INTRODUCTORY REMARKS:
ESTIMATING RELATIVE ABUNDANCE (PART I)

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At the start of this historic symposium, it is appropriate to recall the great pioneers who broke away from the traditional shotgun approach to field ornithology and started us on quantitative studies of bird distribution and avian ecology. (Pertinent references for this brief review are in Kendeigh 1944.)

The first bird census taken in this country was carried out by Alexander Wilson on 8 acres of a botanic garden in Philadelphia apparently in 1811. During that summer, Wilson felt he had not less than 51 pairs. Excluding three species that probably foraged off this tract, the density would be not less than 3.4 pairs/acre (7.4 pr/ha). This density is the only one we have on record before the arrival of the House Sparrow (*Passer domesticus*) and Starling (*Sturnus vulgaris*) on this continent.

Nine decades later F. L. Burns censused the breeding birds on 1 square mile (2.6 km²) of mixed habitats at Berwyn, Pennsylvania. In spite of the large size of his area, Burns obtained a density of 1.1 pairs/acre (2.7 pr/ha). Wilson depended on nests found, but Burns also relied on some sort of mapping. There was around 1900 in the United States some counting for daily lists, an activity giving rise to today's National Audubon's Christmas Bird Count; but the great breakthough occurred on 29 August 1906 when A. O. Gross and H. A. Ray began a series of transects which they carried out across the state of Illinois until September 1909 under the direction of S. A. Forbes. Gross and Ray always walked 30 yd (27 m) apart in open country, counting birds out to a distance of 10 yd (9 m) on each side and up to 100 yd (90 m) in front. In dense habitat their distance apart was 20 yd (18 m) and the census strip 30 yd (27 m). Graber

and Graber (1963), who repeated this remarkable census 50 years later, found that the results of this method compared extremely well with those obtained by territorial mapping of passerines, but they noted that both methods underestimated the numbers of nesting pheasants (*Phasianus colchicus*). Such a narrow fixed-width transect does not, of course, lend itself to censusing owls and hawks.

In 1914, the U.S. Bureau of Biological Survey, led by W. W. Cooke, began "a census of the birds of the United States." In 1916–20 this project involved 256 areas censused 1 or 2 years and 32 censused 3 or more years. The technique used was fairly crude: the "census" was to be taken at the height of the breeding season, beginning at daylight, zigzagging back and forth across tracts of 40–80 acres, counting singing males, the count to be repeated at least once or checked out by subsequent observations. This cooperative project lasted only about 10 years. Although published, it never matured in technique or ecological insight, and it never gave sufficient credit and identification to its cooperative amateurs.

The binocular had now replaced the shotgun in field ornithology. Eliot Howard had convinced the scientific community of the existence of territory in birdlife. In Australia, J. B. Cleland was reporting counts based on transects of a known length but uncertain width. In Germany Gottfried Schiermann, an experienced egg collector who knew how to find nests, worked out the density of breeding birds on 28 km² (10.8 sq mi.) by means of 16 study areas. In Finland, Pontus Palmgren resorted to the mapping method. In Greenland, members of an Oxford University expedition censused the nesting birds on 21.5 km² (8.3 mi.²). Finally in 1932, E. M. Nicholson published *The Art of Bird-Watching* with 40 pages devoted to bird-census work.

We were on our way!

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