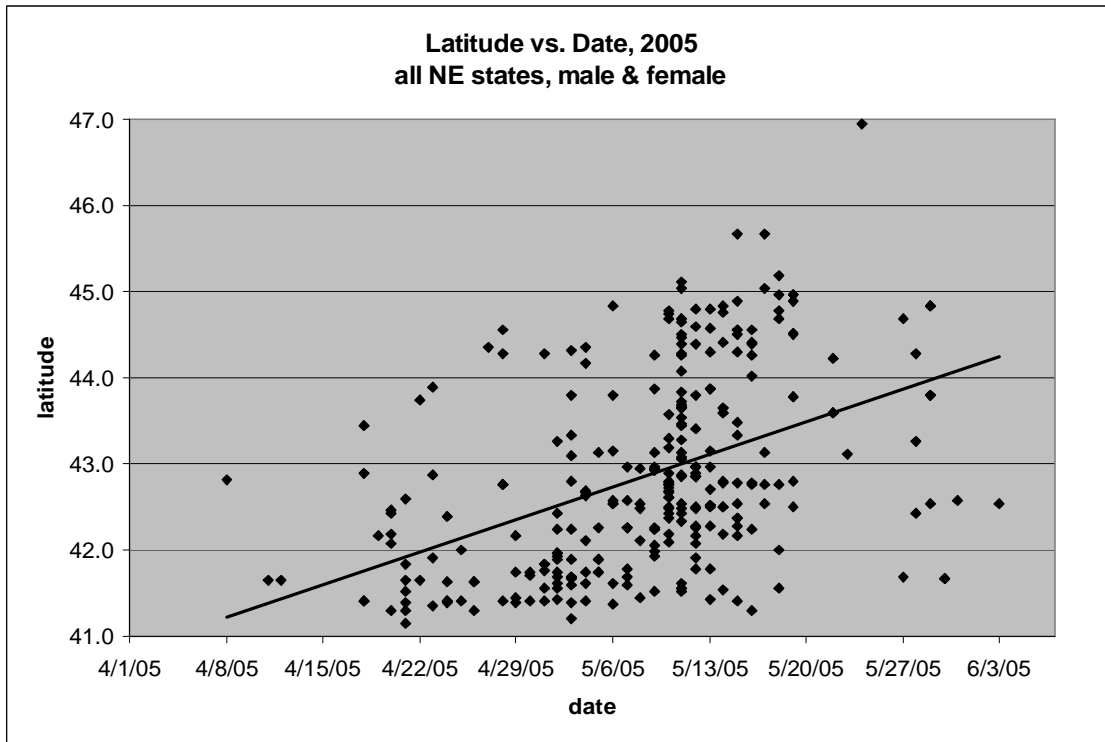
Chart 2B



$r = 0.320$

$r^2 = 0.102$

Chart 2C



$r = 0.444$

$r^2 = 0.197$

The scatterplots give a sense of how fast and with what “spread” across latitudes the hummingbirds moved north each year. In addition, they indicate the extent to which there is a linear relation between date and latitude, or extent to which latitude can be predicted from date. The amount of scatter around the regression line is calculated by the standardized coefficient r . The square of this coefficient estimates the percent of variability in latitude explained by date, so a coefficient of $r=0.44$ in 2005 indicates that date explained 19% of the variability in latitude of the “first birds.” In 2004, $r=0.32$ means that 10% of the variability was explained, and in 2003, $r=0.35$ indicates that 12% of the variability was explained. Results for females only indicated an even stronger relationship between date and latitude each year, with $r = .51$ for 2005, $.35$ in 2004, and $.41$ in 2003. The coefficients for first sighting date and “average” latitude reached by both males and females were even higher.

An interesting observation from Charts 1A, 1B and 1C is that the frequency of very early sightings increased over this period: 2003 was not notable for exceptionally early sightings, whereas 2004 and 2005 were. This suggests the need to look at both “first sightings” and “average arrivals” in a longer time perspective. Are Ruby-throats arriving here earlier than in the past? Could this be attributed to global climate change, or is it perhaps due to more interest and diligence in observation by increased numbers of hummingbird enthusiasts? This possibility is investigated in *New England Hummers*, Research Report No. 2, cited below (Stichter, 2006b).

There is still much to be learned about our familiar and beloved Ruby-throated Hummingbird. That this tiny sprite, weighing no more than 3-5 grams, makes such a long migratory flight from the neo-tropics to New England and southern Canada, is an amazing fact. In this report, we have merely begun the job of keeping track of the Ruby-throated’s movements in our area.

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