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JOURNAL OF OREGON ORNITHOLOGY: PURPOSE, PUBLISHING ISSUES, BASELINE AND SITE-SPECIFIC DATA, TOLERABLE OBSERVATION EFFORT (TOE), FREQUENCIES, AND SHORTCOMINGS

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ABSTRACT.--This article is an introduction to the purpose and structure of the Journal of Oregon Ornithology.

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This article is dedicated to the memory of my parents, Don F. and Ruth E. Bayer.

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Chap. 1. PURPOSE OF JOURNAL OF OREGON ORNITHOLOGY (JOO)

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1-A. PURPOSE

The purpose of Journal of Oregon Ornithology (JOO) is to publish articles based on Oregon field studies about the details of bird distribution, migration, abundance etc. that haven't been, or are unlikely to be, published elsewhere. JOO differs from Studies in Oregon Ornithology (SOO) in that SOO is devoted to individual monographs.

JOO's purpose is not to overlap or compete with other publications but to publish baseline data in much more detail than is currently done (Chap. 3). Theses will not be published in JOO because they are already published, but data gathered during thesis research and not included in the thesis may be acceptable.

The existence of JOO will hopefully encourage observers to publish the results of repeated observations for a year or more at a particular site, even if the site is as mundane as the observer's backyard. JOO papers will usually not be just raw data; papers will also include site characteristics, methods of observations, shortcomings of observations (Chap. 7), and simple analyses.

If ornithological baseline data for Oregon could be stored or published by someone else so that they were both safe from being lost or destroyed and easily accessible (Chap. 3), I would not be starting JOO.

The idea for JOO (and SOO) originated in my use of the Oregon State University (OSU) Hatfield Marine Science Center Library. In particular, the OSU School of Oceanography has a Data Report Series that includes data with some analyses; there are also other similar data report series published by various state and U.S. or Canadian government agencies. While data reports seem common in other areas of science, I haven't seen one for ornithology or for Oregon science that JOO or SOO material could fit into.

The purpose of JOO is not to make money. Although JOO and SOO are technically published by a "commercial" press, Gahmken Press; not one of the SOO monographs has paid even for the cost of printing, and I don't expect JOO to break even either. Authors in JOO or SOO (other than myself) do not contribute to the cost of publication, and Gahmken Press doesn't request or receive grants. Gahmken Press is a "commercial" press because it is too small to have the resources to satisfy all the paperwork and other requirements necessary for it to become a nonprofit organization.

Not everyone may agree that the publication of JOO is worthwhile. In the last two decades there has been a proliferation of journals and articles in science, so that the scope of scientific publications is being debated (e.g., Costa and Sylvester 1993 and the following papers cited therein: Broad 1982, Holden 1987, Abelson 1989, Merriman 1989, Hamilton 1990, McDonald 1990, Mermin 1991, Pendlebury 1991, Dougherty 1992, Maddox 1992). Some may view JOO as adding to the problem, especially since there will be few readers and its articles won't have a great impact on science (e.g., Costa and Sylvester 1993). However, I feel that the publication of JOO is justified for the following reasons:

1) JOO will publish baseline material not published or publishable elsewhere; this type of material is endurable and will continue to be of value,
2) JOO is not published for commercial or for private gain
    a) most, if not all, JOO authors will be amateurs who are interested only in sharing their observations and will not be paid for their papers
    b) JOO won't attract professional researchers writing articles only to secure tenure, grants, or awards because JOO is not prestigious or peer-reviewed
    c) JOO is not funded by taxes or grants and doesn't compete for funding
    d) JOO is donated to several libraries
    e) JOO prices are not unreasonable but are set in an attempt to cover only the cost of printing, not anyone's salary.

The material slated to be included in JOO could theoretically also be published electronically on a computer bulletin board or computer network such as Internet (e.g., Mermin 1991, Maddox 1992, Costa and Sylvester 1993). However, this isn't currently feasible for me. Even if it was, I would worry about how well electronic connections would endure.

Publishing paper copies of JOO that can be electronically scanned into computer files or read directly by humans provides a reasonable and flexible option that is presently feasible.

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1-B. REASON FOR NAME OF JOO

The format of SOO could be changed from its current monograph format, so that each issue could include short, often unrelated papers as is proposed for JOO. In consulting with librarians, however, I discovered that to do so would lead to confusion in library cataloguing, especially for the eight SOO issues already published.

Accordingly, I decided to initiate JOO as a separate publication in the hope that it will be easy for librarians to catalog and put on library shelves for readers.

The name JOO was chosen because it is similar to SOO, so that they can appear like linked publications, which they are. SOO is for monographs; JOO for shorter articles. The names for JOO and SOO can, unfortunately, be confused with "Oregon Fund for Ornithology" (see 1988 Oregon Birds 14[4]:315), which is run by Oregon Field Ornithologists, who also publish Oregon Birds. JOO, SOO, and Gahmken Press are not affiliated with and do not receive funding from any of these entities. The problem is of convergence, not that I have tried to emulate their names; afterall, there are only a few ways that "Oregon" and "bird" or "ornithology" can be put together into a brief, descriptive series title.

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1-C. AVAILABILITY OF JOO

The primary way that JOO will be available is through libraries, either directly or via interlibrary loan. JOO will be donated to about six Oregon libraries and the Josselyn van Tyne Memorial Library of the Wilson Ornithological Society at the University of Michigan.

Published issues of JOO will also be available for sale on an issue by issue basis--there will be no subscriptions. But JOO sales will probably be very low because at the start of 1992, a total of only 16-40 copies were sold of each issue of SOO. These low sales are in spite of SOO announcements of publication or reviews published in Oregon Birds, Northwest Naturalist, Ornithological Newsletter, Recent Ornithological Literature (supplement to Auk), Small Press Record of Books in Print, Wildlife Review, and Zoological Records.

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Chap. 2. JOO PUBLISHING ISSUES: COPYRIGHT, AUTHORSHIP, AND REPETITIVE PUBLICATION

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2-A. COPYRIGHT LAW AND SCIENTIFIC ETHICS

The purpose of copyright law is to protect the copyright holder from unauthorized use of copyrighted material (Sitarz 1989:25-66, Fishman 1992). Perusal of the copyright page on books and magazines indicates that they are usually copyrighted with "All Rights Reserved" and that permission to use any material must be requested.

In scientific publications, almost all material (except that by government biologists) is also copyrighted and is indicated as such. Unauthorized use of such material is not only illegal, but a violation of scientific ethics (CBE 1978:8, Day 1979:111-112, Smith 1984:49).

In JOO and SOO, the purpose of publication is not for personal gain but to freely disseminate information, so that it can be readily used in databases or by whomever wishes to use it. It is doubtful that any JOO or SOO publication will ever be the basis for a movie or any other money-making venture, so the protection of copyright law isn't needed. Further, potential users of JOO or SOO material may be discouraged from doing so if they have to try find the copyright holder to obtain permission, which may be particularly difficult if the author is deceased or has moved.

Since copyright law is written such that a copyright is automatically assumed even if the copyright or copyright symbol is not given, it is essential that if the copyright holder wishes free use of the material that this must be very explicitly stated in a sort of un-copyright (e.g., see un-copyright notice in SOO Nos. 5-8).

Before publication, the author copyrighting the paper will be requested to make a choice of copyright statements and to allow the article to be published in JOO (e.g., see Table 2.1).

If an author agrees, his or her article in JOO will probably have a copyright statement such as the following:

> "Without charge, permission is freely given to anyone to use any means to copy part or all of this article as long as this article is credited as the source."

Such a statement will hopefully allow the free, unimpeded use of the material now and in the distant future, while still giving the authors due credit.

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2-B. AUTHORSHIP

The issue of who to list as authors and in what order to list them is not straightforward (e.g., CBE 1978:8, Dickson et al. 1978, Day 1979:15-17, Bishop 1984: 76-78). Authors in ornithological research are often listed in the order of their importance to the writing of the paper, and a person making observations important for a paper may not even be listed as an author, if he or she didn't help write it. Observers not listed as authors are usually listed in the acknowledgements of such papers.

The situation for JOO is different because observers often may not have the time, energy, interest, or experience to write up their own results. In this case, I will often do the writing, and the observer will be asked to review preliminary drafts at least once. In many cases, the observer will be listed as the first author, I as the second.

Another difference will be that the role of each author in the research and publication of the paper in JOO will be explicitly stated in a section, "Authors' Division of Labor." This should make it clear about who is responsible for what.

In JOO, observers that are not included as authors will still be cited, if feasible, in the paper.

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2-C. REPETITIVE PUBLICATION OF RESEARCH RESULTS

One breach of ethics in science is to publish the same material more than once (Day 1979:109-110, Bishop 1984:79-80, Smith 1984:49-50; 1982 Condor 84:135). This will hopefully not be a problem in JOO because there will be little incentive for authors to win grants or gain tenure by publishing in a small, non-prestigious journal like JOO that is not peer-reviewed. Further, to try to minimize this problem, authors will usually be asked before publication if the material has been previously published (e.g., Table 2.1).

One purpose of JOO is to publish data or results that would not be publishable elsewhere; in particular, details of observations. Since other journals don't publish details, it is possible that a researcher may publish just the observational data in JOO and try to publish the analyzed data elsewhere. This shouldn't be a problem as long as the author notifies the journal's editor of this and there is no or minimal duplication in publication. In this case, the JOO article can serve as a data archive.

In conclusion, repetitive publication is a serious matter of concern, which a JOO author can avoid by not publishing graphs, conclusions, or results in JOO that he or she will also want to publish elsewhere.

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2-D. TABLE

Table 2.1. Example of request to author for his/her choice of copyright statement, statement that the material hasn't been previously published, and release of publication to JOO.

P. O. Box 1467
Newport, OR 97365 USA
(date)

(author & author's address)

Dear (author):

The article cited below that is based on your observations is being prepared for publication in Journal of Oregon Ornithology. Before publication, we need to agree on a Copyright statement. I hope that you will agree to option #1 to allow anyone to freely use material in the article, so that the material can be freely copied or incorporated into databases and be readily available to whomever wishes to use the article.

Please respond promptly. A stamped envelope addressed to me is enclosed for your convenience in replying.

Thank you for your time and consideration.

Yours,

Range D. Bayer (265-2965)

Please check one Copyright option for (Author[s]. Year. Title of Article) to be published in Journal of Oregon Ornithology:

#1: [ ] Copyright © 1993 by (author). Without charge, permission is freely granted to anyone to use any means to copy part or all of this article as long as this article is credited as the source.

#2: [ ] Copyright © 1993 by (author). All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, photocopying, recording or otherwise without prior written permission.

#3: [ ] Copyright © 1993 by (author). [Your wording.] ____________

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I, the undersigned, affirm that this article is based on my own research and that this material has not been previously published; I allow this article to be published in Journal of Oregon Ornithology, expect three complimentary copies of my published article, and choose Copyright Option #____ selected above.

Signature of (author) ________________ Date of Signature ________________

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Chap. 3. BASELINE DATA

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3-A. INTRODUCTION

"Baseline data" or "databases" are terms frequently used, but not often defined. Baseline data about birds can be considered as information that is basic and fundamental to understanding the biology of a species. For example, information about seasonal occurrence, distribution, clutch sizes, nesting success, and nesting chronology are baseline data.

There are three essential parts to having baseline data:
1) the data must be collected,
2) the data must be understandable,
3) the data must be accessible.

These aspects are examined in the following sections.

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3-B. COLLECTION OF BASELINE DATA

It is beyond the scope of this paper to go into the details of how to collect baseline data, but observations should be systematic (section 5-B), observation effort should be sufficient to detect at least most common species (section 5-C), and observation effort should be measured and relatively consistent (section 5-D). Further, before attempting to collect baseline data, it is essential to establish the goal of the research (e.g., see Verner 1985:249), so that observation design and methods can match the objective.

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3-C. UNDERSTANDABLE DATA

Systematic observations are not sufficient to constitute baseline data if they are not understandable. Undecipherable data can result from illegible handwriting, inadequate explanation of the meaning of codes and abbreviations used in recording data, or carelessness in not recording the date and/or site for each set of data. The meaningfulness of data is also diminished if details of the methods of observation and any changes in them are also not documented and placed with the data. Finally, the researcher(s) should add an explanation of the shortcomings of the observations (e.g., see Chap. 7), so that it is clearer what might have been missed or overlooked.

A goal of JOO is to give data that are understandable by attempting to clearly describe study sites, observation methods, data presentation, and shortcomings. Consequently, JOO articles will not be as tidy and concise as those in ornithological journals, whose purpose is generally to serve as summary reports, not baseline data.

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3-D. ACCESSIBILITY OF BASELINE DATA

A common complaint among Oregonians is that there aren't many baseline studies of Oregon birds. This complaint is, however, only partially valid--there is clearly a shortage of **accessible** baseline data. There have been many good observers in Oregon over the last century that recorded their observations--the problems have been the storage and dissemination of their baseline data. For example, much baseline data have been lost or destroyed or are simply not available because there hasn't been a good place to archive data. Also, many observers are so proprietary about their data that they never allow anyone else to use them. Other baseline data are not accessible because they are not readily locatable--data storage sites and their contents haven't been inventoried and published. Finally, some data are relatively inaccessible because they are only available by personally visiting distant museums.

One purpose of JOO is to serve as an archive of accessible baseline data. JOO data are accessible by not only being distributed among several Oregon libraries, but also because copying of the data will usually be freely allowed (section 2-A).

Chap. 4. RECORDING DATA BY SITE, LIFE ZONES, PHYSIOGRAPHIC PROVINCE, HABITAT, ETC.

4-A. INTRODUCTION

A goal of the Journal of Oregon Ornithology (JOO) is to present information that is as site or habitat specific as is feasible. Some readers may question the practicality of listing records for individual sites or habitats because records could be made more concise by pooling them. But the brevity gained by pooling is lost in the generality of results that may not be applicable to any particular site or habitat.

In JOO, information about the dominant vegetation, elevation, and site will also be listed to allow the reader to assign records to a particular classification such as a Life Zone or Physiographic Province.

In this Chapter, the reasons for recording data by site, Zone, Province, or habitat are examined.

4-B. IMPORTANCE OF SITE SPECIFIC RECORDS

There are several reasons why records should be listed separately for individual sites. First, in compiling records for various sites in Lincoln County, I have concluded that many sites have their own peculiar mixture of birds. Thus, the most accurate way to determine what birds are present at a site is to have records for that site--not to predict what birds are present on the basis of information pooled from many sites, even if they are seemingly similar.

Second, site specific records are essential in accurately determining the residency status of a bird species for that site. Although residency is often pooled for large areas, residency may vary widely among nearby sites. For example, in Lincoln County, White-crowned Sparrows are present year-around at some coastal sites, summer residents at some coastal and inland sites, and spring migrants at other inland sites. At first, I thought this residency variation among nearby sites was exceptional, but I am finding it to be true for many other species as well. This diversity in seasonality among sites is also illustrated in McCaskie et al. (1979) for northern California, in Garrett and Dunn (1981) for southern California, in Bayer (1983) for Western Grebes and Brant within Yaquina Estuary, and in Shuford et al. (1989:238-240) for several species of aquatic birds in California.

Third, site specific information is important in conservation issues. For example, Environmental Assessments, Environmental Impact Statements, or controversies surrounding a proposed development usually center around what birds are, or are thought to be, present at the site in question. Usually, site specific information is not available, so planners are less able to determine the impact that a development might have and plan accordingly. The British have long recognized the importance of site specific information in conservation issues and have established a "Register of Ornithological Sites" for birders (Fuller 1982:215). It is unfortunate that there has not been more of an effort in Oregon to establish sites for which birders could keep site specific records.

Fourth, resource managers often would like to know what birds are present at a site, so that they could manage the site or prepare brochures for the general public about what birds are present. As it is, they often have to rely on what they think may be present, rather than what actually is. For example, I have been contacted several times about birds present at various sites in Lincoln County and have been able to sometimes help with information specific to the site in question.

Fifth, bird records for a site are essential in determining changes in bird communities when the habitats at a site change. Because logging, farming, human development, or vegetation growth may alter the habitats of a site; it can be expected that birds found at a site may also change over a period of time. To document this change, site specific records are more accurate than comparing different sites with different habitats.

Sixth, and perhaps foremost, data should be kept separately for individual sites because such data can always later be pooled, but pooled data can not later be separated for individual sites.

Ideally, each site should be well-described and also be within a distinct, well-defined habitat, so that site specific records are also habitat specific, but this isn't always feasible (section 7-B).

4-C. ZONES, PHYSIOGRAPHIC PROVINCES, ETC.

4-C-1. INTRODUCTION

Plants and animals have often been separated into a profusion of categories based on environmental variables and plant and animal associations or communities. Some of these classifications as applied to Oregon are described in the following sections.

4-C-2. LIFE ZONES

Life Zones are characteristic associations of plants and animals in belts of similar temperature with plants often used as indicators of a particular Zone (Gabrielson and Jewett 1940:31, Miller 1951:532-540). The Zones for Oregon include, in order of generally increasing elevation: Sonoran, Transition, Canadian, Hudsonian, and Arctic-Alpine (Bailey 1936, Gabrielson and Jewett 1940:32).

Life Zones are a useful ecological concept in categorizing communities that deserve attention because ornithologists have a tendency to forget that birds are intricately tied to their physical and biotic environment. Although bird species are usually not unique to a particular Zone, they often differ in distribution among Zones (Bailey 1936:36-40, Miller 1951:534-539). In Oregon, the number of breeding bird species is strikingly less in Zones of higher elevation than in the lower Transition Zone (Table 4.1); this is also true in California (Miller 1951:539).

One problem with Life Zones is that they are difficult to apply under field conditions as Zones often merge into each other, so that the demarcation between Zones may not be clearcut. Further, Zones can be influenced by more than just elevation; for example, higher, colder Zones may extend down canyons and lower, warmer zones may creep up ridges with southern exposure (Gabrielson and Jewett 1940:32).

A second problem is that in Oregon, the Zones of large areas have been oversimplified. For example, Bailey (1936) and the map accompanying Gabrielson and Jewett (1940) based on Bailey indicate that virtually all of Oregon west of the Cascades is in the Transition Zone. In their text, Gabrielson and Jewett (1940:35) indicate that along the Oregon Coast the Canadian Zone only occurs in the narrow coastal strip of lodgepole pines and a few islands on the highest peaks in the Coast Range. However, the Canadian Zone may be more widespread in the Coast Range that these authors were aware of. For example, I have found plants indicative of the Canadian Zone such as Pacific silver fir, noble fir, white pine, and rhododendrons above about 2500 ft (762 m) on Saddle Bag Mountain in Lincoln County, and these areas are greater than what I would term mere islands. Islands may better describe areas of the Hudsonian Zone in the Coast Range; for example, mountain hemlock, an indicator of the Hudsonian Zone, grows near the top of Mary's Peak in Benton County's Coast Range. Bailey, Gabrielson, and Jewett may not have been unaware that the elevations of Life Zones can be lower in the Coast Range than in the Cascades; for example, in Washington, the Canadian Zone starts at about 2800 ft (853 m) in the coastal Olympic Mountains but at 4500 ft in the Cascades (Lyons 1956:14).

Table 4.1. Number of breeding bird species in some Life Zones in Oregon. These data are calculated from Bailey (1936:36-40) and could be outdated but continue to serve as a rough guide.

Number of Breeding Bird Species...				
Transition Zone, Division.......		Canadian Zone, Humid Division	Hudsonian Zone	Arctic-Alpine Zone
Coastal Strip	Humid			
69	88	46	5	2

4-C-3. ECOLOGICAL LIFE ZONES

A different set of Life Zones based on elevation, biotemperature, and precipitation that were developed by Holdridge and Hanson are discussed and illustrated in Loy (1976:146). These Zones have the same kinds of problems as those in section 4-C-2.

4-C-4. FRANKLIN AND DYRNESS' ZONES

Franklin and Dyrness (1973) divide Washington and Oregon into various Vegetation Zones; their classification is also illustrated in Loy (1976:144-145). Each of these Zones is the area in which a plant species or group of plant species become dominant under normal natural conditions (Loy 1976:144), so that these Zones differ in location from the Life Zones previously mentioned. These Zones have the same kinds of problems as those in section 4-C-2; in short, bird communities may differ significantly within each of their Zones.

4-C-5. ELEVATIONAL ZONES

Zones based solely on elevation could also be used because there is a general trend of bird species being limited to certain Life Zones with the higher Zones having less diversity (section 4-C-2; Table 4.1). This trend of decreasing diversity with elevation has also been discussed without respect to Life Zones (e.g., MacArthur 1972: 107, 137-140, Massa and Federigo 1989, Finch 1991, Stevens 1992). Of these, only Massa and Federigo (1989) is for birds during the nonbreeding season.

Unfortunately, the change in bird diversity or numbers with elevation has apparently not been studied in Oregon, so it is not clear how these Zones should be demarcated. Research modeled after Massa and Federigo's (1989) point counts for making a winter bird atlas in Italy would be helpful.

But even if a system of Elevational Zones could be set up, they would probably have the same problems as other Zonation systems--they would be simplifications.

4-C-6. PHYSIOGRAPHIC PROVINCES

Franklin and Dyrness (1973:5-6) divide Oregon into 10 Physiographic Provinces, based on classifications of earlier researchers. Currently, nine Physiographic Provinces are used by the Nature Conservancy's Oregon Natural Heritage Database and the Oregon Department of Fish and Wildlife (Marshall 1983).

The problem with these Provinces is that they pool many disparate sites. For example, Lincoln County as well as much of the rest of the Oregon Coast north of Curry County falls within the Oregon Coast Range Province (OCR)(Marshall 1983). Accordingly, Oregon Coast sites that include habitats such as estuary, rocky intertidal, old-growth forest, freshwater marsh, etc. are all pooled into the OCR. Certainly, there can be major differences in bird distribution among sites with such diverse habitats.

4-C-7. OTHER CLASSIFICATIONS

Oregon can also be subdivided into a bewildering number of other ecological categories on the basis of additional variables such as land capability, temperature isotherms for the coldest month, warmest month, or average annual temperature range, and precipitation trends (see Loy 1976: 126-127, 130-133). Other classifications such as Biomes and Districts could also be employed, but discussing all these possibilities is beyond the scope of this article.

4-C-8. CONCLUSIONS

A lot of time and energy can be spent in debating or trying to apply these various classification systems, each with its own merits. But rather than becoming caught up in these systems, articles in JOO will simply try to give enough information about the site that it can be categorized by one of these systems at the reader's disgression. I feel it is better to record data for specific well-defined sites than by conceptual categories that are not always clear in the field because data for sites can always later be pooled, but data recorded only for a Life Zone or Province cannot be later separated for individual sites.

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4-D. HABITATS

4-D-1. INTRODUCTION

JOO will have as habitat specific records as is feasible, but meaningful habitat specificity is more difficult to obtain than site specificity because the borders of a site can be physically defined but the "boundaries" of a habitat are more intellectual. Further, most data in JOO will be by amateur birders, who don't have the time to bird and keep records for separate, well-defined, homogeneous habitats away from ecotones.

Difficulties in obtaining habitat specific records are examined in the following sections.

4-D-2. CONFLICTING MEANINGS OF HABITAT

Habitat is a widely used human abstraction that is often misunderstood because people forget what it means and use it in different ways.

Technically, habitat is the area where an individual organism lives, but habitat is usually broadened to include areas or types of areas where individuals of a species live (henceforth termed a species' habitat).

In practice, people usually define habitat by human standards; for example, an estuary, river, field, coniferous forest, etc. Habitats with this kind of definition are very similar to what Miller (1951:540) referred to as Ecological Formations. In any case, with a humanly defined habitat, the relationship between habitat and the organism or species may be lost or obscured. For example, one Great Blue Heron can feed at an estuary during low tide, forage at a river or farm pasture during high tide, nest in a second-growth forest, and rest in a deciduous forest. Each of these areas can be humanly defined as a separate habitat, but properly they are all included in the single habitat of that individual heron. Neighboring herons may use different areas and may thus have different habitats.

People often assume that animals using the same humanly defined habitat have similar needs, distribution, or abundance. This can be erroneous; for instance, a Great Blue Heron can certainly differ in distribution from a Black-capped Chickadee, although both may often be found in the same deciduous tree.

While the distinction between habitat based on an organism's use and that based on human expediency may seem picayune, it points out a frequent problem of humanly defined habitats. People use them broadly, ignoring their biological meaning, and then mistakenly assume them to be useful in predicting a species' abundance or distribution. Thus, it is not surprising that researchers are finding that humanly defined habitats ascribed to bird guilds or communities may inaccurately predict the distribution and especially the abundance of a particular aquatic species (Shuford et al. 1989:238-240) or terrestrial species (e.g., Morrison 1983, Mannan et al. 1984, O'Neil and Carey 1986, Van Horne 1986, Morrison et al. 1987, Koskimies 1989, Nelson 1989:46-55, Avery and Van Riper 1990, Sedgwick and Knopf 1992).

Another example of the discrepancy between a humanly defined habitat and a species' habitat is that the abundance of a species in a particular humanly defined habitat may not be a measure of the importance or quality of that habitat for a particular species (Van Horne 1983, Hobbs and Hanley 1990, Vickery et al. 1992).

To determine a species' habitat is not an easy task and may require measurements of variables such as branch density, length, width, and thickness that the researcher may not be able to predict or easily measure (e.g, Sedgwick and Knopf 1992).

4-D-3. HUMANLY DEFINED HABITAT PROBLEM: ECOTONES, MOSAICS, AND PATCHES

Too often, people have sat at a desk and defined habitats that they thought were distinct. However, field workers find that these arm-chair habitats are difficult to use in a landscape with broad ecotones between habitats, habitat mixtures (e.g., interspersed coniferous and deciduous forest), or variable sized habitat patches. This is particularly true in the Oregon Coast Range, which is a patchwork of forests of variable ages and shapes with intermingled clearings, roads, houses, streams, marshes, or ponds. The unevenness of the Coast Range terrain, elevation, and distance from the Pacific Ocean are additional variables that contribute to the diversity of the landscape.

Accordingly, it needs to be recognized that large areas such as the Oregon Coast Range may not always be separable into distinct, homogeneous habitats. Since bird densities within Coast Range ecotones may be markedly different than in neighboring homogeneous habitats (e.g., Hansen et al. 1990), the results of researchers who have intentionally studied fairly homogeneous habitats away from ecotones may not be very applicable to more heterogeneous sites, ecotones, or small habitat patches.

4-D-4. GUIDELINES FOR USING HUMANLY DEFINED HABITATS

Although the ambiguity and confusion in the habitat concept can cause one to give up, the concept is useful. If the distinction between a humanly defined habitat and one defined by a species' needs can be kept in mind, there are some guidelines that could enhance the usefulness of humanly defined habitats. First, habitats should be described, so that it is clear what researchers mean or include in each habitat; some Oregon habitats are defined in Maser et al. (1981:33-34).

Second, site specific information should be recorded for each site, so that it may be possible to at least roughly correlate with species' habitats. For example, one commonly used humanly defined habitat is "coniferous forest"; however, this does not distinguish among species of forest trees (e.g., spruce or Douglas-fir) or among ages of forest. This is unfortunate because it is clear that forest age can dramatically influence the abundance or distribution of some forest bird species (e.g., in the Oregon Coast Range: Morrison and Meslow 1983, Nelson 1989, Hansen et al. 1990, Carey et al. 1991).

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Chap. 5. OBSERVATION EFFORT, PRESENCE/ABSENCE DATA, TOLERABLE OBSERVATION EFFORT (TOE), AND DISCONTINUITY ANALYSIS

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5-A. INTRODUCTION

A goal of the Journal of Oregon Ornithology (JOO) is to provide baseline data to establish the monthly presence, and possibly absence, of bird species.

Most JOO papers will probably not include systematic observations or censuses. Accordingly, it is appropriate to examine how these "messy data" can be analyzed fully, to reduce the risk of mistakenly overanalyzing and misinterpreting them.

In the following sections, various aspects of observation effort are examined, to allow a better understanding of the potential errors of data analyses.

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5-B. SYSTEMATIC OBSERVATIONS

To make systematic observations, observation effort needs to be consistent (Table 5.1). Otherwise, variability in methods can lead to variability in what birds are recorded, even though the birds present may be the same.

In practice, it is very difficult to always be consistent because of factors beyond the observer's control; thus, observations may only be partially consistent (e.g., the same study area with the same observation and recording methods). Accordingly, it is important to record, acknowledge, and accept variance in observation effort as one reason for variance in bird presence. The problem is in determining when variation in methods can influence results.

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5-C. OBSERVATION EFFORT AND DETECTION OF SPECIES

5-C-1. INTRODUCTION

It is often overlooked that it is not feasible to detect all species that occur at a site because birds are mobile and researchers have limited observation time and resources. It is predictable, however, which species will be missed--those that are infrequent or inconspicuous. The rest of this section explores the role of observation effort in detecting species.

5-C-2. OBSERVATION DURATION AND NUMBER OF SPECIES DETECTED

Bird censusers usually choose to count birds at a point for 3-10 min (e.g., Scott and Ramsey 1981, Hutto et al. 1986, Robbins et al. 1986:10-11, Manuwal and Carey 1991:2) to reduce the chance that birds are counted more than once.

Such short counts can also be justified because about 90% of bird species detected during the average 20-32 min observation were recorded in only 8 min in forests in Washington (Manuwal and Carey 1991:2) or in only 15-20 min in Hawaiian forests (Scott and Ramsey 1981), in Mexican woodlands (Hutto et al. 1986:596), and at a Newport residential lot (Fig. 5.1A). However, this kind of analysis is very misleading if one is interested in determining all bird species present at a site because the number of new species continues to increase greatly after even a 30 min watch. For example, at a Newport residential lot, an average of only 42% of the total taxa detected during 5.5 hr (11 30-min watches) was recorded in a 10 min watch and an average of only 54% were noted in a 30 min watch (Fig. 5.1B).

Further, justifying short observation periods because they each may have a high percentage of the number of species seen during 20-32 min observations is most appropriate during months when there are few immigrating species. For example, the cumulative percentage of taxa recorded at a Newport residential lot was consistently higher in July during the breeding season than in September, during fall migration (Fig. 5.2).

5-C-3. TOTAL OBSERVATION EFFORT AND NUMBER OF SPECIES DETECTED

The important variable in detecting most bird species is total observation effort, not just the duration of observations. For example, Verner and Ritter (1985:55) write that the initial rapid increase in the number of new species with increasing effort under their study conditions lasted until about 2-3 hr of total effort, and the rate of adding new species dropped to less than 1% after 5.4 hr of point counts or 14.2 hr of line transects. Similarly, at a Newport residential lot, the initial high rate of adding new taxa also declined by about 3 hr of observations, but new taxa continued to be added thereafter (Figs. 5.2 and 5.3).

Verner and Ritter (1985:64) indicate that there are no objective criteria to use to determine how long of observation effort is required to detect all species. They suggest that a measure of adequate effort may be when the rate of adding new species drops below 1%, but they don't explain if this is 1%/hr or what. Under my observation conditions, the rate dropped to 0%/hr for 2.5 hr with about 20% of the species still undetected (Fig. 5.3). Thus, it can't be assumed that the cumulative species curve is as smooth or flat as is shown in Verner and Ritter (1985:50, 55).

Another measure of adequacy of effort could be the slope of the increase in the number of new species; for example, if the slope is less than 1.0 species/hr for a period of four hours or more. Including several hours is necessary to eliminate the possibility of false plateaus as shown in Figs. 5.2 and 5.3.

5-C-4. OBSERVATION EFFORT AND NUMBER OF OBSERVATIONS

Many observations are necessary to statistically determine differences among frequencies of occurrence (section 6-D-2). One way to increase the number of observations is to shorten observation duration; for example, by decreasing observation duration from 30 min to 15 min, the number of observations can be doubled for the same total observation time. Although such alterations may allow some statistical analyses, the only way to increase the total number of species detected is to increase total observation time.

5-C-5. OBSERVATION EFFORT AND TIME SCALE

For a given observation effort, the apparent adequacy of total effort may differ markedly by the time scale over which the observations occur (e.g., week, month, or season). For example, if the 9 hr of observations in Fig. 5.3 had been done during a single week, instead of a whole month, the plateau at 4.0 hr may have remained constant, so that this effort would have been a good measure of the total species present during that week. This is because the possibility of new immigrant species increases as the time scale increases; this would be particularly important during months with many migrants or vagrants such as April (see Fig. 5.3).

On the other hand, if the researcher is interested in the bird species present during the whole month, extrapolating the number based on a sample of a single week would be inappropriate because immigrants occurring during the month but not during the week would be missed. In this case, the researcher needs to accept the less smooth results of Figs. 5.2 and 5.3 and to recognize that sampling throughout the month is important to detect all species that may occur that month.

The importance of time scale also needs to be considered if the researcher wishes to improve the chance of detecting species by increasing observation effort. To increase the chance of detecting most species during a particular time period, additional observations should be added during the time period, not added after it, because later observations may result in detecting species that were not present during the initial time period.

5-C-6. NONDETECTION OF INFREQUENT SPECIES

For a given number of observations of fixed duration, the minimum frequency detectable can be estimated (Table 5.2). For example, if there are 10 observations, each of 0.5 hr, then species with frequencies of 25% or less/0.5 hr have a high probability of being missed (Table 5.2). It is important that the frequency per observation duration be specified because the frequency will change as the duration changes (e.g., 12.5%/0.25 hr, 25%/0.5 hr, and 50%/hr are equivalent). Note, however, that the minimum number of observations may not change linearly with the change in percentage/time (e.g., 12.5%/0.25 hr requires 23 observations [sum of 5.75 hr], 25%/0.5 hr requires 10 observations [sum of 5.0 hr], and 50%/hr requires five observations [sum of 5.0 hr][Table 5.2]).

The number of infrequent species that are missed can also be very roughly estimated. For instance, if there are 10 observations of 0.5 hr each, there are a total of 5.0 hr of observation; from Fig. 5.3, this indicates that about 20% of the species detected with 9.0 hr of observations were missed. Since more species would probably be detected after 9 hr of observation, the 20% would be the minimum percentage missed. As more graphs of cumulative species with cumulative hours of observation become available for more areas and more time periods, the researcher may be better able to estimate the percentage of species missed.

Another way of crudely estimating the number of species missed is to use the slope of the graph of cumulative species vs. cumulative observation effort to extrapolate the number of new species that may be seen. For example, if four species were recorded during the final four hours of observation (i.e., slope=1.00 species/hr), then it is reasonable to estimate that four new species would be detected in the next four hours. As indicated previously, a long interval such as four hours may be necessary to avoid false plateaus as shown in Figs. 5.2 and 5.3. Extrapolating beyond the time interval used to calculate the slope will lead to a cruder estimate because the rate may change, and the slope may not always decrease (e.g., compare slopes for the cumulative percentage between 3.5-7.5 hrs with 5-9 hrs in Fig. 5.3).

5-C-7. CONCLUSIONS

One must know the goal of one's research, if there is to be any chance of the goal being attained. If the goal is to detect all species at a site, then so many observations may be required that the goal may not be feasible. If the goal is to detect an infrequent raptor or species of concern (e.g., Peregrine Falcon), then many observations may also be needed. However, if the goal is to detect just the most common species, then fewer observations may be satisfactory.

5-C-8. FIGURES

Figure 5.1. Average cumulative percentage of bird taxa seen or heard in a Newport residential lot at cumulative 5 min intervals during my 11 30-min observations during 6-14 April 1992. All watches were done during weather favorable for detecting birds (i.e., mild temperatures, no precipitation, no fog, and no winds greater than about 12 mi/hr [20 km/hr]). Watches were from 0635-1405 Pacific Standard Time. See Fig. 5.3 for data for all of April.

The lot was across the street to the west from 717 SW 6th Street. The lot had some scattered lodgepole pines, two Sitka spruce, and lawns as well as an occupied one-story house. But the lot had no bird feeders or bird nesting boxes. The lot was less than one acre (<0.4 ha), was less than one mile (<1.6 km) from the coastline, and was at an elevation of about 100-120 ft (30-37 m).

These are graphs of the average cumulative number of taxa detected at cumulative 5 min intervals during 30 min observations as a percentage of the total number of taxa detected during:

(A) the average 30 min observation (9.8 taxa)
(B) all 11 30-min observations (18 taxa).

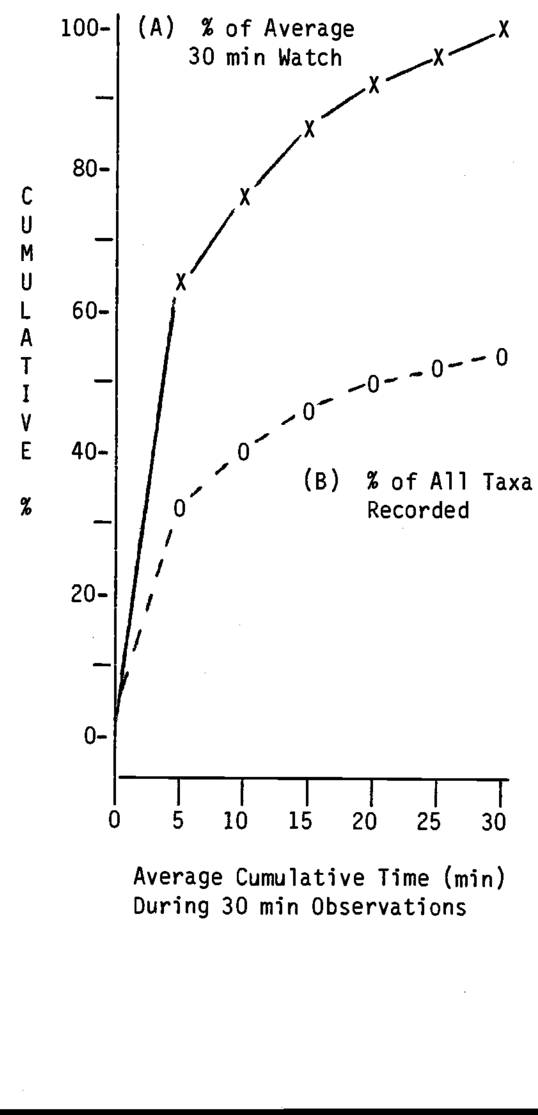


Fig. 5.2. Cumulative percentage of total taxa seen or heard during my cumulative 30 min observations in 1-30 July or 4-30 September 1992 at a Newport residential lot. There were 11 observations each month. See Fig. 5.1 for description of methods.

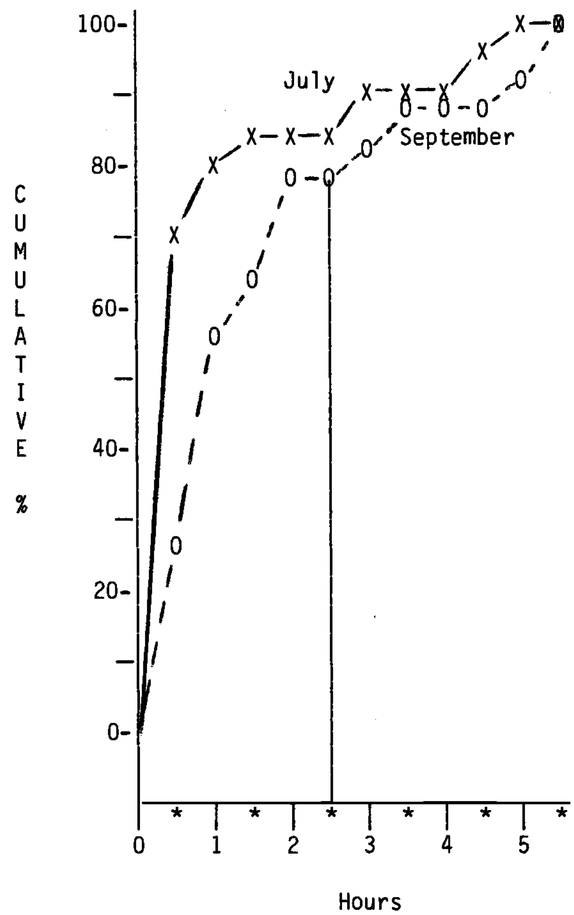
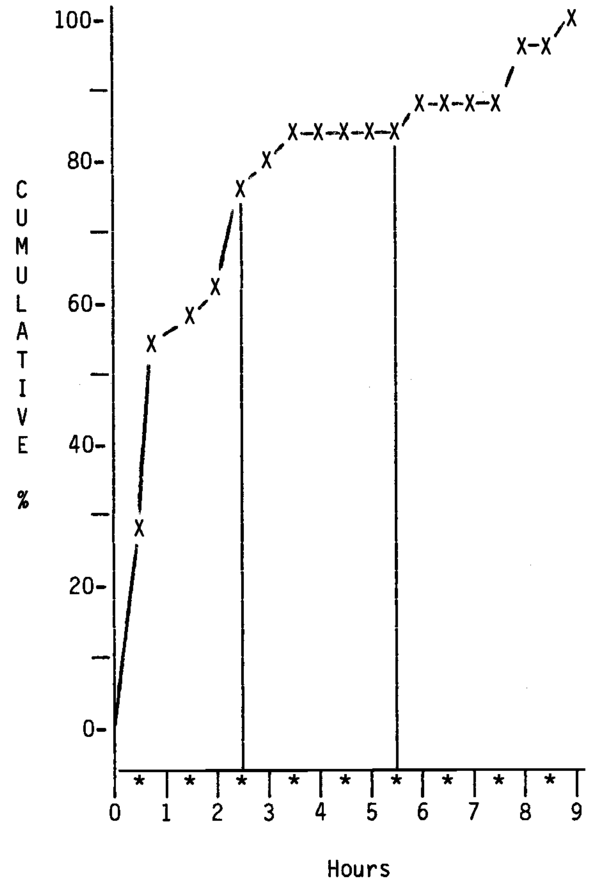


Fig. 5.3. Cumulative percentage of total taxa seen or heard during my 18 cumulative 30 min observations in 1-30 April 1992 at a Newport residential lot. See Fig. 5.1 for description of methods and for results for just April 6-14.



5-D. OBSERVATION EFFORT AND ITS CONSISTENCY

5-D-1. INTRODUCTION

A problem with many ornithological studies is that observation effort and its variability are not explicitly stated. Where possible, JOO papers will give estimates of observation effort.

Another problem in assessing a study is determining which species may have been missed. Although some studies don't deal with this problem, it is a very rare study in which all species present were recorded because so much observation effort may be required (see preceding section). A partial solution is to recognize that it can be estimated which species are the ones most likely to be overlooked, particularly where observation effort is low (e.g., Table 5.3).

5-D-2. MEASURES OF OBSERVATION EFFORT

The amount of observation effort can be estimated by the total or average, if appropriate, for categories in Table 5.4.

Consistency of effort can be measured by a coefficient of variation (CV)(i.e., the standard deviation divided by the average and multiplied by 100 to convert to a percentage) or by the minimum/maximum ratio for these categories. But to have a very meaningful CV or minimum/maximum ratio, five or more observations per month are needed.

A lot of time and effort could be spent in debating the merits or demerits of each measure of observation effort or its consistency. However, I don't think there are enough data currently available to make such a debate worthwhile.

5-D-3. JUDGING OBSERVATION EFFORT

One of the most difficult tasks in critically examining an ornithological study is judging if observation effort is adequate to determine the presence or absence of as many species as may be suggested. Researchers can be wishful thinkers, who feel that their data are better and more complete than they really are.

EXTERNAL STANDARDS.--There are currently not enough external (independent of observer) standards to use as criteria in judging effort.

Some preliminary external standards specific to the Lincoln County Coast Range can be inferred from data in Table 5.5. These data give an estimate of the number of bird species to be expected, especially since the estimates somewhat converge between observers. If an observer records 60%, 70%, or some other percentage of these criteria under similar conditions, then the observer's effort is probably "reasonably" adequate. Unfortunately, standards based on Faxon's and Schrock's observations are not as applicable to more sedentary observers or those observing a smaller study area (e.g., Lamberson's maximum species/month in Table 5.5), so more observations under differing conditions are needed before establishing more external standards.

An additional external standard would be to graph the cumulative percentage of species against cumulative observation time (e.g., Figs. 5.1-5.3). If the graph reaches and maintains a plateau, perhaps most or all infrequent species have been detected; if not, then the number or perentage of infrequent species missed can be roughly estimated (section 5-C-6).

Another external criterion for judging effort is to calculate the monthly frequency of occurrence for each species, tabulate the number of species in five frequency classes (i.e., 1-20%, 21-40%, 41-60%, 61-80%, and 81-100%), and determine how these classes fit Raunkaier's Law (section 6-H). For example, if only 20% of the species recorded in a month by an observer are included in the 1-20% class, effort was probably inadequate to detect infrequent species (section 6-H-6). Although this has the potential for being a reasonable external standard, there are currently too few data to establish at what point effort is inadequate to detect infrequent species, and few observers make enough observations each month (i.e., 10 or more) to calculate meaningful monthly frequencies.

Looking for gaps in the presence of species can also be an external criterion. If many species known to be common were not recorded during a month, then observation effort that month was probably inadequate. This type of analysis (which I call Discontinuity Analysis) is much more difficult than the reader may suppose and may require more information than is currently available (section 5-G).

Other external standards could include comparing the ratios of the monthly or yearly number of bird records/observation or per taxon of an observer with others. Unfortunately, there aren't enough data currently available to make such comparisons, but this kind of information is planned to be given in JOO, so perhaps in the future, such ratios will be useful as standards.

For the time being, external criteria that will be used in JOO for judging observation effort are discussed in section 5-F.

INTERNAL STANDARDS.--Instead of comparing an observer's results with external standards, the adequacy of observation effort could be determined by internally looking at the variation in the observer's results over a period of months and years. Some variance in the number of species/day or species/month could be expected to be the result of migration (e.g., Table 5.5). However, marked differences for the same month between years could indicate that a variation in effort influenced how many species were recorded.

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5-E. PRESENCE OR PRESENCE/ABSENCE DATA

5-E-1. DEFINITIONS

Most papers in JOO will include records of species that were seen or heard at a particular location for a particular date or semimonthly period. Such data are adequate to provide baseline data in establishing a species' presence and, in some cases, its absence.

Presence simply refers to observations in which a species is recorded. The potential error in interpreting presence data is if a species is misidentified, it will be mistakenly recorded as present.

Absence refers to observations in which a species is not recorded. It is considerably more difficult to prove a species' absence than its presence, even if observations are systematic (Table 5.1). For example, an observer may not have the time or resources to prove beyond a doubt the absence of some species in categories #3-5 in Table 5.3.

Absence data are most accurate for diurnal, conspicuous, frequent, easily identifiable species active during the time of observations (Table 5.3); some criteria for describing conspicuousness (e.g., distance to a bird when it is first detected) are examined by Kendeigh (1944:76-77), Ramsey and Scott (1981), Nelson (1989:10, 16-17), and others.

5-E-2. DANGER OF USING PRESENCE/ABSENCE DATA

Although presence/absence data are much more difficult to conclusively establish, they are also much more meaningful in detailing a bird's seasonality of occurrence. Thus, there is a tendency to make data that should be considered only as presence data into presence/absence data. The dangers in doing so are examined in this section.

One danger is in misinterpreting a species' absence. If a species is present during an observation, then it can be considered as being present at the site that day, week, month, and year. In marked contrast, if a species is absent during an observation, it only means that it appears to have been absent that observation; it is a mistake to assume that it means that the species was absent altogether from the site. It may have been present but overlooked, or it may have been present at some other time during the day or on another day (see Table 5.3).

The second danger is concluding that if data are adequate for determining presence/absence for one species or group of species that it is valid to do so for all species. This assumption may only be valid for common, conspicuous species active during the time of observations (Table 5.3). Ideally, the data for each species should be evaluated separately to determine if it is reasonable to consider them as presence/absence data. Unfortunately, there isn't enough information currently available about objective measures of a species' conspicuousness throughout the year to determine the species for which observations should only be treated as presence data. Accordingly, if data are considered as presence/absence in JOO, they will be so for all species. However, the reader is encouraged to keep the danger of doing so in mind.

5-E-3. DISTINGUISHING BETWEEN PRESENCE AND PRESENCE/ABSENCE DATA

INTRODUCTION.--Given the advantages and disadvantages of presence/absence data, it would be helpful if there were objective criteria to determine if data should be treated as presence/absence or presence only. However, I am unaware of any such criteria or of anyone that has tried to deal with this problem. Such criteria will depend largely on how systematic observations are, and this is examined in the following paragraphs.

SYSTEMATIC OBSERVATIONS.--If observations are consistently systematic as outlined in Table 5.1, then each observation could be assumed as giving presence/absence data for a site for species not included in Table 5.3. This assumption is reasonable because these species' absence is less likely to be a result of variability in methods.

But the focus in JOO is often on analyzing monthly records for presence or absence, not records for a single observation. In this case, if there are a number of systematic observations each month (e.g., three or more), then monthly record summaries could be assumed as being presence/absence data for even more species than for single observations. This is because as monthly observation effort increases, the probability of detecting infrequent or inconspicuous species (see Table 5.3) at least once also increases. However, measuring observation effort involves more than just the number of observations, so the duration and methods of observations also need to studied (section 5-D).

NONSYSTEMATIC OBSERVATIONS.--Unfortunately, articles in JOO will often involve "messy data"; that is, data in which the methods may not be known and/or are probably not consistent. Further, observations by some observers may only be partially consistent for the criteria in Table 5.1 (e.g., consistent only for the same study area with the same observation and recording methods).

Although such partially systematic or nonsystematic data could be simply treated as presence data, I believe it is possible to salvage some of these and use them as presence/absence data. The key to doing so is establishing criteria of adequate observation effort (section 5-D) or using Tolerable Observation Effort (section 5-F) or Discontinuity Analyses (section 5-G).

ALL OR NONE.--Once criteria for distinguishing presence/absence data are chosen, it would be easy to assume that all species either fit or don't fit these criteria. This, however, could often be mistaken, especially for taxa included in Table 5.3. It is best to make such decisions on a species by species basis, but this will rarely be possible in JOO because there may not be enough available information to make such decisions.

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5-F. MONTHLY TOLERABLE OBSERVATION EFFORT (TOE)

There are several ways to judge if data should be considered as presence or presence/absence data. For example, criteria for measuring observation effort directly such as given in section 5-D-3 or in the following paragraphs or using Discontinuity Analyses (see following section 5-G) can be used. In JOO, specific criteria will generally be used because they can be more objective and broader, although Discontinuity Analyses will occasionally be used on a species by species basis.

In JOO, the term Tolerable Observation Effort (TOE) will be used to indicate that if certain criteria are attained, monthly effort is judged Tolerable (i.e., moderately good or passable), so that observations can be considered as monthly presence/absence data, not just presence data. However, TOE does not indicate an effort in which all species present were recorded; TOE suggests only that effort was probably sufficient to find most, if not all, conspicuous, common species and, perhaps, some of the more inconspicuous or uncommon species included in Table 5.3.

In an effort to have at least somewhat objective criteria to use in judging what data to use as monthly presence/absence data in JOO, the following arbitrary criteria define TOE:

1) a month with three or more systematic observations by an experienced observer;

or 2) a month when the number of recorded taxa was 60% or more of the maximum for three or more years for that month, and the observer tried to record all bird taxa present;

or 3) a month when the observer's effort appears systematic enough to record all taxa present, although the observer has less than three years of observations.

Admittedly, these are not as objective as one would like, but they are a start, and as information becomes available, more objective criteria may emerge (e.g., see section 5-D-3). In particular, the reader may object to criteria #2 and #3 as being too subjective; these loose criteria were chosen in an attempt to salvage some observations as presence/absence data where observations were semi-systematic or observations seemed relatively thorough. In practice, the observer's degree of effort will become fairly apparent in discussing his or her methods or in a cursory examination of his or her number of taxa per day or per month.

If the reader wishes to use other criteria for judging observation effort (section 5-D-3) or to use more stringent criteria for TOE, the reader may be able to use details about observation methods published in each JOO article to make his or her own criteria and change judgments about a species' absence that are given in JOO.

The mistakes in using TOE criteria are predictable. The greatest error will be in judging species in Table 5.3 as being absent when they were actually present. The other error will be in judging common, conspicuous species not included in Table 5.3 as possibly being present (i.e., in JOO they will be noted with a "?"), when in fact they were truly absent. No matter what the criteria for TOE, one of these errors will probably occur, so the criteria represent a trade-off between these two errors.

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5-G. DISCONTINUITY ANALYSIS

A gap in the presence of a species may be a result of a lapse in an observer's effort or the actual absence of a species. Since the term "Gap Analysis" is currently used in ecology to refer to a different phenomenon (e.g., Scott et al. 1993), I use the term "Discontinuity Analysis" to refer to analyses of discontinuities in a species' presence.

Although the term Discontinuity Analysis is new, researchers have often consciously or unconsciously used this process in judging the adequacy of records. For example, if there are many discontinuities, especially of common species, then it is assumed that they are a result of lapses in observation effort. Unfortunately, researchers may assume that a species' pattern of presence is more continuous than it may actually be. Accordingly, they have a tendency to pool records, so that the results look "prettier" and more continuous than they would be if shorter time intervals are examined.

Thus, the problem with Discontinuity Analyses is that not all species can be accurately analyzed for discontinuities, especially kinds of species that are in Table 5.6. Although at first glance, these types of species may seem to be the exception rather than the rule, it has become apparent to me that the number of species that fit into Table 5.6 is too large to ignore and is increasing as additional site specific information is analyzed that show many species to differ in seasonal patterns of presence among even nearby sites. Therefore, to accurately use Discontinuity Analysis, more information about the variation in each species' patterns of presence may be needed than is currently available.

In spite of the potential for error, cautious use of Discontinuity Analysis can still be a valuable tool in three situations. One such case is where a species is present with frequencies of occurrence of 50% or more in months preceding and following the month in which it was not recorded. A second case is where a species was present at the same site for several years for a particular month but was absent just one year. A third case is where a species known to be common at a site is not reported in a particular month. In all these cases, it is reasonable to assume that the lack of records may be a result of a lapse in observation effort and that the data for the month in question would probably more accurately be considered as presence data for at least that species, not presence/absence data.

Discontinuity Analysis could be used for various time intervals, but, in JOO, it will be mainly used in cursorily examining monthly records. The main way of judging which data will be treated as presence/absence data in JOO will be through the use of TOE criteria (section 5-F).

In using Discontinuity Analysis, it is important to keep an open mind, so that if additional information about variation in patterns of a species' presence becomes known, then one can change one's mind or be more equivocal about the reason for a lapse in records.

5-H. TABLES

Table 5.1. Factors necessary for consistent, systematic observations.

1) same study area with recognizable borders is covered each observation
2) same methods of observing the study area (e.g., use of binoculars to scan for birds)
3) same time of day for observations (e.g., morning before 11 AM)
4) same duration of observations (e.g., 30 minutes)
5) same method of recording bird occurrence (e.g., writing records as they occur)
6) same favorable weather for observing or listening for birds (*)

* Roughly based on Dawson (1981a), Robbins (1981), Verner (1985:259), Robbins et al. (1986:6-7), and Manuwal and Carey (1991:7-8); weather to be avoided for observing terrestrial birds includes when it is raining, hailing, or snowing; when it is blowing with winds greater than about 12 mi/hr (20 km/hr), when it is abnormally cold or hot for the season, and when it is foggy.

Table 5.2. Minimum number of observations needed to statistically demonstrate a species' presence for species with a given Frequency of Occurrence. These values are calculated from a formula in Goldstein (1964:97) that is for the binomial distribution at the 5% level of significance. Note, that by chance, a species may appear in fewer observations than indicated.

Frequency of Occurrence (%)	Minimum Number of Observations (N)	Frequency of Occurrence (%)	Minimum Number of Observations (N)
5	59	35	7
10	29	40	6
12.5	23	45.1*	5*
13	22	50	5
14.0*	20*	60	4
15	19	70	3
18.2*	15*	77.7*	2*
20	14	80	2
23.9*	11*	90	2
25.9*	10*	100	1
30	9		

* For the given number of observations, the smallest Frequency detectable at the 5% significance level.

Table 5.3. Kinds of species whose absence during an observation may not mean that they were absent at the study site.

1) species that are not active at the time of day of observations (e.g., owls that are active at night or Common Nighthawks that are most active at dusk)
2) species with large home ranges that may only spend a portion of some days at the site
3) infrequent or rare species
4) inconspicuous or skulking species
5) species whose conspicuousness varies during the year (e.g., a species that becomes inconspicuous while rearing young or when not singing)
6) species that are present but that are misidentified as another (e.g., an observer may misidentify an uncommon species as a more common one if they are similar in appearance or sound)
7) species that are present but that are very abundant or are introduced, so that the observer either doesn't think they are noteworthy enough to record or may simply overlook them (e.g., Rock Dove, Eurasian Starling, House Sparrow)

Table 5.4. Some measures of observation effort. Record=one bird taxon seen or heard during one observation.

MEASURES FOR EACH MONTH:
Total Observation Hours
Total Observation Days
Observation Hours/Observation Day
Total Species
Species/Observation Day
Total Records
Total Records/Total Species
Raunkaier's Frequency Classes (section 6-H)
Discontinuity Analysis (section 5-G)

MEASURES FOR A YEAR:
Total Observation Hours
Total Observation Days
Total Species
Total Records
Total Records/Total Species
Raunkaier's Frequency Classes (section 6-H)
Discontinuity Analysis (section 5-G)

MEASURES FOR SEVERAL YEARS:
Comparisons of Measures for a Month
Comparisons of Measures for a Year
% of Years in which a Species was Recorded
Discontinuity Analysis (section 5-G)

Table 5.5. Number of bird taxa recorded daily or monthly in the Lincoln County Coast Range at elevations less than 1000 ft (305 m).

Darrel Faxon and Floyd Schrock were independent, mobile observers intent on recording birds in large, diffuse study areas; Faxon's area was at Thornton Creek (Faxon and Bayer 1991) and Schrock's area was in the Siletz/Logsden area. If they had any observations, they had one observation/day. Faxon's duration of observations is unknown, but he averaged 19-24 observations per month (Faxon and Bayer 1991:22). In 1983-1985, Schrock estimated that he averaged about 60 min per observation; he usually had 3-8 observations per month (unpublished data).

Janet Lamberson was a relatively sedentary observer, whose observations were around her home at Newton Hill between Toledo and the town of Siletz. Her area was much smaller than observed by Faxon (i.e., see Faxon and Bayer 1991:9, 12) or Schrock (unpubl. data). The duration and number of her observations is unknown.

Yrs=number of years of observations, 60% of MAX=60% of maximum number of species recorded.

		Average Number of Taxa/Observation												
Observer	Yrs	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Source
Darrel Faxon	16-18	15	15	18	25	34	32	30	25	20	19	13	14	Faxon and Bayer 1991:24
Floyd Schrock	1*	18	18	18	26	36	37	39	34	23	23	23	20	unpublished data

* 1984 data.

		Maximum Number of Taxa/Observation												
Observer	Yrs	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Source
Darrel Faxon	16-18	30	26	32	44	50	45	43	46	45	34	26	26	Faxon and Bayer 1991:24
Floyd Schrock	3*	29	30	23	41	52	56	48	43	38	34	31	32	unpublished data

* 1983-1985 data.

		Maximum Number of Taxa/Month												
Observer	Yrs	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Source
Darrel Faxon	16-18	44	45	48	66	79	61	68	68	72	55	47	44	Faxon and Bayer 1991:25
Floyd Schrock	3*	37	41	42	65	75	69	62	60	57	51	50	44	unpublished data
Janet Lamberson	6	22	25	27	25	33	31	33	26	27	23	25	23	unpublished data
60% of MAX	-	26	27	29	40	47	41	41	41	43	33	30	26	

* 1983-1985 data.

Table 5.6. Types of species for which Discontinuity Analyses to judge the reason for a lack of records must be done very cautiously, if at all. Examples of species are from results for Lincoln County.

1) species included in Table 5.3
2) species that vary greatly in seasonal status among sites near each other (e.g., White-crowned and Savannah sparrows)(as Lincoln County data are analyzed, it is apparent that many common species fall into this category)
3) species that often but not always occur outside their normal season of occurrence in such low numbers or with greatly reduced distribution that they could easily be missed (e.g., in winter: Willet and Whimbrel; in summer: Bonaparte's Gull, Whimbrel, and Brant)
4) species with inconsistent patterns of seasonality from year to year (e.g., irruptive species such as Red Crossbills, Red-breasted Nuthatches, and Pine Siskins that may be present all year some years or only in one season in others)
5) species that are virtually absent for short periods of time (e.g., Red-winged Blackbirds in late July and August)
6) species that may be spring and/or fall migrants some years and summer residents or summer vagrants in other years (e.g., Northern Oriole)
7) species that don't occur every year

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Chap. 6. FREQUENCY OF OCCURRENCE

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6-A. INTRODUCTION

Frequencies were once more popular in studying bird populations (e.g., Kendeigh 1944:71-73) than they are today, but at about the time of Kendeigh's review, frequencies lost favor to bird censusing. More recently, Stanley Temple (see references in Literature Cited) has championed the use of frequencies as an index of bird abundance and as an useful measure of bird occurrence, and others have also used frequencies (e.g., Reese 1985, Bart and Klosiewski 1989). Although frequencies are not an accurate measure of abundance (section 6-E), frequency data can be invaluable in determining the seasonality of birds and could be thought of as complementing not competing with census data.

Frequencies can be used several ways (Table 6.1); the methods and kinds of frequency analyses will be examined in the rest of this Chapter. In Journal of Oregon Ornithology (JOO), frequency of occurrence will be used to estimate changes in monthly presence/absence, not as a measure of bird abundance, for which bird censusing is eminently more suitable (e.g., Verner 1985).

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6-B. MONTHLY FREQUENCIES IN JOO

Frequency has been defined in various ways. For example, it can be the percentage of sites at which a species is noted or the percentage of hours in which a species is detected (Kendeigh 1944:72, Verner 1985:251). Although a frequency is often expressed as a percentile, it can also be expressed as a decile (e.g., Faxon and Bayer 1991), the number of occurrences, or simply as a checkmark or "X" to indicate presence at least once. Percentile and decile frequencies are only appropriate if observations can be considered as presence/absence data, not just presence data (5-E).

In JOO, frequencies of occurrence will be calculated as percentiles or deciles by dividing the number of observation days in which a bird taxon is recorded by the total observation days only if observations are judged as having Tolerable Observation Effort (TOE)(5-F). Otherwise, frequencies will be indicated by an "A" for presence in the 1-15th of a month, a "Z" for presence during the 16th-end of a month, a "?" if not recorded during a non-TOE month, or a ".." if not recorded during a TOE month.

****

6-C. AVERAGE MONTHLY FREQUENCIES IN JOO

In JOO, if there are three or more years of records with TOE for a calendar month (e.g., January records in each year of 1976-1978), then the Average Frequency for that month will be calculated as a decile. If there are fewer than three TOE years, then a "X" will indicate that the taxon was present in at least two years, a "x" will denote that the taxon was recorded in only one year, a "?" will indicate that the taxon was not recorded, although observation effort appears so inadequate that the taxon may have been overlooked, and a ".." means that the taxon was not recorded although effort seems adequate to detect it, if it was indeed present.

This flexibility will allow patterns of monthly presence to be more apparent, which is an an objective in JOO.

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6-D. STATISTICAL COMPARISON OF FREQUENCIES

6-D-1. CONSISTENT, SYSTEMATIC OBSERVATIONS

Frequencies are best used for statistical comparisons if they are systematic (section 5-B and Table 5.1) and meet conditions in "A" in Table 6.1. Otherwise, differences in frequencies may represent differences in observation techniques, not actual differences in a bird's presence. In particular, if the size of study sites or observation duration vary, frequencies can only be cautiously compared, if at all (see "A" in Table 6.1).

Under field conditions, methods may knowingly or unwittingly change; nevertheless, it is still informative to compare frequencies. What is then important to remember is that it may not be possible to determine the reason for any changes in frequencies or that only large differences in frequencies (e.g., 50% or greater) may represent real changes in a bird's presence.

Statistics to determine significant

differences between frequencies include chi-square and contingency table tests or may be listed with "enumeration statistics" (e.g., Dice 1952:47, Davis and Zippin 1954, Dixon and Massey 1957, Greig-Smith 1964:37-41, Fleiss 1981, Sokal and Rohlf 1981:Chap. 17).

6-D-2. IMPORTANCE OF MANY OBSERVATIONS

People often assume that differences between frequencies may be significant when they aren't. This is particularly a problem when there are fewer than 10 observations, which is often the case. For example, at least 10-20 observations/month are needed to detect differences between frequencies of about 30% or less (Table 6.2, Davis and Zippin 1954, Fleiss 1981:33-43, Sokal and Rohlf 1981:765). Accordingly, sometimes observations from 2-3 months may have to be lumped together to be able to do a test, but such data pooling obscures differences in monthly frequencies.

Another advantage of having many observations is that frequencies can be more finely estimated. For example, if there are only five observation days, then frequencies can only be measured to the nearest 20%, but if there are 10 days, then they can be measured to the nearest 10%.

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6-E. USING FREQUENCIES TO ESTIMATE ABUNDANCE AND DENSITY

In the 1930's and early 1940's, Linsdale and others (section 6-H) felt that bird frequencies were a good estimator of bird abundance. They also thought that measuring frequencies was preferable to censusing because determining frequencies took less skill and could be done by more birders.

However, frequency is really a measure of a species' presence, not its abundance. Nevertheless, many books and checklists confuse frequency and abundance in classifications of a bird's status and mix these two concepts (e.g., "abundant" with "common" and "rare"). This is unfortunate because frequency and abundance data complement each other in understanding a bird's seasonality, while an ill-defined composite only confuses the issue.

Further, there are significant flaws in using frequencies to estimate bird densities or abundance (see references for "B" and "C" in Table 6.1). If one's objective is to determine bird abundance or densities, then censusing is much more appropriate (e.g., Verner 1985), although a single method of censusing has not been universally agreed upon (Ralph and Scott 1981, Verner 1985, Hutto et al. 1986, Gutzwiller 1991, Manuwal and Carey 1991).

There has been much recent interest in using changes in frequencies as an index to changes in abundance (see "C" in Table 6.1). However, I am very sceptical of using frequencies to detect population tends where observation methods, effort, and/or area surveyed are unknown or variable as in Temple's papers (see Literature Cited). Frequencies can best detect changes in bird populations if methods are systematic or standardized (Table 6.1), such as in Breeding Bird Surveys (e.g., Bart and Klosiewski 1989, Cox 1990).

****

6-F. USING FREQUENCIES TO DETERMINE GEOGRAPHIC VARIATION

Frequencies are appropriate for elucidating geographic variation (e.g., Verner 1985:249) and have been done so more than the few references in "D" in Table 6.1 indicate. However, such analyses have some limitations, so that a combination of frequency and abundance data may better measure geographic variation than either alone (Bock et al. 1978, Raivio 1989).

****

6-G. USING FREQUENCIES TO DETERMINE ASSOCIATION AMONG SPECIES

Using frequencies to test association among species is best done for plants because they are immobile and are equally detectable (e.g., "H") in Table 6.1). For birds, such tests should only be done if conditions in "A" in Table 6.1 are met; this may be impossible for some combinations of species with markedly different detectabilities. Accordingly, associations found between bird species with frequencies may be different than those found with abundance, so associations may be better measured by a combination of frequencies and abundances rather than just abundances (Bock et al. 1978, Raivio 1989).

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6-H. FREQUENCY DISTRIBUTIONS AND RAUNKAIER'S LAW

6-H-1. INTRODUCTION

Raunkaier's (or Raunkiaer's) Law of the Distribution of Frequencies predicts that if there are a large number of observations and if species are divided into five frequency classes (class A, 1-20%; B, 21-40%; C, 41-60%; D, 61-80%; E, 81-100%), the distribution of numbers of species among classes is approximately A>B>C=D<E). In other words, the number of infrequent species is much greater than the number of very frequent species.

This Law was first formulated for plants but was also thought to hold for a wide variety of animals as well (Kenoyer 1927); this Law assumes a random distribution, but most plants and animals are not distributed randomly (Dice 1948, 1952:47). This Law appears to have been first formulated by botanists for observations during a short period of time (e.g., during a week) at a number of small quadrats, not for the frequency at a single large area measured over a year or more as has been used by Linsdale and other ornithologists prior to 1944 (Table 6.3).

This Law was sometimes used in understanding community organization at different locations, but it may only be a result of the mathematical relationship between frequency and size of plot (Dice 1952:49).

6-H-2. AMOUNT OF OBSERVATIONS AND HUMAN DISTURBANCE

Raunkaier's Law appears to be most applicable to birds when there is great observation effort. For instance, the average percentage of species in Raunkaier's 1-20% class is greatest when there are 100 or more observations (64%) or when there were 100 or more species recorded (69%)(Table 6.4).

Humans may also influence frequency distributions, so that highly disturbed sites may have fewer species in Raunkaier's 1-20% class than undisturbed sites. But I don't know if there are any supportive data for this possibility.

6-H-3. SITE SIZE

Plot (quadrat) size was found to greatly influence whether or not this Law applied to plants (Gleason 1929, Ashby 1935, Blackman 1935), and there is no reason to suppose that the same would not hold also for birds. Afterall, the frequency of a bird species will generally increase as the size of the study site increases because there is a better chance of the species being detected.

6-H-4. OBSERVATION DURATION

The duration of each observation is also critical in determining frequencies and applicability of Raunkaier's Law. In general, as the duration increases, frequency will also increase, and, subsequently, the distribution of frequencies would then be more skewed towards higher frequencies.

6-H-5. TIME SCALE

The time scale over which observations are made also influences frequencies. Ornithologists often combined results for all months of a year for two or more years in showing that bird frequencies complied with this Law (Table 6.3). Also, the average percentage of species in the 1-20% frequency class was greatest (68%) when results from eight or more months were pooled (Table 6.4).

Consequently, it is informative to see if bird frequencies conform to this Law during individual months. They do not; the disparity is great even for Linsdale and Rodgers (1937) and Rodgers and Sibley (1940), who found conformity when two or more years were combined (Table 6.3). Further, the average frequency in the 1-20% frequency class was least (31%) when results for only one calendar month were calculated even if observations occurred during more than one year in the month (Table 6.4).

The reason for the discrepancy between results pooled for a year and individual months is probably because many species are vagrants or migrants that may only be present for a month or for a 3-4 month season. When the frequencies for these species are calculated for a total year, their frequencies are going to be much lower than for the month or season in which they are frequent because many months in which they were absent will be included. Thus, many more of these vagrant and migrant species will fall into the smallest frequency class and better fit the Raunkaier distribution.

6-H-6. USING RAUNKAIER'S LAW

Although Linsdale and other ornithologists felt that Raunkaier's Law could be used to compare bird communities at different sites, habitats, or times; this can only be possible if conditions "A" in Table 6.1 are met. Unfortunately, the methods and study areas of Linsdale and others were not precisely defined enough to make reasonable comparisons. Further, the size of their study sites and duration of observations appear to be so variable that even if known, it is doubtful that anything but crude comparisons could be made.

This Law has apparently been forgotten among ornithologists, probably because even systematically made frequencies are not a good measure of bird abundance, which is one use Linsdale and others made of this Law. Additionally, this Law really isn't as helpful in comparing bird communities as is bird abundance. Kendeigh's (1944) review championed the importance of systematic censusing in determining bird abundance, monitoring bird populations, and comparing bird communities, and censusing is the direction that ornithology has taken.

Nevertheless, Raunkaier's Law can be useful in ways that earlier researchers didn't recognize. First, it can be used as a crude measure of the adequacy of observations at a site in meeting research objectives. For example, if the percentage of species in class A (1-20%) is less than in class E (81-100%) and if a study's objective is to detect all species at a site, then more observations are needed because there haven't been enough observations to better conform with this Law. However, if the main objective is to record common and infrequent species, then monthly or seasonal effort could perhaps be judged adequate if class A is 85% or more of class E or if class A is 30% or more, as is approximately the case for most Oregon studies in Table 6.3.

But before this Law can be used rigorously as a measure of observation effort, there needs to be more field studies to calibrate the effects of sizes of study areas and duration of observations on frequency distributions. Further, this Law must be used cautiously to measure effort because it assumes that all species are recorded without bias. But, in my experience, many birders record rarer species more often than the most common species because of the novelty of the rarity. Using such biased data would imply that observation effort was more adequate than it actually was.

A second use of this Law is that it points out that it is the rarest species at a site that are proportionately much more missed with low observation effort. There is much debate about how much effort is necessary for adequate observations, but it has not been clear which species would be missed if effort is low. From Table 6.3, it appears that it would be the species with frequencies of 20% or less because it is that class that usually greatly increases as observation effort increases.

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6-I. USING FREQUENCIES TO DETERMINE OTHER VARIABLES

Frequencies have also been used to determine seasonal trends in presence, effects of weather on migration, and differential occurrence among habitats ("F"-"H" in Table 6.1). Such comparisons are best if conditions in "A" in Table 6.1 are met, and, although not necessary, it would also be helpful if measures of abundance were also available in making these comparisons.

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6-J. TABLES

Table 6.1. Types of frequency analyses. This is not a comprehensive review.

Conditions for or Types of Analyses	References
A. Comparisons are Most Valid	
for Similarly Detectable Species	Dice 1952:47-48, Verner and Ritter 1985:64, Table 5.3
for Same Sizes of Study Sites	Dice 1952:44, Davis and Winstead 1980:230, Verner 1985:251, Verner and Ritter 1985:64
Method for Variable Site Sizes @	Dice 1952:45
for Observations of Same Duration	Verner 1985:251, Verner and Ritter 1985:64
for Observations with Same Methods	Verner and Ritter 1985:64
when Frequencies are Less than 100%	Dice 1952:44, Davis and Winstead 1980:230, Verner and Ritter 1985:64
when Abundance is Not Great	Dawson 1981b:393, Bart and Klosiewski 1989
B. Density, if Poisson Distribution *	Dice 1952:45, Davis and Winstead 1980:230-231, Seber 1982:56
C. Abundance	
Measuring Changes in	Kendeigh 1944:71-72, Temple and Temple 1976, 1987; Bart and Klosiewski 1989, Verner and Milne 1989, Cox 1990, James et al. 1990, Temple and Cary 1990
Estimating	Ashby 1935, Blackman 1935, Osborn 1943, Kendeigh 1944:71-72, Dice 1952:45-49, Wadley 1954, Davis and Winstead 1980:230-231, Nachman 1984
Flaws in Estimating	if conditions in "A" of this Table are not met
D. Geographic Variation (Biogeography)	Bock et al. 1978, Temple and Temple 1984, 1986; Temple and Cary 1987b, Raivio 1989
E. Comparisons of Different Species	
Association among Species #	Greig-Smith 1964:Chap. 4, Pielou 1977:Chap. 13, Bock et al. 1978, Raivio 1989
Raunkaier's Law of Frequencies	see section 6-H and Table 6.2
F. Seasonal Trends	Rodgers and Sibley 1940, Temple and Temple 1984, Temple and Cary 1987b
G. Weather Effects on Migration Timing	Temple and Cary 1987a
H. Comparisons of Habitats	Fuller 1982:223, Temple and Temple 1986

@ Calculations are based on the assumption of random distribution, which may not be the case, see footnote *.
* Many organisms are not randomly distributed, so use of the Poisson distribution can lead to errors that can sometimes be reduced or may not be important (Dice 1952:47, Wadley 1954, Eberhardt 1978:221, Davis and Winstead 1980:230-231, Dawson 1981b:394, Seber 1982:56, Nachman 1984).
# See section 6-G.

Table 6.2. Estimates of the minimum larger frequency to be different from a smaller frequency at a two-tailed 90% significance level for various numbers of observations. These data are the upper confidence intervals estimated to the nearest 5% from a graph in Dixon and Massey (1957:414). Note that many statisticians prefer the 95% significance level that could be estimated by adding 5% to each value in this Table. Also see Davis and Zippin (1954) and Fleiss (1981:33-43) for other sample size estimates that include measures of Type II error (i.e., power analysis).

These are only rough estimates of when a significant difference could occur; statistical tests need to be actually calculated to determine if differences are significant.

N=number of observations.

-=difference not detectable.

Smaller Frequency (%)	Minimum Larger Frequency (%) for a Significant Difference N=5	N=10	N=15	N=20
0	45	25	20	15
10	55	40	35	30
20	65	50	45	40
30	75	60	55	50
40	80	70	65	60
50	85	80	75	70
60	95	85	80	75
70	95	90	90	85
80	-	95	95	95
90	-	-	-	-
100	-	-	-	-

Table 6.3. Percentage of species seen in each of Raunkaier's frequency classes.

Time Period	State or Country	Total Species	Number of Observations	% of Species/ Frequency Class......... A 1-20%	B 21-40%	C 41-60%	D 61-80%	E 81-100%	Reference
1921-1925	Kansas	194	200	68	16	7	3	5	Linsdale 1928
June-Aug. 1924	Michigan	106	50	59	15	10	9	5	Linsdale 1936
July-Aug. 1941	Michigan	80	120	43	14	12	15	16	White 1942
1931-1932 **	Rhodesia	100	208	75	7	9	3	6	Winterbottom 1936
1932-1938	Rhodesia	175	1226	75	9	5	4	7	Winterbottom 1940
1920-1931	California	151	3829	73	13	5	3	5	Linsdale 1932
June 1926-1936	California	66	15	27	23	11	21	18	Linsdale and Rodgers 1937*
Dec. 1926-1936	"	63	15	32	17	13	13	25	"
1929-1936	"	101	138	62	14	7	14	4	"
Jan. 1938 & 1939	California	31	10	42	10	13	19	16	Rodgers and Sibley 1940 *
Feb. 1938 & 1939	"	30	10	23	30	3	7	37	"
Mar. 1938 & 1939	"	24	10	42	0	8	4	46	"
Apr. 1938 & 1939	"	31	10	29	10	10	16	35	"
May 1938 & 1939	"	31	10	19	3	6	10	61	"
Jun. 1938 & 1939	"	28	10	11	11	4	7	68	"
Jul. 1938 & 1939	"	27	10	19	4	11	4	63	"
Aug. 1938 & 1939	"	30	10	33	17	10	7	33	"
Sep. 1938 & 1939	"	29	10	17	10	14	21	38	"
Oct. 1938 & 1939	"	37	10	24	27	3	19	27	"
Nov. 1938 & 1939	"	33	10	21	15	15	12	36	"
Dec. 1938 & 1939	"	35	10	31	11	9	6	43	"
1938-1939 @@	"	65	120	52	21	8	8	11	"
May-July 1979	Oregon	50	25	30	16	10	10	34	Morrison and Meslow 1983@
May-July 1980	"	42	30	21	14	17	7	40	"
May-July 1981	"	34	30	26	18	0	9	47	"
May-July 1979-81	"	53	85	34	19	11	4	32	"
January 1987	Oregon	32	10	38	16	3	6	38	Faxon (unpubl. data) #
February 1987	"	38	16	37	3	8	16	37	"
March 1987	"	46	18	43	11	11	4	30	"
April 1987	"	66	23	42	12	11	6	29	"
May 1987	"	79	23	35	14	5	9	37	"
June 1987	"	60	21	27	12	8	5	48	"
July 1987	"	68	21	34	18	6	4	38	"
August 1987	"	62	28	29	23	6	13	29	"
September 1987	"	72	22	36	14	14	10	26	"
October 1987	"	55	29	25	25	15	9	25	"
November 1987	"	42	25	40	17	12	14	17	"
December 1987	"	37	17	38	16	11	8	27	"
April 1992	Oregon	18	11	39	0	11	6	44	Bayer (see Fig. 5.1)

** Data collected during eight months.
@@ Data collected during all months in both years.
@ Data compiled from several sites.
* Data calculated from a chart in their paper.
# Data calculated from Faxon's unpublished data for Thornton Creek (e.g., see Faxon and Bayer 1991).

Table 6.4. Influence of number of observations, number of observation months, and total species on the percentage of species in Raunkaier's 1-20% frequency class. Data are calculated from data in Table 6.3. N=number per class, CV=coefficient of variation, MIN=minimum, MAX=maximum.

	% of Species in Raunkaier's 1-20% Frequency Class								
	Number of Observations			Total Species			Calendar Months in which Observations Occurred *		
	<25	25-99	≥100	<50	50-99	≥100	1 Month	2-4 Months	≥8 Months
N	24	8	7	20	13	6	27	6	6
Mean	30.8	33.0	64.0	29.6	34.3	68.7	30.9	35.5	67.5
CV (%)	29.4	36.4	19.4	33.4	22.2	10.0	28.5	38.7	13.5
MIN	11	21	43	11	25	59	11	21	52
MAX	43	59	75	43	52	75	43	59	75

* This is not the total number of months of observations, but the number of calendar months in which there were observations. For instance, there could be a number of years with observations in January, but this would still be treated as only one month.

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Chap. 7. SHORTCOMINGS IN JOO PAPERS

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7-A. INTRODUCTION

Observational ornithological research has shortcomings, whether researchers are willing to admit so or not. For example, some of the difficulties in observing or censusing terrestrial birds are examined in Ralph and Scott (1981) and Verner (1985). But shortcomings can be ignored in scientific publications, and it can be difficult to detect shortcomings, not because they don't exist, but because they may be obscured or may not be seriously discussed.

The people best able to identify shortcomings are the researchers or authors, themselves. If they have reasonably sceptical minds, they may realize and recognize some of the problems and biases in their own methodology as they make observations or write their results. Instead of writing articles for scientific publication in which shortcomings may be consciously or unconsciously downplayed to increase the possibility of the research being published, researchers can take a "warts and all" approach and acknowledge and highlight shortcomings.

Unfortunately, researchers and birders may be embarrassed by shortcomings and not understand the importance of acknowledging them. Shortcomings should not be taken personally as faults in one's character; they can be understood as universal problems that can sometimes be reduced, but not eliminated. For example, some shortcomings result from constraints placed on the researcher because there may not be the time, money, assistance, or other resources available to make as many systematic observations as needed. In other words, the researcher may be doing the best that he or she can under the circumstances, but this may not be enough to eliminate shortcomings that may influence results. Thus, the point should be to identify and acknowledge shortcomings and to try to recognize that shortcomings may be most important and most difficult to minimize for infrequent or inconspicuous species (section 5-C).

One reason why it is important to identify and understand shortcomings is to optimally interpret the results and recognize that some results may be consequences of methods, rather than traits of the birds. This is particularly important if the research is to serve as baseline data in understanding bird populations because apparent changes in populations over time or between sites may simply be a result of human variability in methodology.

Another reason is that recognizing shortcomings can lead to improved methods in future research. If problems aren't identified, they can't be solved.

Finally, acknowledging shortcomings is a good way to better understand methodology and document methods, so that they can be duplicated by other researchers. If methods and shortcomings aren't seriously examined, then an inability to reproduce the same results may be a consequence of seemingly slight, but significant, differences in methods.

A goal of the Journal of Oregon Ornithology (JOO) is to present information that can be objectively evaluated, not to present "perfect" research. Accordingly, there will be an attempt to highlight shortcomings in JOO articles by providing a special section for them. This attention to shortcomings should not be construed as belittling the author(s) but to illustrate the author(s) courage to try to forthrightly deal with shortcomings.

Various kinds of shortcomings are examined in the following sections.

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7-B. SHORTCOMINGS: STUDY AREA

7-B-1. INCOMPLETE STUDY AREA DESCRIPTION

Details about the aspect, elevation, vegetation (i.e., species, sizes, and distribution), weather, approximate coverage of each habitat, etc. at a site are helpful in establishing what the site is like because these factors may influence what birds are present. References to consult in measuring habitat characteristics include James and Shugart (1970), Anderson (1981), and Wiens and Rotenberry (1981).

However, more time and resources are required to fully describe a study site than are usually available, so study area descriptions in JOO will often not be as comprehensive as one would like.

7-B-2. ILL-DEFINED BOUNDARIES

The boundaries of the study area should be clear to researchers during observations and should also be clearly stated in the publication of results. Distinct boundaries are essential to calculate surface areas, to compare results with other areas, and to repeat observations in the future at the same study area to detect changes.

Although study areas with distinct boundaries are preferred, birders often make observations in ill-defined study areas. This is particularly true when birders roam over a general area and may not repeat their observations in exactly the same area each visit.

Since it is erroneous to suggest that boundaries were more defined in the results than they were during observations, JOO articles will try to preserve the observer's degree of definition. Thus, some articles may be for general areas with ill-defined boundaries.

7-B-3. LACK OF HABITAT SPECIFIC RECORDS

Habitat specific information is ideal (section 4-D) and is easiest to collect where observations are confined to a single habitat (e.g., a lake). However, many JOO contributors observe areas that are mixtures of habitats or ecotones between habitats, not distinct habitats (section 4-D-3). Even where habitats are distinct, contributors often don't have the time to keep records separate for each habitat. While the lack of habitat specific records in JOO is regrettable, records as site specific as feasible will have to do.

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7-C. SHORTCOMINGS: OBSERVATION METHODS

7-C-1. INADEQUATE DESCRIPTION OF METHODS

Describing methods is essential in understanding how they may have influenced what was recorded and to determine if differences in bird presence/absence between sites or at various times at the same site are real or may have resulted from diverse methods. Some characteristics to include in descriptions are included in Table 7.1.

In JOO, methods will be detailed as much as possible, but observers may not have recorded as many details or used the same methods as consistently as is preferred.

Table 7.1. Some characteristics of methods to record and include in publications. Note that as methods become more consistent between observations, observation records also become more systematic and meaningful.

- names of observers
- each observer's skills in identifying birds that are to be recorded
- dates of observations
- time of day in Standard Time and duration of observations
- whether observations are systematic or incidental (e.g., was there an attempt to record all species present, just rarities, or just species that the observer felt noteworthy)
- list of bird taxa or kinds of bird taxa intentionally excluded, if any
- optical equipment used
- time and method of recording observations (e.g., written at end of day, written during observations, made with a tape recorder during observations)
- weather variables measured (e.g., sky cover, wind speed and direction, temperature)
- route for making observations and amount of time spent at each step
- methods of counting birds, if done
- which bird taxa were identified by sound or if all were identified by sight alone
- consistency of methods among observations

7-C-2. LOW OBSERVATION EFFORT

Many studies in JOO will be based on inadequate observation effort to detect the monthly presence or absence of all bird species, especially infrequent or inconspicuous species (section 5-C). The purpose of JOO is to publish what information is available and not to extrapolate observations beyond what they are. Observational data in JOO papers can always be considered as presence data (section 5-E), which are better than no data at all.

7-C-3. VARIABILITY IN OBSERVATION EFFORT AND SITES COVERED

Ideally, all observations should be consistently of the same duration for the same study area, so that observations can be treated as presence/absence data (section 5-E). However, many articles in JOO will be for incidentally made observations whose duration, if known, may have been quite variable, and not all portions of the study area may have been observed each time. In JOO, determining if observation consistency was sufficiently adequate for the observations to be considered as presence/absence data will be done by Tolerable Observation Effort (TOE) criteria (section 5-F).

7-C-4. EXCLUSION OF SOME BIRD TAXA

Excluding some bird taxa from records may not be a problem if it is explicitly stated which taxa were excluded. Excluded species could include inconspicuous species that may have been present but overlooked, species with which the observer is unfamiliar, birds active at a different time of day than observations (e.g., owls or nighthawks), or species that were excluded for various other reasons (section 5-C). Especially when attempting to make systematic observations, it may not be feasible to record every taxon (section 5-C).

7-C-5. IGNORING HUMAN DISTURBANCE

Human disturbance can influence what birds are present and recorded, so it is important to list sources of human disturbance for a study area, whether they may occur during observations or not. Obvious disturbances include the presence of cats, the number and kinds of bird feeders, and various kinds of human activities.

The observer can also be a significant source of disturbance, especially if he or she moves through the study area while making observations. Birders may think that because they don't see birds that the birds don't detect them. But birds may often detect birders and move away before the birder may realize it. This problem can be reduced by making observations in blinds after waiting 30 minutes or so for the birds to resume normal activities.

7-C-6. MISIDENTIFICATION OF BIRDS

Although some ornithologists believe that only specimens should be used in accepting records of rarities, I was amazed at the number of misidentified bird skins I learned about while compiling Oregon Coast bird skin records (Bayer 1989:12-13). So I would hesitate in accepting the identification of a bird skin in a museum without a second opinion.

Since the idenity of some museum specimens may be mistaken, it is clear that some bird records in JOO will be misidentified because JOO papers will usually be based only on sightings or calls. The advantage of bird specimens is that they can be re-examined to determine their identity; sight records have to be taken on faith in the observational skills and humbleness of the observer.

Misidentification errors will be most important for species with which the observer is unfamiliar or for species that the observer sees too briefly to make a correct identification. While birders and official committees (e.g., the Oregon Bird Records Committee) concentrate on the problems of confirming rarities, uncommon species are probably misidentified much more frequently, especially those that are similar in appearance to common species. In Lincoln County, some uncommon species that are misidentified more often than rarities include Eared Grebes, Long-billed Curlews, Red-breasted Mergansers in summer, and Herring Gulls.

Although corroboration of the identities of rarities or uncommon birds is preferred, this may rarely be accomplished for records given in JOO. One problem is that rarities or uncommon birds may not be present long enough for another birder to confirm a sighting, especially in rural areas where most papers in JOO will probably originate. The second problem is that the observer may be unable to take a photograph to support the identification.

As a matter of policy, records published in JOO will be screened for possible misidentifications, but unconfirmed rarities will generally not be excluded, especially if they have been published elsewhere, unless they appear very doubtful. The details of rarities will usually be included in JOO, if available, so that the reader can make his or her own decision of whether or not to accept the record. Thus, a record of a rarity in JOO may often not have the supporting evidence that a reader or committee considers acceptable.

7-C-7. TENDENCY TO RECORD RARITIES

Birders (especially avid listers) have a tendency to be most interested in rare birds. Accordingly, some birders may not have recorded common birds as often as they were present but always noted unusual birds. Thus, in a birder's field notes, common birds may appear less common, and rarities may seem to be more frequent than they actually were.

Fortunately, this tendency to focus on the rarity is usually apparent in a birder's records and will be pointed out in JOO articles. But subtle biases toward keeping records proportionately more for unusual or rare species may be overlooked.

7-C-8. NOT RECORDING AN ABSENCE OF BIRDS

Birders sometimes go to a site, find no birds, but don't record this because they mistakenly think there isn't any point in doing so. However, it is as important to know when birds are absent as when they are present, so that bird usuage of a site is clear and records are unbiased.

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7-D. SHORTCOMINGS: INTERPRETING RESULTS

7-D-1. DATA TRANSCRIPTION MISTAKES

Errors in recording or in transcribing data are more common than most researchers realize. Double-checking data for accuracy after each step is essential in minimizing errors but may often not be done. Thus, if a result is anomalous, the reader should wonder if it may be a result of an error in data transcription.

7-D-2. ERRORS IN FIRST AND LAST DATES

First and Last dates are often recorded by birders and, if available, will be included in JOO articles because they are useful estimates of migration phenology. However, errors in determining First and Last dates may be common because these dates are highly dependent on observation effort as well as the oftentimes sporadic occurrence of a species after it first arrives or before it departs (e.g., Faxon and Bayer 1991:29-31).

If observations are not made daily at an appropriate time of day for when the species can be detected, the species can easily be missed. Thus, First dates are predictably after the actual arrival of a species, and Last dates before its departure. The accuracy of First and Last dates and their averages is examined in detail in Faxon and Bayer (1991:29-31).

7-D-3. FORGETTING SHORTCOMINGS IN METHODS

Perhaps the greatest shortcoming is to overlook shortcomings in methods and to mistakenly assume that the results are a consequence of traits of a bird population rather than artifacts of methodology. The existence of shortcomings should not be forgotten.

7-D-4. MAKING FREQUENCIES INTO ABUNDANCES

Although there is a great interest in determining bird population changes, most papers in JOO will probably not include systematic censuses, so data analyses will usually be limited to frequencies (e.g., see Chap. 6). Nevertheless, a reader may be so engrossed with bird abundance that he or she may mistakenly try to interpret frequencies as abundances.

7-D-5. MISINTERPRETING AN ABSENCE OF BIRDS

It must be kept in mind that a lack of records for a species does not necessarily mean that the species was truly absent because it is much more difficult to show a species' absence than its presence (section 5-E). In spite of many warnings in this paper, mistakenly interpretating a species' absence as meaning that the species was actually absent will probably be one of the most common errors in using data given in JOO articles.

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