

APPENDIX I TERMINOLOGY USED IN ESTIMATING NUMBERS OF BIRDS

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Hundreds of papers, such as those presented in this volume, are produced annually by workers using various techniques. The purpose of this section is twofold: (1) to provide for readers unfamiliar with counting techniques a handy guide to the most common terms and methods used in the field; and (2) to attempt to set a consensus on the meanings of some terms that are too commonly used interchangeably in the literature. I have not attempted to set arbitrary standards here; rather, if two or more terms are commonly used to apply to the same method or unit, and if each is unambiguous, then I have indicated this synonymy.

I thank Dr. Frank Pitelka who, as chairman of the working group on terminology, synthesized the comments made on the original draft distributed at the symposium. He incorporated the comments of many people, applying his own erudition to the problems presented. Mike Scott contributed many suggestions at all stages. I thank David Anderson, James Baldwin, Kenneth Burnham, David E. Davis, John T. Emlen, David DeSante, Martin Erdelen, Charles Gates, Joseph J. Hickey, Frances James, Olli Jarvinen, Douglas H. Johnson, G. M. Jolly, Duncan Mac Lulich, Raymond O'Connor, Hans Oelke, Carol Pearson Ralph, Chandler S. Robbins, Larry D. Voorhees, Jared Verner, and many others for their comments.

Clear and precise statement of the method and units of measurement used in an estimation will facilitate communication between workers by preventing misunderstanding. It is hoped that the usage given here will gain currency among workers in the field.

accuracy (n): a measure of the closeness of an estimate to the actual value of the population parameter being estimated.

atlas (n): result of a comprehensive survey of a large geographical area that maps the occurrence (or occurrence and relative abundance) of species in subdivisions of that area; usually based on a grid of fixed intervals in kilometers or degrees latitude and longitude; restricted to a particular season of the year, usually the breeding season.

bias (n): the difference between the expected

value of an estimator and the actual value of the parameter being estimated.

Breeding Bird Census: a census program of the National Audubon Society in North America that uses the Spot-mapping Method during the breeding season.

Breeding Bird Survey: a cooperative program of the U.S. Fish and Wildlife Service and the Canadian Wildlife Service for monitoring population changes in North American breeding birds using Index Method station counts.

Capture-recapture Method: a procedure involving the distinctive marking of individual birds and their subsequent recapture (or sighting) to estimate population size (and other population parameters).

census (n): a count of all individuals in a specified area over a specified time interval.

census (vb): the act or process of counting all birds within a specified area and estimating density or a total population for that area.

census efficiency (n): proportion of density as assessed by a census to actual population density (cf. detectability).

Christmas Bird Count (formerly "Census"): an annual project in the Americas of the National Audubon Society involving a one-day count of the individuals of all species observed within a 15 mile (24 km) diameter circle.

Common Birds Census (U.K.): a program of the British Trust for Ornithology using the Spot-mapping Method.

community (n): the aggregate of all populations within a defined area.

contact (n): a single field record of a bird by sight or sound (Syn. detection, cue, registration, observation).

count (n): a) the act or process of enumerating; b) number or sum total obtained by counting.

count (vb): to record the number of individuals or groups present in a population or population sample (cf. census and index).

density (n): the number of units (e.g., individual birds, pairs, groups, nests) per unit area (Syn. abundance; cf. frequency).

detectability (n): a measure of the conspicuousness of a species equal to the proportion of observed to actual units (individuals, territorial males, etc.) on a given area.

detection distance (n): the distance from the observer at which the individual bird or cluster of birds is seen or heard (radii in station

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- counts; lateral or perpendicular distances in transect counts).
- estimator (n): a function of sample data that describes or approximates a parameter.
- Fixed-distance Methods: see Strip Transect Methods and Point Count Methods.
- frequency (n): number of plots, stations, counts (visits), or intervals in which a species is detected; when expressed as a percent it becomes relative frequency (cf. density).
- index (n): a) the proportional relation of counts of objects or signs associated with a given species to counts of that species on a given area; b) counts of individuals (e.g., at a feeding station) reflecting changes in relative abundance on a specified area, or just locally.
- Index Methods: bird counting methods involving sampling that yield measures of relative abundance rather than density values.
- line transect (n): a sampling route that bisects a surveyed area followed by an observer counting contacts over a measured distance.
- Mapping Method: see Spot-mapping Method.
- parameter (n): an unknown quantity (e.g., the number of robins in a fixed area).
- Point Count Methods: counts of contacts recorded by an observer from a fixed observation point and over a specified time interval: *Fixed Distance (Radius) Point Counts* limited to birds within a single arbitrarily selected fixed distance; *Variable Distance (Radius) Point Counts* limited to birds within distances varying according to species-characteristic detection distances (Syn: Variable circular plot); and *Unlimited Distance Point Counts* all birds without limits, i.e., all detections recorded regardless of distance (e.g., the "Indices Ponctuels d'Abondance" developed in France). (Syn: Station Count Methods).
- point transect (n): a transect along which the Point Count Method is used; no recordings are made between stations (as opposed to strip transects with continuous recordings).
- population (n): the birds of one and only one species within a defined area.
- precision (n): a measure of the sampling variability of an estimator (proportional to reciprocal of sampling variance).
- quadrat (n): a small sample plot, usually square or rectangular.
- relative abundance (n): a percent measure or index of abundances of individuals of all species in a community (Syn. [in Europe] dominance; cf. index, frequency, density).
- relative frequency (n): See frequency.
- species diversity (n): a measure of the variety of species in a community that takes into account the relative abundance of each species; also used for just species richness.
- species richness (n): the number of species in a given area (cf. species diversity).
- Spot-mapping Method: a census procedure that plots individuals seen or heard on a gridded map of the area surveyed, usually over a period of days or weeks in a season; and, relying on simultaneous observations, the subsequent demarcation of individual territories or home ranges by examination of the clustering of those observations. Used in Breeding Bird Census. (Syn. Territory-mapping Method) For further information on terms and procedures see Anon. (1969), Robbins (1970), or Svensson (1979).
- station (n): the area within which observations made from a point are recorded by the observer (or often synonymous with "point," see Point Count Methods).
- Strip Transect Methods: a procedure using a strip of land of fixed direction that is sampled visually and/or aurally by an observer; counts may be: *Fixed Distance (Width) Counts* limited to a strip of set width for all or specially chosen species; *Variable Distance (Width) Counts*, with different, species-specific widths that are determined to reflect detection attenuation; or *Unlimited Distance Counts*, all detections recorded regardless of distance. (Syn. belt-transect).
- survey (n): an enumeration or index of the number of individuals in an area from which inferences about the population can be made (cf. census, count).
- Territory-mapping Method: See Spot-mapping Method.
- transect (n): a cross-section of an area along which the observer moves in a given direction; see line transect, point transect, and strip transect.
- Variable Circular Plot: see Point Count Methods.
- Variable-distance Methods: See Strip Transect Methods and Point Count Methods.
- Winter Bird Population Study (U.S.): A Program of the National Audubon Society involving census of wintering birds by counting and mapping, but not depending on persisting territory or home range occupation (cf. Breeding Bird Census).