

their ability to distinguish different species or count the number of individuals in a flock. Professionals and amateurs alike tend to underestimate the number of individual birds in a large group and the bias rises with the size of the group (Johnson 1981). In addition, the quality of equipment has improved immensely making bird identification much easier. Hence, more uncommon species may be counted now than in the past just because of the improvement in optics and guides. Nevertheless, one does not want to make too much of the equipment issue if only because a birder with a good ear is worth more than the finest pair of binoculars.

The issue of effort is a crucial one and has been studied by Butcher and McCulloch (1990). In order to account for effort, the number of observers on a CBC is divided by either party-hours or party-miles to get an accurate gauge of numbers of birds in any given count area. The underlying assumption is that as the number of observers increases so too does the count of birds. Butcher and McCulloch found this to be true for Red-tailed Hawks, for example. But for some species, it is unlikely that there is a linear relationship between the number of observers and the number of birds. This is particularly true of birds in a well-defined habitat that can be easily covered such as a pond where one individual could count the number of waterfowl present just as easily as six persons could. Indeed, Butcher and McCulloch showed that a positive relationship between count and effort does not exist for Mallards and Bald Eagles. For other birds, such as hawks and shrikes, the number of miles covered, for instance, might make a significant difference in the annual count. What must be stressed is that the appropriate analyses of CBCs may be different for different species depending on habits and habitats.

Furthermore, Butcher and

McCulloch said biases may arise from the fact that more effort is exerted in areas of high human population density, while certain bird species may be most likely to be found in remote areas. In assessing CBC data there is no way to control for this particular perverse distribution of effort. Finally, because effort has increased overtime, absolute numbers of birds reported have generally risen. This problem could at least be partially offset by analyzing the numbers of birds seen and hours of counting.

Robert Arbib (1981) also sees a number of inherent flaws in the CBCs including the frequent widening of the predefined count circle, overlapping of count circles - in some cases egregiously so - annual weather fluctuations, the wide variation in the number of people assigned to a count area, and effort intensity. Arbib bemoans the absence of a serious use of habitat analysis and what he euphemistically calls "observer credibility." In an ideal world, Arbib sees a count that would require participants to meet a minimum level of experience. Feeder station counts, which upwardly bias the CBC, would also be separated from field observations.

Several examples exist of counts that might be providing inaccurate information on the numbers of certain species, stemming principally from lack of competence or wishful thinking of birders who want to see the unexpected. After the Thayer's Gull was officially defined as a species distinct from the Herring Gull in 1973, at least one writer suggested that the CBC data on these two birds in western North America were quite contradictory and hence unreliable. In essence, observers in some places began suddenly to see a rather unusual number of Thayer's Gulls (Mark 1981). Similar discrepancies have been cited in the counts of Sharp-shinned and Cooper's Hawks. The CBC data displayed an unexpectedly high number

of Cooper's to Sharp-shinned Hawks. Veteran birders are well aware of the difficulty of identifying a Cooper's Hawk because of how closely it resembles the Sharp-shinned Hawk. Observers may have been biased in favor of identifying the less common Cooper's Hawk (Daniels 1975). Thus, while the total number of accipiters may be correct, the breakdown between species may not.²

Observer bias is also fostered by the competitive atmosphere that marks the CBC. There is more prestige associated with seeing a winter rarity than counting common species. Observers may begin to see what they would like to see. It is hard to call anything a serious scientific pursuit when the results represent, even in some small way, a self-fulfilling prophesy. While the presence of a rarity is not especially consequential when it comes to the analysis of trends, what is important is the diversion of energies and time that go toward finding rarities in the competitive environment that frequently mark the counts. The single Gray Catbird that appears on a count may not be as important as the number of American Robins or Dark-eyed Juncos observed.

As a corollary, there is the assumption that a previously abundant species still exists in large numbers. But since measuring incremental change is at the very heart of the CBC, there is no room for a cavalier attitude toward counting an abundant species. Said one observer two years ago, "You can never count too many crows." Yes, you can. Good science does not assume what it is supposed to measure.

CBCs have been the basis for some 200 refereed journal articles, not to mention a number of monographs (Pennisi 1991). However, their extensive use is not an argument in support of their validity; bad data are bad data whether they are used not at all or are used frequently. The justification for the use of the CBC must rest on its own