A SELECTIVE ANALYSIS OF DATA FROM THE NEWBURYPORT CHRISTMAS BIRD COUNT

by Jim Berry

The Newburyport, Massachusetts, Christmas Bird Count (CBC) is middle-aged, as CBCs go. It was founded in 1938 by Don Alexander of Rowley, who compiled it through 1976, a total of thirty-nine years. Rick Heil was compiler from 1977 through 1984, and passed it on to me in 1985. Since then I have looked at the years of data from many angles and have written several historical summaries for the participants, most of whom gather after each count in the barn at the Ipswich River Wildlife Sanctuary in Topsfield.

This article attempts to present some of the CBC data for a wider audience. Some numbers and averages are given, but nothing should be construed as necessarily statistically significant. It is simply one compiler's way of looking at a database for information and trends that might be of interest to CBC participants anywhere. There are many other ways to look at CBC results, and my hope is that this summary will serve a heuristic purpose by encouraging other compilers to publish comparable summaries.

By way of background, CBCs are systematic bird censuses conducted in defined fifteen-mile-diameter circles throughout North America during a three-week period before and after Christmas. They began in 1900 and are organized by the National Audubon Society, which publishes the results of all 1500-plus counts in the CBC issue of *American Birds*. Counts are conducted primarily by groups of people called parties. A party-hour is one party observing in the field for one hour. A party-mile is one party traveling one mile. The parties have to quantify the hours and miles on foot versus those traveled in a car. A feeder-hour is a person (or family) counting birds at a feeder for one hour. The object of the count is to record as many birds of as many species as possible, as recorded by parties in the field and additional observers at their feeders.

Effects of Observers and Party-Hours on Species Recorded

The Newburyport count began with eleven field observers in 1938 and had as many as seventy in 1990. In reviewing the number of observers in relation to the number of species recorded, the count fell into four periods, shown in Table 1.

For the first thirteen years all species totals for the count were in the fifties and sixties. For the next seventeen years they rose into the seventies and eighties, only once dipping below seventy while twice rising into the nineties. Beginning in 1968 and continuing through 1983, the totals were routinely in the nineties, falling below that number only four times and rising to a then-incredible 108 in 1979 when the count record was smashed by a full ten species.

Table 1. Newburyport, Massachusetts, Christmas Bird Count.

Period	Average # of species	Average # of field observers	Average # of party-hours
1938-50	62	23	*
1951-67	80	26	*
1968-83	93	26	78*
1984-91	103	51	153

* No data available until 1972.

But from 1984 to the present, totals of over one hundred species have become the norm, and the record was broken again in 1990 with 109.

By now any reader familiar with Christmas counts will already be drawing some conclusions from these escalating species totals. I suspect that many, if not the vast majority, of CBCs have experienced a similar phenomenon for three obvious and mutually reinforcing reasons: better birders using better optics and better field guides. There can be little question that species totals would have increased significantly over the years for these reasons even if all other factors had been constant.

But other factors have not been constant, such as the numbers of observers, parties, party-hours, party-miles, and feeders. There is also weather, which is extremely difficult to correlate, and the birds themselves, which have a way of being at different latitudes or altitudes from year to year on the same date. No one even knows how many factors there are, let alone how to quantify and correlate them.

Numbers offer the best hope of correlations, of course, and at least we can quantify the things we ourselves control, like observer statistics. (This assumes that observers are correctly reporting their hours and miles to the compiler, which can be a shaky assumption, knowing how many of us wing these figures.) But Table 1 offers only partial correlations. While the numbers of species were increasing over the years, the numbers of observers were remaining fairly constant until the mid-1980s. And with no data available on party-hours until 1972, one can only assume that with constant observers, there must have been relatively constant party-hours. Only when the numbers of observers and party-hours doubled starting in the mid-1980s can any relation be drawn between observer effort and species tallied.

My own hypothesis is that greater observer effort is more critical for increasing species totals when the saturation point for a count is being reached than it is before that point is reached. As long as there are plenty of species not

being recorded, a given level of effort can keep increasing the species tally as observers learn where the occasional stragglers like to hang out and consequently find them more quickly. But when the species potential is largely reached, coverage must be significantly increased to squeeze out any more species. I believe that the data in Table 1 give evidence of this.

Party-Miles as a Measure of . . . Nothing!

While party-hours have always seemed a useful tool to measure level of observer effort, the same cannot be said for party-miles. In fact, party-miles have always struck me as useless. To test this, I looked at the figures within one of the above periods (1968-1983). I have no data for 1968-1971, but the party-miles showed a big jump from an average of 164 from 1972-1976 to an average of 440 from 1977-1983. This was probably due to the change in compilers and the recruitment of new observers, many of whom, living farther away and being less familiar with the territory, walked less and drove more, perhaps to try to cover more of their large sectors.

The rise in species totals during this time was not impressive, although there was an increase from 89 to 96 for the two subperiods. But observers and party-hours also rose during this time (Table 1 shows only the average for the whole period), and the increase in species totals could be attributed to these factors. My own impression is that party-miles are simply an offshoot of party-hours, and that party-miles have no particular significance. I may economize on my driving time to maximize my time on foot, which is when I see and hear most of the birds I am counting. Or I may be driving to places farther apart, perhaps even retracing certain routes, and then getting the same results on foot. In either case I am not adding significantly, if at all, to the species total while driving. Rather, I am simply able to add a flock of starlings here and a few jays or crows there. The payoffs come when my party and I are on foot.

Perhaps this is why I cannot recall reading any CBC analyses that considered party-miles, while many have used party-hours. Thus I think that party-miles are virtually irrelevant to CBCs, at least in terms of data analysis.

I asked *American Birds* about this a couple of years ago when sending in my count results, but I never received an answer. I also asked them why we are required to separate hours and miles by foot versus car, which seems equally pointless, but I remain in the dark on that too. Finally, I asked for clarification on why we need to record feeder-hours, which seem much less important than party-hours afield and are harder to measure. I suspect that relatively few feeder watchers, especially those who watch intermittently, have a clear idea of how much time they actually spend counting their chickadees. Inaccurate data are of little use and are inconsistent with pleas by CBC organizers for accurate records. If *American Birds* cannot define a purpose for or ensure a reasonable degree of accuracy of the data collected by the CBCs, they should not ask compilers to

collect the data.

Numbers of Individual Birds Counted

It is ironic that the interest of CBC participants in the number of species overwhelms our interest in the total number of birds counted. In fact, I cannot recall ever meeting anyone who expressed more interest in the total biomass than in an arbitrary number like the species total; hence my attention in the above section to the variety of species. If I am going to sell you on the value of total numbers of birds, I have to get your attention first!

Although these are clearly important, I do not have as much to say about the total number of birds counted. To be sure, the trend on the Newburyport count has been up over the years. For the first thirty years, the grand total varied within a range of 7000 to 28,000. Starting in 1968, totals began reaching 30,000 and 40,000 with regularity, although there were still years in the mere tens of thousands until 1980. The last eleven counts have averaged 34,000 birds, with a high of almost 57,000 in 1988.

What is one to make of these wildly fluctuating totals? Do they have any relation to the actual populations of early-winter birds within the 177 square miles of the count circle? Perhaps. But once again all those pesky variables force themselves into view. Weather, for instance. A look at some of the lower totals and the weather patterns on those count days shows that northeasters, with their nasty precipitation, keep the numbers down, as do strong northwest winds on otherwise beautiful days. Such conditions suppress birds and depress birders.

Of more importance are the long-term trends, since weather conditions presumably "average out" over the years. But I am not sure that I can draw any conclusions other than the rather obvious one that the increase in observers is almost certainly related to the increased totals of birds. What else is new? Logic tells us that more observers mean that more territory can be covered. I would have to look at many more CBCs than Newburyport to attempt an analysis of whether the avian biomass in December has genuinely increased over the years, and that is beyond the scope of this article. Meanwhile, we can perhaps conclude that growing numbers of observers, augmented by growing numbers of starlings, are having a salutary effect on the total numbers of birds counted at Christmas time.

The Effects of "Onesies" on Species Totals

Inevitably I must return to the variety of species recorded on CBCs, for that is ultimately what we are most interested in. The species total is an artificially inflated number for a very simple reason: a whopping percentage of the species tallied are represented by a single individual. In one recent seven-year period, an average of sixteen species were in this category: sixteen species that would not have been tallied had it not been for the skill, diligence, or pure luck of a single

observer or party. If you also consider the number of species represented by two or three individuals, the species total takes on an even less exalted status.

Nonetheless, the species total, the Holy Grail of every Christmas count, is the primary reason that people are willing to endure ridiculous discomforts. The desire to set a new count record, and for some the competition associated with that quest, represent the fun of Christmas counts, something that will never be challenged. It is our permanent lowest common denominator.

At the same time, while the species total may have meaning only to CBC participants, the "onesies" nevertheless help to establish range limits for many species of birds. Any student of CBC data for the continent, or any part of it, has an excellent understanding of winter bird ranges. And while we delight in Essex County, Massachusetts, at finding an occasional Pine Warbler on a CBC, we are set straight when we open a CBC issue of *American Birds* to find that counters in the Maritimes are starting to find them "routine" (*American Birds*, 1991, 45(4), page 528). And while we locals suspect that Dunlins, Sanderlings, and Purple Sandpipers are the only common winter shorebirds in Massachusetts, a look at the other coastal CBCs shows that species like Red Knot, Ruddy Turnstone, and Black-bellied Plover are regular from Boston to Cape Cod and the islands. Nothing like a little perspective.

I have looked at the cumulative Newburyport data since 1938 to see which species we have found only once or twice over the fifty-four years, and thus the extent to which our cumulative total of 192 species and five subspecies ("Blue" Goose, "Kumlien's" Gull, "Ipswich" Sparrow, "Oregon" Junco, and "Bullock's" Oriole) is dependent on such rarely seen species. For fun, I have also thrown in the species Newburyport has never or seldom missed.

Listed below (with the year recorded) are the twenty-three species and one form that have been recorded only once. I did not inherit any documentation of these species with the CBC records, so I cannot verify the authenticity for any but those since 1985, with two exceptions.

> Arctic Loon (1979), Eurasian Wigeon (1983), Redhead (1972), a well-known Tufted Duck (1976), Osprey (1943), Broad-winged Hawk (1951), Common Moorhen (1971), White-rumped Sandpiper (1979), a widely observed Ivory Gull (1976), Forster's Tern (1952), Thick-billed Murre (1986), Barn Owl (1980), Boreal Owl (1942), Great Crested Flycatcher (1963), House Wren (1988), Varied Thrush (1977), American Pipit (1963), Blackpoll (1939), Black-headed Grosbeak (1954), Vesper Sparrow (1979), Grasshopper Sparrow (1967), Harris's Sparrow (1946), "Bullock's" Oriole (1957), and Hoary Redpoll (1968).

Six species and one form have been recorded twice. My comment on documentation applies here as well.

> Western Grebe (1984, 1987), "Blue" Goose (1954, 1957), Blue-

winged Teal (1973, 1983), Long-billed Dowitcher (1977, 1978), Mew Gull (1955, 1976), Black-backed Woodpecker (1957, 1962), and Swainson's Thrush (1963, 1976).

At the other end of the spectrum, twenty-five species have never been missed, although the lowest total, shown in parentheses, shows how close we have come.

Common Loon (low of 4), Horned Grebe (1), Black Duck (522), Mallard (1) (!), Oldsquaw (3), White-winged Scoter (6), Common Goldeneye (264), Bufflehead (3), Red-breasted Merganser (11), American Kestrel (1), Herring Gull (146), Great Black-backed Gull (6), Downy Woodpecker (3), Hairy Woodpecker (1), Horned Lark (2), Blue Jay (9), American Crow (121), Black-capped Chickadee (114), Golden-crowned Kinglet (1), European Starling (234), Tree Sparrow (130), Song Sparrow (3), Dark-eyed (slate-colored) Junco (5), American Goldfinch (9), and House Sparrow (25).

The reason that some species are as low as one is that the first count in 1938 had only eleven observers and fifty-one species. Several of the single observations were from 1938 and were never that low again.

Fifteen species have been missed only five or fewer times (shown below with number of times or years in parentheses).

Canada Goose (5 times, 1938-1948), Greater Scaup (1981, 1984), Rough-legged Hawk (5), Ruffed Grouse (4), Ring-necked Pheasant (3), Bonaparte's Gull (1938, 1989), Ring-billed Gull (1939), Common Flicker (1966), White-breasted Nuthatch (1942), Brown Creeper (1983), American Robin (1945), Yellow-rumped (myrtle) Warbler (1980), White-throated Sparrow (4), Snow Bunting (3), and Purple Finch (1938).

Thus Newburyport has at least forty species we can bet money on, but about thirty we are lucky to have at all. Our 54-year cumulative species total stands at 192, plus five forms, if the Clapper Rail and Lincoln's Sparrow documented in 1991 are accepted by the CBC regional editor. Even if we subtract the thirty or so that we rarely find, we have a working universe of well over 150 species. Yet the count has never managed to find 110 of them on the same day. This is something to think about. We are lucky to find as many species as we do given the number of single-bird species, yet we could have much greater species totals given the universe of species previously counted.

Trends

Counts of the following five species have decreased steadily and noticeably over the last half-century on the Newburyport CBC: Black Duck, Greater Scaup, Red-shouldered Hawk, Yellow-rumped Warbler, and Evening Grosbeak.

By comparison, the following twenty-eight species have increased noticeably: Canada Goose, Mallard, Gadwall, Common Eider, Common Merganser, Northern Harrier, Red-tailed Hawk, Ring-billed Gull, Herring Gull, Great Black- backed Gull, Mourning Dove, Eastern Screech-Owl, Great Horned Owl, Downy Woodpecker, Horned Lark, Blue Jay, American Crow, Black-capped Chickadee, Tufted Titmouse, White-breasted Nuthatch, American Robin, Northern Mockingbird, Cedar Waxwing, European Starling, Northern Cardinal, Song Sparrow, House Finch, and House Sparrow.

The ratio seems favorable, but two caveats are in order. First, feeders may be important contributors to the counts of those species that use feeders. However, more feeder watchers are also participating in CBCs, so we are probably seeing the results of both greater observer effort and greater numbers of surviving feeder birds. Second, some of the increases result directly from the increase in field observers and observer effort. This is clearly the case with the owls, because Newburyport hours owling have catapulted since the mid-1970s. It is also probably true of such species as the larks, jays, crows, robins, waxwings, and starlings, whose increased numbers may or may not represent bona fide population increases.

The other species changes, however, by and large represent real population trends. The explosions of doves, titmice, mockingbirds, cardinals, and House Finches in New England are well documented, as are the increases in Ring-billed, Herring, and Great Black-backed gulls, Canada Goose, and Mallard. The decreases, on the other hand, are alarming, because increased observer effort is getting fewer and fewer results. Fortunately there are few major decreases.

A Word About Owls

A few years ago I researched all twenty-plus Massachusetts CBCs for the most recent four-year period (1985-1988) for owling hours and owling results. To my surprise, I found only six CBCs that showed consistent efforts before sunrise. These efforts clearly paid dividends: the six counts averaged between thirteen and thirty hours owling, between twenty and forty-two Eastern Screech-Owls, and between six and twenty-seven Great Horned Owls. (I can modestly add that Newburyport tallied, with no apparent duplication, a total of sixty-two Great Horned Owls on a very still night in 1986.) Most of the other Massachusetts counts showed very few hours owling and considerably fewer owls. Thus, the tallies of these birds often do not reflect their populations, whereas with a little extra effort (read a little less sleep), we could have a much better picture of owl numbers in Massachusetts.

Thus, if I can plant any seeds in this article, I would exhort other compilers to routinely organize their parties for at least two hours of owling before daylight, given reasonable weather. (First light is generally the best time to hear them.) If results are not forthcoming, perhaps a few of the hardiest (or craziest)

can volunteer to put in another hour after the evening festivities.

Final Thoughts

I conclude with two observations. The first concerns the validity and reliability of Christmas count statistics and records. CBC regional editors (until their reports were inexplicably edited out of last year's CBC compendium, an unfortunate degradation of that much-awaited issue of *American Birds*) were forever reminding compilers and participants how critical it is to document rare, out-of-range, and out-of-season species, so that CBC data can be reliably used in research—and the data are used in a lot of research. I think that many CBC participants are particularly reluctant to document otherwise easily identified species that are nevertheless in need of details because they are out-of-range or out-of-season, particularly the latter.

For example, Ruby-crowned Kinglets are common birds in Massachusetts during migration. They are not common in winter and, to my knowledge, are nonexistent as nesting birds. Few would question the need to document a nesting record in this state, yet many have questioned the need to submit details on this and similar species that, while not highly unusual to record in CBCs, are at the northern end of their winter ranges here. I cannot overemphasize how important I think it is for participants observing marginal species for their count areas to provide written details to their compilers for the record. The point, as regional editors have pleaded with us for years, is not to question anyone's credibility. There is nothing personal about it. Rather it is simply to satisfy regional editors and all posterity that a bird reported by some complete stranger can stand the test of time. If we are going for species records, which is what provides us with much of the joy of the count, let us be sure that our totals are credible.

My second observation concerns *American Birds* itself: namely, the format of the Christmas count issue. From a researcher's standpoint, the editors made a mistake in returning to the old narrative format to publish the counts after developing and using, in the 1987 issue for the 1986 count, a method of presenting the data that made comparative analysis of CBCs a thousandfold easier than it had ever been.

Many readers will remember the 1987 issue, where the numbers of each species were laid out in tabular format across the pages for all the counts in a given state. This made comparing the numbers for any species across a whole state easy. What a pleasure it was to be able to see how many Ruby-crowned Kinglets were found in Massachusetts that year (fifteen); to compare shorebird numbers up and down the coast at a glance; and to see that my boldfaced numbers of 1443 Blue Jays and 68 Red-breasted Nuthatches were the highest counts in the state. It would have taken me ten, twenty, thirty times as long to dig those facts out of twenty-five separate count summaries.

That was not the only advantage. Just before the species tables for the state were the statistical and weather summaries for each count, once again making comparisons instantaneous. These were followed by the list of participants in alphabetical order for the entire state. It looked forbidding at first, but you could look up a given friend in seconds and know instantly every count that person participated on. When you know a lot of Christmas count junkies, that in itself can be interesting.

Alas, readers of *American Birds* apparently flooded the editors with protests. I was stunned the next year, after heaping praise and gratitude upon them, to see that the old format had been disintered. "Last year's issue earned its hard-won oblivion," the editor said. ". . . no one can complain that we've this year lost the 'integrity' of an individual count," whatever that meant. Thus because people would rather see their counts treated separately, *American Birds* abandoned a huge step forward. The narrative format not only makes comparative analysis astronomically more difficult, it also hinders analysis from even taking place because of the phenomenal amount of time required to pull out desired data. The tabular format, by contrast, literally offers ideas for analysis because of its logical presentation. If ever there were a case of emotion, reaction, and provincialism triumphing over practicality, progress, and perspective, this was it.

I hope the various concepts discussed in this article will stimulate additional contributions in the years to come. There are many ways to analyze and present CBC data. Perhaps Bird Observer can make this kind of article a feature each December. Who wants to be next?

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