

Content and Organization of a Scientific Paper

ABSTRACT.—This section is placed at the beginning of a manuscript and must convey everything presented: what the research was about, where, why, and how it was conducted, and what it means relative to the current state of knowledge. It should consist of one paragraph of 250 or fewer words (*i.e.*, no more than 3% of length of manuscript). Abstracts always are written in the past tense, thus, the best quality abstracts are written after the remainder of the manuscript is finished. Bibliographic services publish only the title and abstract of manuscripts. When conducting a literature search, researchers may read abstracts of perhaps 100 s of papers in which the titles possibly have bearing on an aspect of their work. Only if the content of the abstract seems relevant, will researchers progress to reading the article from which the abstract was derived. Therefore, great care must be used to write an abstract so it correctly reflects the contents of the manuscript in a precise and concise manner that can stand alone. Furthermore, it must contain no figures, tables, or references to them, or material not presented in the body of the manuscript; except for critique papers, no literature citations should be included. Also, it should not contain acronyms or jargon, even with definitions, not readily known to the general reading audience of the publication in which the manuscript will be published.

INTRODUCTION

This section should include a well-ordered compilation of published information, with necessary literature citations that lead to the 'why' of the research being conducted and reported to the scientific community. Also, particular aspects that have a significant bearing on the subject of the research, with appropriate literature citations, should be expanded upon. The introduction should end with the presentation of the reasons and hypotheses that led to the research being conducted.

Before commencing to write a manuscript, decide on the journal that would be the best outlet for the research and obtain a copy of their guidelines for contributors. This may seem an unnecessary step; however, the style of writing and types of information and sections included in a manuscript are dependent upon the intended outlet. Editors appreciate close adherence to journal style. Manuscripts submitted in the style of another publication outlet, likely will be returned to the corresponding author for revision before the review process is allowed to begin.

A separate title page containing the title, byline (Appendix I), a short running head (<40 characters long), and the corresponding author's name (Appendix II) and contact information (for multi-authored manuscripts) is required by some publications. For publication outlets that do not require a title page, the corresponding author's name (for multiauthored manuscripts) and contact information needs to be provided at the upper left corner of the first page of the manuscript. All publication outlets for scientific research require information contained in a manuscript to be sorted into set sections: a meaningful title (Carraway, 2006), a byline that contains the author's name(s) and address(es), abstract, introduction, materials, methods, discussion, acknowledgments and literature cited. Auxillary materials, in support of the research, should be placed in appendixes (Appendix III). A listing of key words (Appendix IV), placed between abstract and introduction, is required by some publications. Separate conclusions or summary sections (Appendix IV) may be required in addition to or in lieu of some already mentioned. Guidelines for contributors may state that some or all of these sections need to be combined or labeled individually. However, they also may state that no actual headings are used, meaning that information contained in a manuscript simply has to be in this order. Tables and figures (in that order; Appendix V), used as support for information presented, are placed at the end of a manuscript after the typescript. Figure legends should be listed in sequence on a separate page placed before the tables. Lastly, a properly written cover letter (Appendix VI) always must accompany the manuscript when submitted for publication.

After all reference and background materials are read and data collected and analyzed, the time arrives when words must be placed on paper (organic or electronic) in the proper sections of a manuscript. You could think of each part of a manuscript as being represented by a different colored

pea. All information gleaned from the literature, knowledge learned in the course of conducting the research and talking with colleagues, study area descriptions, types and how many data were collected, statistical analyses, and such, would be included somewhere in the big pile of different colored peas. So, an important task when writing a scientific manuscript is sorting all the peas by color, that is, different types of information. Some people would claim there might be some striped or speckled peas in the pile, that is, some types of information fit equally well within more than one section of a manuscript. They would be wrong. Upon careful examination and consideration, all information that needs to be included in a manuscript has one best place for that fit.

Finally, throughout the manuscript, any organism mentioned must have the scientific name included at first reference of a vernacular name. Thereafter, the vernacular name alone may be used. If only a group (*e.g.*, voles or rodents) is mentioned, then the appropriate scientific group name should be provided (*e.g.*, Arvicolinae or Rodentia). This may seem superfluous; however, vernacular names commonly have limited regional usage. Furthermore, not everyone will be knowledgeable about the particular organisms mentioned in every paper.

MATERIALS AND METHODS

This section can take many forms, depending on the complexity of the research being reported, including: materials and methods as a combined section with information presented in that order, as separate sections, or materials divided into two sections (*i.e.*, study area and the remainder of materials) and methods as a third section. Furthermore, if data presented in each of the sections involve discrete categories of information (*e.g.*, specimens, samples, hydrology, flora, phylogenetics, DNA, proteins), that require extensive descriptions, they can be presented under different subheadings.

So, when given a choice, when should information about the materials and methods used for a research project be combined into one section or separated into distinct sections? If all the information is simple, straightforward, and easily explained, then present the information in one section, materials first and methods second. If the description of the study area is extensive and several types of materials or methods, each with its unique characteristics, are used then place the study area in its own section and use subheadings for everything else under the materials or methods headings.

However materials and methods used in the research being reported are organized, enough detail must be provided that anyone can perform the same procedures, in the same way, and duplicate the research. For ecology- or behavior-based research, other researchers interested in duplicating the experiments should be able to come as close as possible to the conditions of the original research reported in a publication.

Study area.—Present the name of the area(s) if one exists and county, state, province, and country (as appropriate) where it is located. For a study area of limited expanse provide its location relative to the nearest city. However, no matter which of these pieces of information are provided, always include a geographic designation for the study area. The designation can take the form of: UTM's (*i.e.*, Universal Transverse Mercator Projections) or latitude and longitude in degrees and hundredths of degrees or degrees, minutes, seconds. If the study area is large, the geographic designation provided should define the boundaries of the study area. Also, include mention of why the particular area was used as opposed to some other area (if appropriate).

A general description of the habitat, including flora (include scientific names), climate, hydrology and geology, as appropriate, should be presented. Then, provide pertinent details of the aspects of the habitat significant to the research. However, always remember that the physical and biological characteristics of a study area are ever changing. "If volcanic eruptions, hurricanes, fires, floods and ecological succession have taught scientists anything, it is that environments, including study areas, can be referred to in the present tense only when standing in [or near] the study area. Ecosystems are dynamic! So, refer to characteristics of study areas as they were when the study was conducted—always in the past tense" (Carraway, 2006:377).

Materials.—These take as many forms as there are types of research; however, they all have one thing in common — from each of the forms data are collected. For example, in a study of DNA of rodents within a genus, the specimens (*i.e.*, which animals) from which tissues (*i.e.*, what types) are removed need to be identified. Details, including catalog numbers with museum acronym for at least the tissues

and collection locality for the animal from which tissues were removed, should be provided in an appendix at the end of the manuscript (Appendix III). Also, if relevant, other types of information recorded for each animal should be mentioned.

For osteological material, if measurements of more than a few dimensions were recorded, then how many and of what kind (*e.g.*, cranial, mandibular, postcranial) should be stated. A figure illustrating landmarks used for the dimensions should be included as supporting material. Otherwise, a written description of each dimension should be provided in the materials section.

In behavioral, botanical, ecological, geological, or hydrological studies, the types of samples collected or observations recorded need to be described in the materials section. If extensive samples or observations were collected or recorded they should be described briefly or summarized in the materials section with details provided in an appendix at the end of the manuscript. For qualitative characters, if more than a few were examined, or multiple classes for each character make descriptions cumbersome, the qualitative characters with their descriptions and character states should be presented in an appendix at the end of the manuscript.

Findings of organism-based research have significance relative to the identifications of the involved plants or animals. Therefore, it is necessary that voucher specimens (*i.e.*, documentary records) be deposited in an accredited systematics collection located at a university or museum. These specimens should be documented in a specimens examined list (Appendix III). This allows for the possibility that identifications of the involved organisms could change and the research be reinterpreted based on the new information. If the research is based on a colony of animals maintained in a laboratory or outside enclosure, then the origin of the colony needs to be provided.

If access, usage, or collection permits were required from private, state, or federal agencies, be sure to state the type of permit obtained and from what agency it was obtained. If live animals were handled for which published guidelines or institution protocols had to be followed, state which guidelines or protocols were followed.

Methods.—The methods section should provide sufficient detail of the process(es) used to conduct the research and analyze data collected to enable precise replication of the research. This includes how specimens were located and samples (*e.g.*, tissues, blocks of time for behavioral observations, soils and such) collected or obtained as well as how they were analyzed (*e.g.*, statistics and equipment). Any data collection and sample manipulation performed in the laboratory should be described, including procedures used.

For the genetics study mentioned previously, this would include, at a minimum, how tissues were stored and where archived, how DNA was extracted from tissues and how the procured DNA was analyzed including sequencing kits, primers, buffers and temperatures used. The final information that must be provided is, "In what gene banks were the gene sequences deposited?"

For research involving plots or grids (whether in the wild, agricultural field, or petri dish) the layout, size, and distance among points of data collection must be documented. What type, size, and how many traps were used. The trapping regiment must be described: how often were traps examined, when were they set, for what time period were they used, when were they moved, what type of bait or lure was used (if any), was bedding provided and were traps shaded artificially or by vegetation? If sections of a plot or grid were demarcated, with a plowed or raked strip (provide width) or flagging, this needs to be noted. How often and what methods were used to collect samples, were there replicate plots, and how far apart were the plots or grids? If data collection was interrupted for any reason, this should be documented. The impact of the interruption(s) on data interpretation and analyses should be explained.

Statistical software used, with citations if not well-known, and statistical analyses used with any nonnormal variants should be described. If data were normalized, standardized, or altered in any manner because of statistical requirements, an explanation of data manipulations done and reasons need to be provided. Citations for field or laboratory techniques and analyses used, if not in common usage, need to be provided. However, do not just write "Techniques of Jones (2002) were used", especially if Jones (2002) is a thesis, dissertation, or other document with limited availability. Include enough information to eliminate questions regarding techniques used and describe any variants to those techniques. If novel methods of collecting or analyzing data were employed, describe them in

great detail (enough so that the same techniques can be duplicated by someone else) and justify their usage.

RESULTS

This section should contain the outcome of statistical or laboratory analyses of data and analyses of data obtained by field or laboratory observations written in the simple past tense. The information should be sorted into a logical progression from most basic to most complex conducted within a logical progression of categories. However, this is neither the place to mention materials or methods missed in those sections, nor is it the place to discuss the meaning or implications of the findings. For complex research projects it is acceptable to initially provide a brief overview of findings, then to divide analyses into separate sections each with its own subheading to provide readers with a greater ease of digesting many different types of findings. For example, a study of cranial, DNA, mtRNA, ecological and behavioral characteristics, each addressing its own hypothesis(es), of shrews within a particular geographic region would have a subheading for each characteristic.

Supporting materials for the findings of statistical or laboratory analyses may include figures (e.g., maps, graphs, photographs, genetic sequences) and tables. But, neither tables nor figures should be subjects of sentences. Examples of what not to write are: "Table 1 contains summary data for cranial dimensions recorded" or "Figure 3 illustrates the chromosomal differences of individuals in the 2 populations." Instead write: "Specimens from populations A and B can be distinguished by skull length (19–23 mm, 32–38 mm, respectively) and cranial breadth (9.5–11.5 mm, 16–19 mm, respectively; Table 1)" or "Individuals in population A have $2n = 36$, whereas individuals in population B have $2n = 52$ (Fig. 3)."

The results section often is among the shortest sections of a scientific manuscript because it is not the place for flowery, obscure, or ambiguous language — only clear, explicit language should be used. The findings of any analytical techniques used must be presented with great clarity. After all, readers have only the information provided in the manuscript to understand the voluminous quantities of data collected by the author(s) and it is the author's responsibility to collate null, expected and unexpected findings. Thus, total honesty is required, meaning that even findings contradictory to expectations, i.e., failed hypotheses or nonsignificant statistical tests, or null data, also need to be reported. This is necessary to allow future researchers to know that unnecessary collection of data wasted money or time, or can provide future avenues for research or other types of analyses (i.e., meta analyses).

DISCUSSION

This section is not the place to recapitulate the results, nor should the results and discussion sections ever be combined. Merging of the sections leads to superfluous wording, unnecessary discussion and confusion. The discussion section of a manuscript should contain a synthesis of the contents of the introduction and results sections. Also, it should provide readers with an understandable and orderly treatment of the hypotheses or concepts at the center of the research being reported as reflected in the title of the manuscript. Furthermore, this is the place where new taxa are named following proper formatting (de Queiroz, 2006; ICZN, 1999). Published literature that provides corroboration, or opposition, for segments of the research should be cited. The ultimate purpose of the discussion section is *the advancement of science through the addition and refinement of knowledge*.

The length of the discussion and what it contains are highly variable, but commonly it is the longest section within a manuscript. Its variable nature is related to the complexity and significance of the research conducted and the quantity of previous knowledge that must be integrated with the present findings. The discussion is where relationships determined during the course of a research project, with their possible mechanisms, are presented. The meaning of various aspects of the analyses, including which were hypothesized and which were not, should be provided. Mention also should be made of exceptions to the rules, absence of correlations when such were expected on theoretical grounds, new theoretical implications, and, if appropriate, applications of the findings of the research. Therefore, if there is a story to be told, the discussion section is where it takes place. But, remember that the story needs supportive evidence that can be obtained from the results section combined with published literature. Always provide evidence for every conclusion and cite tables and figures as necessary and

appropriate. Never assume anything regarding what a reader already understands, how astute they might be in seeing the relationships you see, or think you see, or that readers magically have an intimate understanding of the thought processes used to arrive at your conclusions. Success is reached when a reader at the end of a paper is not asking the question "*So what?*" Thus, the object of writing a discussion section is to combine evidence from your results section with that from the published literature *to extend knowledge one step further* and to write that *one step* in such a manner that it is understood by any reader with basic scientific knowledge.

Near the end of the discussion should be a description of the significant findings and implications of the research, and specific recommendations for future research. Also, if appropriate, suggestions for needed government (*e.g.*, local, state, federal, international) oversight, involvement or intervention would appear near or at the end of the discussion.

Having all material to be included properly sorted is the ultimate goal of writing any manuscript resulting from scientific research. Readers should be able to follow the what's, why's, when's, where's, and how's of the research, and how the findings of the research fit within all of science. Accomplishing this goal can make the difference between acceptance and rejection of a manuscript by a managing editor swamped with 100 s of manuscripts to be considered. Even if a manuscript is based on superb research, proper analyses, and all relevant background information, if poor thought processes by the author(s) leads to a poorly organized manuscript, a busy editor may decide that the time required to properly sort all of the information — a job that truly is within the author's purview — is simply not worth the effort.

Acknowledgments.—If short, this section may be placed at the end of the introduction, otherwise it should be placed at the end of the manuscript just before the literature cited section. Recognition of assistance in the performance of research described in a manuscript, of whatever sort, is made in this section. Any 'thank you's' should be simple, honest, straightforward, and devoid of unrestrained emotion. Phrases such as, "I want to thank ... for ..." or "I wish to thank ... for ..." are unnecessary; just state "I thank ... for ...". Assistance of people can take many forms including, but not limited to: landowners or agencies (*e.g.*, state, federal, private) who provided access to their property where research was conducted, persons or granting agencies (*e.g.*, state, federal, private) who provided financial support (with grant number if appropriate), persons who assisted with field or laboratory work or statistical analyses, names of individuals who provided reviews of the manuscript before it was submitted for publication, and names of reviewers chosen by the managing editor of a publication who provided particularly helpful constructive criticisms and that provided their name. Another form of assistance to be recognized is: museum collections that allowed access to specimens (*e.g.*, skin, osteological, tissue, plant, mineral, soil) in their care; be sure to include the standard acronym (if cited in text or an appendix) and official name used by each collection. Names of the curator or collection manager may or may not be included. If a large number of illustrations used in the manuscript are by one person, then they should be afforded recognition in this section; however, if only a few were used, then the name of the artist should be presented in the appropriate figure legends. If the research is derived from a Master's thesis or Ph.D. dissertation it is appropriate to mention that herein. Finally, if appropriate, at the end of the acknowledgments section, a number applied to the manuscript by an agency or academic institution should be provided, *e.g.*, "This is Technical Paper No. xxxx, Oregon Agricultural Experiment Station."

I thank my husband, B. J. Verts, for allowing me to peruse lecture notes he used in a manuscript-preparation class. I thank M. B. Fenton and B. J. Verts for their comments on an earlier draft of this manuscript.

LITERATURE CITED

In a scientific paper, to qualify for inclusion in a literature cited section, publications must be from sources available to all readers. Thus, monthly, annual, or job completion reports to state, federal, or private agencies do not qualify. Such papers not only have a limited life expectancy, but are not available to the entire scientific community. Any reader, whether at the time of publication, or 100 y from that moment, should have the possibility of

examining the literature upon which a paper was based. Furthermore, all references listed must be cited somewhere within the manuscript. This is what distinguishes a Literature Cited from Bibliography or Reference listings.

Do not assume that all publication outlets use the same style or format for references cited. When writing of a manuscript commences, examine the instructions for contributors and recent issues of the publication to which the manuscript will be submitted for proper style of citations. This will allow citations to be formatted correctly from the onset. Although editors will examine citations for proper formatting and correct minor errors, it is not the job of the editor, reviewers, or printer to redraft all citations in a literature cited section in the necessary style of the publication. If citations are in a format other than required, likely the manuscript will be returned to the corresponding author for correction. Although citing literature in proper order and format is largely a mechanical exercise, more mistakes in manuscripts are related to literature citations than from any other cause. When a manuscript is finished, and after every revision of a manuscript, all citations presented in text, figure legends, tables, or appendixes should be verified against the references presented in the literature cited section to ensure they match.

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CHO, M. K., G. MCGEE AND D. MAGNUS. 2006. Lessons of the stem cell scandal. *Science*, **311**:614–615.

DE QUEIROZ, K. 2006. The PhyloCode and the distinction between taxonomy and nomenclature. *Syst. Biol.*, **55**:160–162.

ICZN. 1999. International code of zoological nomenclature. 4th edition. The International Trust for Zoological Nomenclature and The Natural History Museum, London.

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APPENDIX I

The byline is placed between the title and abstract of a manuscript. It would seem that presentation of the names and addresses of authors of a manuscript should be the most simple part of writing a manuscript; however, many times it is the most onerous. The best time to settle any questions regarding authorship is before research ever begins. This is not to say that conclusions researched earlier regarding who should be included as a author and in what order cannot be changed as the work of research progresses. Questions to be considered are: whose name should appear, in what order, and do major professors or heads of laboratories automatically get their names listed for simply breathing, providing a little advice, assistance or obtaining funding for the research (but, did none of the research or writing)? On a purely ethical and professional basis, only people who actually made a major contribution (*e.g.*, to the research or writing of the manuscript based on the research) to a paper should be included as an author (Cho *et al.*, 2006). As for the rest, that is what acknowledgments sections were invented for.

I have known people demanding their name be included as an author for merely providing a piece of equipment used in the research, for providing an outside review of the manuscript, because they sign the time sheets necessary for researchers to obtain their paychecks or simply because they think they can deceive a novice writer into believing a few 'How's your research going?' legitimately qualifies them for authorship. All of these qualify as honorary authorship or less — neither of which are acceptable or ethical. A number of years ago, the journal *Science* published a retraction of an article, with several authors, because of data fabrication. Subsequently, one of the authors published a *Letter* stating that he should not be held responsible for any aspects of the problems with the data included in the retracted paper because he was just head of the laboratory and had nothing to do with the research in question. At which point the questions "Then why were you an author in the first place?" and "Just how many

other papers in which your name is listed as an author were you nothing more than an honorary author?" were poised. I am quite sure that the number of papers he published each subsequent year dropped precipitously after he had to start justifying his authorship for every paper.

APPENDIX II

The corresponding author of multiauthored manuscripts performs an important, and sometimes difficult, task. This is the only author who interacts with the managing editor of a publication outlet. It is this author's responsibility to ensure that all authors of a manuscript have given their approval for submission of the manuscript before it is sent to a publication outlet. Consideration might be given to having a printed statement signed by each author that they agree to the manuscript being submitted. Furthermore, the corresponding author must keep all authors of a manuscript apprised as to the status of the manuscript in question. Notification should be made when the manuscript has been submitted. When reviews, the managing editor's comments regarding the manuscript, and the edited manuscript have been received, copies of all materials received and a copy of the reprint order form, must be sent to all authors of the manuscript. It is the dubious honor of the corresponding author to ensure that comments and suggestions of all authors of the manuscript are incorporated into the revised draft. After a revision is produced, the corresponding author *must* be sure that all authors have the opportunity to read the completed revision — *not just the portion each author revised*. This is necessary because all authors have equal responsibility for the contents of the manuscript. Also, all authors must be notified when the manuscript has been accepted for publication. The final responsibility of the corresponding author is to carefully read the galley (or page proofs) against a copy of the revised manuscript returned to the managing editor, clearly mark any corrections, and return it to the managing editor in the time frame indicated in the paperwork that arrived with the galley.

APPENDIX III

A manuscript may include one or more appendices, each numbered or lettered individually, starting on a new page, and containing different types of auxiliary materials that support the contents of the manuscript. An appendix consisting of raw data not analyzed and discussed in the manuscript is not acceptable. Each appendix should begin with a caption describing its contents to the extent that reference to the text is unnecessary.

For specimen-based studies, a specimens examined list must be included that contains information for all specimens (*e.g.*, skin, osteological, tissue, plant, mineral, soil) used. This would include scientific name to appropriate level (*e.g.*, species, subspecies); country, province, state, and county (as appropriate), and specific locality where specimen was collected; and museum acronym and catalog number of each specimen. For tissue samples, the museum acronym and catalog number of the specimen from which it was derived (if at all possible) also must be included. This piece of information is necessary because tissues have relevance only in reference to the specimens from which they were derived. Also to be considered are other types of information that might be included regarding each specimen, *e.g.*, sex, age, condition, relationship to other specimens, provenance and water, substrate, or soil type where collected.

APPENDIX IV

Following are descriptions of additional sections required by some, but not all, publication outlets. Before including them in a manuscript, be sure to consult the guidelines for contributors for the proposed publication outlet.

Key words.—This is a listing of 6–12 words or phrases, considered pertinent to the research by the author(s). Bibliographic services include them as part of their subject search mechanisms. Great care

should be used when choosing the words or phrases such that the needs and expectations of people conducting literature searches will be met.

Conclusions.—This section has been eliminated by many publication outlets that want the significant findings and implications of the research, and specific recommendations for future research, provided at the end of the discussion section. Statements, such as, "More research is needed" should never be used as it conveys the impression that in some manner the research reported did not satisfactorily answer the questions presented in the manuscript. If a separate conclusions section is required, it is placed between the discussion and acknowledgments sections and may contain new material, *e.g.*, hypotheses, ideas, thoughts and literature citations.

Summary.—The summary section rarely is used in manuscripts published in journals because of a redundancy of information provided in the abstract. Its most common usage is at the end of books that contain a compilation of articles, thus, it serves to tie together all the papers that appeared in the book. When used, the summary provides a synopsis of what the results of all the articles mean in terms of the state of knowledge on the subject and the significance and relevance of the research within 500–1000 words. Emphasis is placed on the conclusions reached in the research. It does not contain any new material, *e.g.*, hypotheses, ideas, or thoughts, and must be based entirely on the contents of the manuscript.

APPENDIX V

Tables and figures are meant to serve as support for statements, results and findings presented in a manuscript. Figures have the additional value of providing a visual aid to explanations. However, to be effective, great care must be used when drafting tables and figures to insure they are absolutely necessary, for them to convey the intentions of the author(s), and have readers be able to understand those intentions.

How many.—The number of figures and tables to include with a manuscript is not limitless. Usually, only one figure or table for every three pages of typescript text are allowed. Exceptions would be for figures that accompany a Key or when a new taxon is being described where new or not well-known characters need to be illustrated. It is always possible to combine illustrations to produce fewer figures and eliminate redundancies in figure legends. Also, small tables, containing the same information in the stub or boxhead, can be combined into fewer tables to eliminate redundancy. Exceptionally large tables should be placed in an appendix at the end of a manuscript and referred to where appropriate in text.

How referred to in text.—Tables and figures are numbered consecutively in separate series and are numbered in the order in which they are referred to in text. Always placed in parentheses, they would be referred to as: (Table 1), (Tab. 1) or (Figure 1), (Fig. 1), depending on the style required by the publication outlet. When citing a table or figure published in another paper, the basic format would be: Carraway 2002:fig. 1, table 2; however, this can vary depending of the required style. Note that the first letter of figure and table is uppercase for those being published for the first time and lowercase for those cited from other sources.

Legends.—On receipt of a new issue of a journal, many readers initially quickly scan through the issue before reading any of the papers. Often they will pause to examine tables and figures, thus legends that accompany tables or figures always must be self-explanatory. Many types of information may be included. However, readers should not be required to refer to the text to decipher acronyms, species involved, where the study area was located, when data collection occurred (if appropriate), the types of data contained in the tables and figures, and who drafted the table or drew the graphics (if appropriate).

Conformance.—All figures (when at all possible) and all tables within a manuscript should possess a high level of conformance. For tables, this means the same styles of boxheads, stubs, indentations and lines for all tables within a manuscript should be used. For figures, this means the same font for lettering and numbering and style for labeling axes, scale bars, north arrows, line-types, parts, and keys for graphics should be used. Also, the same symbols should be used to indicate a particular type of item for

all figures in which that item is included. For example, if in figure 1 individuals are represented by solid circles for population A, solid squares for population B, and open triangles for population C, use these same symbols to represent individuals from the different populations for all figures. Never mix symbol usage.

Tables.—When drafting a table always keep in mind the page size of the publication to which the manuscript will be submitted and types of orientations (*i.e.*, parallel and perpendicular to the page) allowed. Tables should never be treated as partial figures. Everything included within a table should be able to be typeset, thus, no artwork (*e.g.*, little figures) ever should be considered for inclusion. For the boxhead and stub, often one may contain several or many categories, whereas the other only a few. Usually, it is best to place the few categories in the boxhead and the many categories in the stub for best fit on a published page. However, when only two columns or rows are available for a table, the data should be placed either in a figure (if appropriate) or text. As the number of footnotes should be kept to an absolute minimum, the table legend should include all general information related to the contents of the table and any ancillary information often referred to in the body of the table.

Figures.—Be sure that diagnostic characters mentioned in text are visible in illustrations that purport to exemplify them. This is particularly necessary when an artist is paid to provide illustrations. The artist must be made to understand that artistic license is not allowed in scientific publications, *i.e.*, any drawings must accurately represent the item being drawn. Keep in mind that not all artists are capable of producing accurate drawings.

When using figures directly (*i.e.*, by scanning or photographing) from a published source, permission for usage always must be obtained from the holder of the copyright. After permission is obtained, an explicit statement must be included in the figure legend stating "Figure is from (*insert citation of publication from which the figure was derived*). Permission for use of this figure was obtained from (*insert name of holder of copyright*)." If permission is not sought or is denied, it is neither acceptable nor ethical to use a figure not owned by one of the authors of the manuscript in which the figure would be included. When an original Figure in a publication is modified or redrawn, an explicit statement must be included in the figure legend stating "Figure [drawing(s), map, or whatever is appropriate] modified (or redrawn) from (*insert citation of publication from which the figure was derived*)."

APPENDIX VI

A well-written cover letter is just as important as a well-written and organized manuscript. The cover letter must contain the title of the manuscript, who the author(s) is (are), that it is being submitted for consideration for publication in (*name of the publication outlet*), and a statement that the manuscript is not being considered simultaneously for publication in another outlet. Also, the corresponding author's name, postal address, e-mail address and FAX and telephone numbers must be included either in the text of the cover letter or running head of the stationery on which the cover letter is printed. Do not include a sentence stating that the guidelines for contributors were adhered to closely when writing the manuscript; just write the manuscript such that it does adhere to the guidelines. Do not presume that managing editors should know the name(s) of the author(s) and title of a manuscript just because a copy of the manuscript is traveling with the cover letter. Remember, it is the corresponding author's responsibility to "sell" the manuscript, not the managing editor's job. Finally, if submitting a manuscript via the postal service, always be sure to actually sign the cover letter before including it with the required number of printed copies (as noted in the guidelines for contributors) of your manuscript, a disk copy of the manuscript if required, and mailing it to the managing editor of your intended publication outlet.

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